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MONDAY NEWSLETTER BOOKLET

FuelEU Maritime Compliance Insights

Content

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CHAPTER ONE

FuelEU Maritime 101

FuelEU Maritime Compliance Timeline

In this chapter, we break down the key dates and requirements for FuelEU Maritime to help you stay on track with the FuelEU compliance timeline.

Monitoring Plan Submission

Deadline: 31 August 2024

The ISM company must submit a monitoring plan for each vessel. The monitoring plan must outline the chosen method for monitoring and reporting emissions. In case a ship is subject to FuelEU Maritime after 31 August 2024, a monitoring plan must be submitted to the verifier no later than two months after the first port call at a port falling under the regulation's scope.

Recording Data

Period: 1 January to 31 December 2025

Throughout the operational year of 2025, companies are required to record EU MRV (Monitoring, Reporting, and Verification) data in line with the submitted monitoring plan. This includes but is not limited to detailed documentation of fuel usage, emissions, and distance traveled for each vessel.

Data Submission

Deadline: 31 January 2026

The recorded EU MRV data for the operational year must be submitted to the verifier by the end of January 2026. Note that if a ship changes the ISM company throughout the operational year, the transferring company must submit the partial data to the verifier who must verify the data and record it in the FuelEU database within one month.

Data Verification

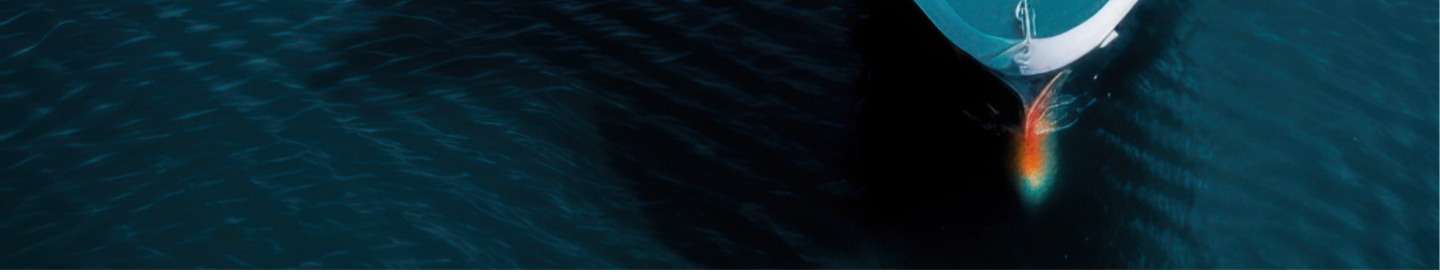
Deadline: 31 March 2026

By the end of March 2026, the verifier must complete the verification process and report the results to the company. The verified data will then be recorded in the FuelEU database. This data includes but is not limited to the ship's compliance balance and GHG intensity.

Compliance Mechanism Reporting

Deadline: 30 April 2026

After receiving approval from the verifier, companies must report their utilization of compliance mechanisms such as banking, borrowing, or pooling in the FuelEU database by the end of April 2026. Effective use of these mechanisms can provide flexibility and cost savings while ensuring compliance with FuelEU regulations.



Compliance Penalty Notification

Date: 1 June 2026

On this date, responsible authorities (the administering state) will inform companies of any applicable penalties that must be paid.

Penalty Payment and Document of Compliance (DoC) Issuance

Deadline: 30 June 2026

By the end of June 2026, any outstanding penalties must be paid, and a Document of Compliance (DoC) is issued.

Why is it Important to keep on track with FuelEU and closely follow the FuelEU Maritime compliance timeline?

Compliance with FuelEU regulations is not just a regulatory requirement but also a commercial risk. The penalties for non-compliance can be enormous (see previous case study), the commercial as well as legal alignment of stakeholders is demanding, and choosing the most cost-effective compliance option is not straight forward.

Responsibility under FuelEU Maritime

Who is responsible under the FuelEU Maritime regulation?

The ISM (International Safety Management Code) company i.e. DoC (Document of Compliance) holder is responsible for ensuring compliance with the FuelEU Maritime Regulation. This does not depend on whether the DoC holder is a ship owner, charterer, or ship manager. It places a significant responsibility on the DoC holder to manage and oversee compliance with the regulation's requirements.

Differences from EU ETS?

Under the EU Emissions Trading System (EU ETS), an implementing act shifted the responsibility from the DoC holder to the ship owner. This change was made to acknowledge the inability of ship managers to influence the technical and operational setup of ships exposed to the regulation.

Will the same happen for FuelEU?

In contrast to EU ETS, the FuelEU regulation legally doesn't allow for a similar implementing act. This means that, unlike the EU ETS, the DoC holder will remain responsible under FuelEU.

Challenges

The DoC holder, in most cases the technical manager of the ship, has no direct power over the fuel choice or the technical setup of the vessel as the ship owner or operator typically determines it. This lack of control complicates the DoC holder's ability to ensure compliance with FuelEU requirements while at the same time exposing him/her to extensive financial risks.

At the same time, it raises the question of surplus ownership. While the DoC holder is responsible, the operator bears the increased fuel costs of bunkering alternative fuels and is interested in owning the monetary benefit (the surplus).

Both the regulatory responsibility as well as the surplus ownership require amendments of charter party agreements and further contractual agreements, especially when choosing pooling as a mean of compliance.

Regulatory Context

The relevant portion of the FuelEU Maritime Regulation regarding responsibility is in Article 3(13):

"Company means the shipowner or any other organization or person such as the manager or the bareboat charterer, which has assumed the responsibility for the operation of the ship from the shipowner and has agreed to take over all the duties and responsibilities imposed by the International Management Code for the Safe Operation of Ships and for Pollution Prevention"

For more detailed information, refer to the full text of the FuelEU Maritime Regulation (EU) 2023/1805 on the EUR-Lex website.

FuelEU Maritime Banking

For which of the below vessels would you consider FuelEU Maritime banking as a smart means of compliance with FuelEU?

- ❑ HFO vessel
- ❑ MeOH vessel
- ❑ Dual-fuel LNG vessel
- ❑ Bio30 vessel

What is FuelEU Maritime Banking in Compliance?

Banking in the context of FuelEU compliance refers to the process by which a vessel that has achieved a compliance surplus (i.e., its greenhouse gas (GHG) intensity or RFNBO (Renewable Fuels of Non-Biological Origin) sub target performance is better than required) can carry over this surplus to offset future deficits. This mechanism allows vessels to store their compliance surplus for future use, effectively smoothing out the compliance process over multiple years.

FuelEU Maritime banking is particularly useful for vessels facing varying operational conditions or fuel availability over time, providing a flexible strategy to maintain compliance with evolving regulations. However, it's essential to note that banking is vessel-specific; the surplus generated by one vessel can only be used by that same vessel in subsequent reporting periods.

The correct answers

When it comes to banking, it’s crucial to remember that banking is only allowed for the same vessel.

Dual-fuel LNG Vessel: These vessels can accrue a compliance surplus during the period from 2025 to 2030. This surplus can be banked and used when these vessels become non-compliant from 2030 onwards.

Bio30 Vessel: A Bio30 vessel, which runs on a blend of biofuels and traditional fuels, can generate a surplus. This surplus can be banked and used in future years when the vessel might be running on more conventional fuels like HFO due to e.g. fuel availability, thus ensuring compliance in those years.

Why Not the Other Vessels?

HFO Vessel: HFO vessels do not generate a surplus under FuelEU and therefore cannot benefit from banking, as it is only allowed for the same vessel.

MeOH Vessel: While a MeOH vessel (methanol-fueled) generates a surplus, it is not as advantageous for banking because it will maintain a compliance surplus for years to come and has as such no option to utilize the banked surplus for its own compliance needs. Planning for compliance in the far future, such as around 2040 to 2050, is not advisable due to potential changes in fuel infrastructure and availability.

Regulatory Context

The relevant portion of the FuelEU Maritime Regulation regarding banking is detailed in Article 20:

"On the basis of the calculations undertaken in accordance with Article 16(4), where the ship has, for the reporting period, a compliance surplus on its GHG intensity as referred to in Article 4(2) or, if applicable, on the RFNBO subtarget as referred to in Article 5(3), the company may bank it to the same ship’s compliance balance for the following reporting period. The company shall record the banking of the compliance surplus to the following reporting period in the FuelEU database subject to approval by its verifier. The company may no longer bank the compliance surplus once the FuelEU document of compliance has been issued."

FuelEU Maritime GHG Intensity & Mitigation

When it comes to FuelEU Maritime compliance, which of the following mitigation options is favorable?

- ❑ Technical vessel improvements
- ❑ Wind-assisted technologies
- ❑ HFO fuel

General Overview: Understanding the FuelEU Maritime GHG intensity.

The FuelEU Maritime Regulation (EU) 2023/1805 outlines the calculation of greenhouse gas (GHG) intensity for ships in Article 4. The FuelEU Maritime GHG intensity is the ratio of total GHG emissions to total energy used by a ship.

Formula

Total GHG emissions / Total energy used

Components

Total GHG emissions: Includes all well-to-wake (WtW) GHG emissions by different fuel types consumed onboard. The emissions are calculated by multiplying the energy consumption of a specific fuel type with its respective emission factor.

Total energy used: Considers all energy types consumed during the reporting period.

Here is why wind-assisted technologies are the correct answer

When considering FuelEU compliance, the intensity indicator (GHG intensity) is crucial. Here's why wind-assisted technologies are the favorable option:

Wind-Assisted Technologies: Wind-assisted propulsion systems (WAPSs) significantly reduce fuel consumption and GHG emissions. Ships with WAPSs benefit from a Wind Reward Factor under FuelEU, reducing their GHG intensity. For example, a vessel with a factor of 0.97 can achieve compliance while still using fossil fuels between 2025 and 2030.

Why Not the Other Options?

Technical Vessel Improvements: Technical improvements, such as waste heat recovery systems, enhance energy efficiency by reducing both the numerator and denominator of the GHG intensity formula, resulting in minimal to no impact on the GHG intensity. While these improvements lower the remedial penalty by reducing non-compliant energy consumption, they do not significantly improve compliance under FuelEU.

HFO Fuel: Heavy Fuel Oil (HFO) has a high emission factor, resulting in an intensity figure that exceeds the regulatory threshold, making it unsuitable for improving compliance.

Regulatory Context

The relevant portion of the FuelEU Maritime Regulation regarding wind-assisted technologies is in Article 9:

"For the purposes of calculating the attained annual average GHG intensity as referred to in Article 4(1), the energy savings achieved through wind propulsion technology shall be taken into account. The Commission shall adopt implementing acts specifying the verification procedure and the methodology to calculate the energy savings from wind propulsion technology."

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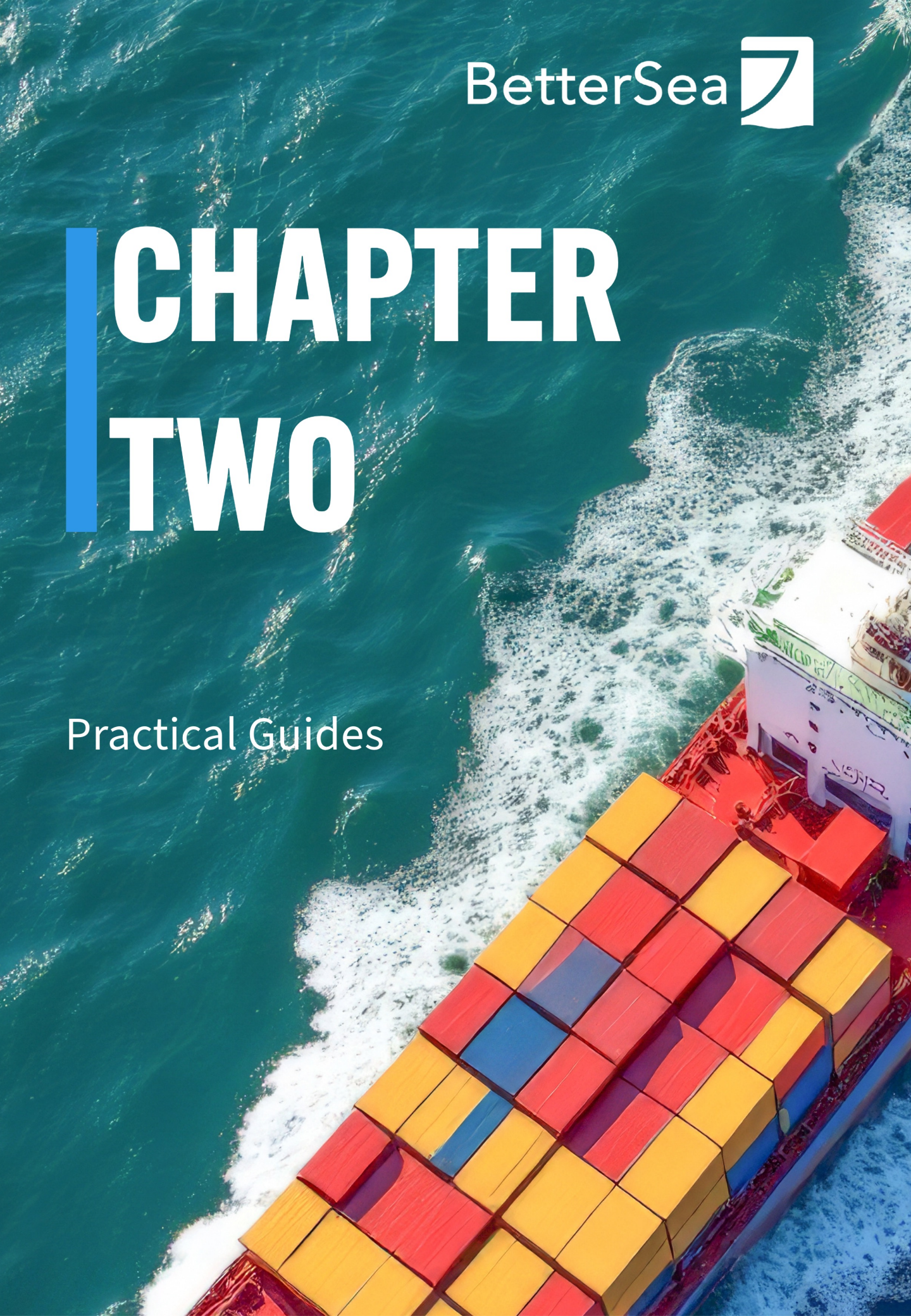
CHAPTER TWO

Practical Guides



FuelEU Maritime: Finding the Right Emission Factor

Most essential for compliance with FuelEU Maritime is the emission factor used to determine the GHG intensity. The emission factor under FuelEU Maritime measures a fuel's lifecycle emissions (well-to-wake), which are expressed in grams of CO_2 equivalent per megajoule (g CO_2e/MJ). This chapter sheds light on where to find a fuel's emission factor and how it is derived:

Where to find a fuel's emission factor for calculations under FuelEU Maritime?

FuelEU Maritime is the first EU regulation for shipping considering not only tank-to-wake emissions, those occurring when combusting fuel onboard, but also well-to-tank emissions, caused by, for example, the production of the fuel. This required the definition of well-to-wake emissions for maritime fuels, a new set of emission factors. When calculating the penalties under FuelEU Maritime, the use of the right emission factors determines correctness.

The regulation provides default emission factors for the most commonly used fuels such as HFO or LFO under Annex II.

Less common fuel types, including biofuels, are not defined in the above-mentioned Annex II. The document instead refers to the EU's Renewable Energy Directive (RED). Compliance of fuels with this regulation is proven by the International Sustainability & Carbon Certification (ISCC) and documented on a fuel's Proof of Sustainability (PoS). The corresponding emission factor not mentioned in Annex II of the FuelEU Maritime regulation can, therefore, be found under Section 3 of its PoS document.

What does the Proof of Sustainability (PoS) document include?

The PoS document has three different sections beyond mentioning the supplier and recipient, those are:

1. General Information
2. Sustainability criteria
3. Greenhouse Gas Information

The section 'Greenhouse Gas Information' outlines both the well-to-wake emission factor as well as the emission factors for the underlying steps of the lifecycle. Those are:

Emissions from the extraction or cultivation of raw materials e_{ec}

These are the emissions associated with the cultivation or extraction of raw materials. It includes greenhouse gases from the application of fertilizers, energy for machinery, and irrigation. Field-level data such as fertilizer use and diesel consumption must be accounted for, along with emissions from the production of chemicals used in cultivation.

Emissions from carbon stock change caused by land-use change e_l

If there has been a change in land use (e.g., forest to farmland) after a specific cutoff date, emissions from the carbon stock change must be included. This is annualized over a 20-year period, using carbon stock calculations that compare the former and current land use.

Emissions from processing e_p

Processing emissions include energy used for converting raw materials into fuels, such as electricity and heat consumption, and the production of intermediate goods. For example, emissions from the generation of steam or other energy sources in production facilities need to be included.

Emissions from transport and distribution e_{td}

Emissions related to the transportation and distribution of raw materials and final products are calculated based on fuel use and distance traveled. This also includes emissions from storage.

Emissions from use of fuel e_u

These emissions occur during the use phase of the fuel. In the case of renewable fuels, this typically refers to emissions from burning the fuel. This is subtracted from the total emissions to provide net emissions.

Emission saving from soil carbon accumulation e_{sca}

Emission savings from improved agricultural management, such as better tillage practices or improved crop rotation, may further reduce the emissions attributed to the cultivation phase.

Emission savings from CO_2 capture and replacement e_{ccr}

This refers to the CO_2 captured from processes, which replaces fossil-derived CO_2 in other industries. This results in a net emission reduction.

Emission savings from CO_2 capture and geological storage e_{ccs}

Emissions can be reduced by capturing and storing carbon, such as in biofuel production where CO_2 is sequestered instead of released.

Emission savings from excess electricity e_{ee}

Occurring excess electricity can be fed into the grid and replace fossil-based electricity resulting in emission savings.

To derive the resulting emission factor, each fuel supply chain participant needs to provide the relevant intermediate emission factors together with a sustainability certification that outlines which option was chosen to come up with the corresponding values. Options include:

- The use of total default values
- The use of disaggregated default values
- The use of actual values
- Combination of the above

A final verification of the values by an auditor marks the end of creating a fuel's PoS.

Challenges of the Proof of Sustainability under FuelEU Maritime

Considering the amount of reporting stakeholders, one of the main challenges with emission factors for biofuels under FuelEU Maritime is the timely delivery of the proof of sustainability, which can take up to three months. During this time, the shipping company can only work with an estimate that might change with the delivery of the PoS, resulting not only in a changed emission factor but also a compliance penalty or surplus value.

Default vs. Actual Values

Beyond the PoS, it is noteworthy that the FuelEU Maritime regulation allows for both default values and actual values to be used under specific circumstances when reporting the fuel's emission factor. The regulation allows the use of actual values derived from either direct measurements or laboratory testing according to applicable international standards for all emission factors except well-to-tank emission factors from fossil fuels and tank-to-wake CO_2 emission factors from fossil fuels.

The well-to-wake performance of renewable and low-carbon maritime fuels should be established using default or actual and certified emission factors covering the well-to-tank and tank-to-wake emissions. For the purpose of this Regulation, only default well-to-tank emission factors and default tank-to-wake CO_2 emission factors for fossil fuels should be used.

For more detailed information, refer to the full text of the FuelEU Maritime Regulation (EU) 2023/1805 on the EUR-Lex website.

Conclusion

FuelEU Maritime, its compliance and penalty, strongly rely on the correct usage of emission factors. Shipping companies can use default factors but also actual values are possible for specific types and circumstances. Getting an understanding of where to find the right emission factor and the available options is crucial for the most optimal compliance with FuelEU Maritime.

Guide:
How to Calculate GHG Intensity under FuelEU Maritime

Following up on the previous chapter, in this chapter we'll focus on the practical application of emission factors, calculating the greenhouse gas (GHG) intensity of a ship under the FuelEU Maritime regulation. We provide a guide on how to correctly calculate the GHG intensity based on an example with a containership using heavy fuel oil (HFO).

What is GHG Intensity?

Under FuelEU Maritime, the GHG intensity is the ratio of total greenhouse gas emissions (in grams of CO_2e) to the total energy consumed by the ship (in MJ). This value, expressed in g CO_2e/MJ, is the metric used to determine compliance with FuelEU Maritime.

Example: Calculating GHG Intensity under FuelEU Maritime for a Containership in 2025

In this example, we will calculate the GHG intensity of a containership with 7,000 tonnes of annual HFO consumption (in scope) under FuelEU Maritime in 2025 (using AR4 Global Warming Potentials).

Step 1: Identify Calculation Parameters

Before diving into the calculation, we need to gather the relevant data:

Annual fuel consumption: 7,000 tonnes of HFO.

1	2	3	4	5	6	7	8	9
			WtT	TtW				
Fuel Class	Pathway name	LCV [MJ/g]	$CO_{2eq\ WtT}$ [gCO2eq/MJ]	Fuel Consumer Unit Class	$C_{f\ CO_2}$ [gCO2/gFuel]	$C_{f\ CH_4}$ [gCH_4/gFuel]	$C_{f\ N_2O}$ [gN_2O/gFuel]	C_{slip} As % of the mass of the fuel used by the engine
Fossil	HFO ISO 8217 Grades RME to RMK	0,0405	13,5	ALL ICEs	3,114	0,00005	0,00018	-
	LFO ISO 8217 Grades RMA to RMD	0,041	13,2	ALL ICEs	3,151	0,00005	0,00018	-
	MDO MGO ISO 8217 Grades DMX to DMB	0,0427	14,4	ALL ICEs	3,206	0,00005	0,00018	-

Image 1: A snippet of the Emission Factors provided in Annex II of the FuelEU Regulation

HFO's Emission Factors:

- The default well-to-tank (WtT) emission factor for HFO is 13.5 g CO_2e/MJ.
- Tank-to-wake (TtW) CO_2: 3.114 g CO_2/g fuel.
- Tank-to-wake (TtW) CH_4: 0.00005 g CH_4/g fuel.
- Tank-to-wake (TtW) N_2O: 0.00018 g N_2O/g fuel.

The values are according to Annex II of the regulation, as shown in Image 1.

Global Warming Potential (GWP):

- GWP CO_2: 1.
- GWP CH_4: 25.
- GWP N_2O: 298.

The values are according to AR4 as per FuelEU Maritime.

Step 2: Calculate Well-to-Wake (WtW) Emission Factor

Based on the above-identified parameters, the GHG intensity can be calculated. The first step is the calculation of the corresponding well-to-wake emission factor, for which it is mandatory to first determine the tank-to-wake emission factor for HFO based on AR4 GWPs:

$$EF_{TtW,HFO} = C_{f\,CO_2} \cdot GWP_{CO_2} + C_{f\,CH_4} \cdot GWP_{CH_4} + C_{f\,N_2O} \cdot GWP_{N_2O}$$

$$EF_{TtW,HFO} = 3.114 \cdot 1 + 0.00005 \cdot 25 + 0.00018 \cdot 298 = 3.16889 \left[\frac{\text{g } CO_2\text{e}}{\text{g fuel}}\right]$$

From here, the well-to-wake emission factor can be calculated by adding the well-to-tank and the tank-to-wake part:

$$EF_{WtW,HFO} = EF_{WtT,HFO} + EF_{TtW,HFO}$$

$$EF_{WtW,HFO} = 13.5 + \frac{3.16889}{0.0405} = 91.744 \left[\frac{\text{g } CO_2\text{e}}{\text{MJ}}\right]$$

Note that the calculated tank-to-wake factor must be divided by the LCV to have the same unit.

Step 3: Calculate Energy Content of HFO

The next step is to calculate the total energy content of the 7,000 tonnes HFO consumed. The Lower Calorific Value (LCV) of HFO is 0.0405 MJ/g fuel (see Annex II image above). With that, the total energy used by the ship can be calculated to:

$$E_{total} = m_{HFO} \cdot LCV_{HFO}$$

$$E_{total} = 7{,}000 \cdot 10^9 \cdot 0.0405 = 2.835 \cdot 10^{11}\ [\text{MJ}]$$

Step 4: Calculate Total Emissions

Next, we calculate the total greenhouse gas emissions using the well-to-wake (WtW) emission factor and the fuel consumption:

$$CO_2e_{total} = EF_{WtW,HFO} \cdot E_{total}$$

$$CO_2e_{total} = 91.744 \cdot 2.835 \cdot 10^{11} = 2.60095 \cdot 10^{13}\ [\text{g } CO_2\text{e}]$$

Step 5: Calculate GHG Intensity

Finally, we calculate the GHG intensity by dividing the total emissions by the total energy used onboard.

$$GHG\ Intensity = \frac{CO_2e_{total}}{E_{total}} = 91.744\ \left[\frac{\text{g } CO_2\text{e}}{\text{MJ}}\right]$$

It can be noticed, that in the case of just one fuel type the GHG intensity equals the well-to-wake emission factor of the fuel type.

Note on AR4 vs. AR5 GWP Values

While the above calculation uses AR4 Global Warming Potentials (GWPs) as per the current regulatory text, it is important to note that the European Maritime Safety Agency (EMSA) has indicated that the regulation will shift to AR5 GWPs before January 2025. This means the GWP values for CH_4 and N2O will change to 28 and 265 respectively, affecting the well-to-wake emission factor:

$$EF_{WtW,HFO,AR5} = 91.601\ \left[\frac{\text{g } CO_2\text{e}}{\text{MJ}}\right]$$

Conclusion

The GHG intensity of the containership consuming 7,000 tonnes of HFO annually under FuelEU Maritime in 2025 is 91.744 g CO_2e/MJ based on AR4 values. The fuel consumption did not affect the resulting GHG intensity as the ship only consumed one fuel type.

Shipping companies should remain prepared for any adjustments in their emission factor calculations, as regulatory updates will incorporate AR5 GWPs.

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Guide:
How to Calculate FuelEU Maritime Penalties

Following up on the previous chapter, we're providing a guide on how to calculate the FuelEU Maritime penalties. We will go through each required step.

General Overview of FuelEU Maritime Regulation

The FuelEU Maritime Regulation aims to reduce the maritime sector's greenhouse gas (GHG) emissions, targeting a 6% reduction by 2030 and 80% by 2050. The regulation mandates stricter emissions reporting and compliance with GHG intensity limits for ships operating to/from or within the EU, promoting the use of cleaner fuels and innovative technologies to drive sustainability.

The Compliance Penalty

The FuelEU Maritime Regulation includes a strict compliance penalty that is applied if the target GHG intensity is not met. The penalty costs have cautiously been chosen to ensure that a strategy of just paying the penalty is commercially not attractive.

"Without prejudice to the possibility of complying through the flexibility and pooling provisions, ships that do not meet the limits on the yearly average GHG intensity of the energy used on board should be subject to a penalty that has dissuasive effect, is proportionate to the extent of the non-compliance and removes any economic advantage of non-compliance, thus preserving a level playing field in the sector (the 'FuelEU penalty'). The FuelEU penalty should be based on the amount and cost of renewable and low-carbon fuels that the ships should have used to meet the requirements of this Regulation." as per FuelEU Maritime Regulation (EU) 2023/1805.

The penalty is set at 2400€ per ton of VLSFO equivalent exceeding the limit, but what does that mean for a vessel in total?

How to calculate FuelEU Maritime Penalties?

Step 1: Calculate the GHG intensity

Required data:

- Fuel consumption per fuel type (in g fuel)
- Tank-to-Wake (TtW) emission factor per fuel type (in g CO_2e / MJ)
- Well-to-Tank (WtT) emission factor per fuel type (in g CO_2e / MJ)
- Lower calorific value (LCV) per fuel type (in MJ / g fuel)
- Electricity consumption (in MJ)

The lower calorific value can be found in Annex II of the FuelEU Maritime Regulation (EU) 2023/1805, the emission factors can be found in the same Annex or the fuel's Proof of Sustainability (PoS).

Equation:

$$GHG\ Intensity_{actual} = \frac{m_{fuel} \cdot LCV_{fuel} \cdot (EF_{WtT} + EF_{TtW})}{m_{fuel} \cdot LCV_{fuel} + E_{electricity}}$$

Note: For LNG, RFNBOs, ice class, or wind propulsion, please consult the FuelEU Maritime Regulation (EU) 2023/1805 for more details.

Step 2: Calculate the Compliance Balance

Required data:

- Actual GHG intensity (in g CO_2e / MJ)
- Target GHG intensity (in g CO_2e / MJ)
- Fuel consumption per fuel type (in g fuel)
- Lower calorific value (LCV) per fuel type (in MJ / g fuel)
- Electricity consumption (in MJ)

The lower calorific value can be found in Annex II of the FuelEU Maritime Regulation (EU) 2023/1805, the actual GHG intensity has been calculated under Step 1, and the target GHG intensity is 89.34 g CO_2e / MJ as per Article 4(2) of the FuelEU Maritime Regulation (EU) 2023/1805.

Equation:

$$CB = (GHG\ Intensity_{target} - GHG\ Intensity_{actual}) \cdot (m_{fuel} \cdot LCV_{fuel} + E_{electricity})$$

Step 3: Calculate the Compliance Penalty

Required data:

- Actual GHG intensity (in g CO_2e / MJ)
- Compliance balance (in g CO_2e)

The actual GHG intensity has been calculated under Step 1, the compliance balance has been calculated under Step 2.

Equation:

$$Penalty = \frac{|CB| \cdot 2400€}{GHG\ Intensity_{actual} \cdot 41{,}000}$$

This step-wise approach helps calculate the FuelEU Maritime penalties and breaks down the complex equations in a simpler manner. Note that the above has been simplified to exclude the use of LNG, RFNBOs, wind propulsion, or an ice class. In case any of the above is relevant, please refer to the annexes of the FuelEU Maritime Regulation (EU) 2023/1805 for further information.

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Step-By-Step to Successful FuelEU Maritime Compliance

The upcoming FuelEU Maritime regulation goes beyond just data recording and reporting. It requires an overarching multi-faceted approach to achieve and maintain compliance. Multiple maritime stakeholders must manage responsibilities, assess compliance status, and carefully plan their compliance actions throughout the year.

In this chapter, we break down step-by-step what is required to master compliance with the upcoming FuelEU Maritime Regulation successfully.

Align Stakeholder Responsibilities

While the ISM company is ultimately responsible for compliance with FuelEU, it is expected that individual contractual agreements will pass on responsibility for achieving compliance to other parties. Define with your respective counterparties (owners, charterers, and/or managers) how to handle GHG intensity tracking, reporting, and surplus management. Special emphasis must be laid on the compliance mechanisms, most importantly on the ownership of surplus as it is critical for external/internal pooling and banking.

Assess and Track Compliance Status

Regularly assess each vessel's and the fleet's GHG intensity relative to the FuelEU targets to ensure end-of-year compliance. Make use of simulation tools to project how your compliance status may evolve throughout the year, considering factors like fuel changes, voyage patterns, and price data.

Develop a Compliance Strategy

Define a strategy based on your fleet's projected end-of-year compliance status. If your fleet will have a deficit (non-compliance), decide whether to:

- Pay the penalty.
- Purchase alternative fuels.
- Borrow from the following year's compliance balance.
- Buy surplus by entering an external pool.

If your fleet will have a surplus (over-compliance), decide whether to:

- Bank the surplus for future use.
- Use it for internal pooling within your fleet.
- Sell the surplus to other companies.

Option: Source Alternative Fuels

Consider the technical capabilities of your vessels, their routes, the corresponding alternative fuel availability, and the correct fuel certification for eligibility under FuelEU. To prevent extra costs, calculate the exact amount of alternative fuel needed by considering the intricacies of the FuelEU regulation, especially the fuel allocation across different voyages.

Option: Manage External Pooling and Surplus Trading

External pools are both particularly appealing as they save compliance costs for non-compliant companies and allow for additional revenues for over-compliant companies, but must also be looked at with caution. To ensure risk-managed, trustworthy, and reliable external pooling, several key points must be considered:

- **KYC and Partner Selection**: Ensure thorough Know Your Customer (KYC) processes and select reliable partners.

- **Data Accuracy**: Request pre-validated data when trading before the annual data verification to reduce the risk of non-delivery.
- **Contractual Agreement:** Set up contracts that cautiously define price, amount, timelines, responsibilities, and most importantly risk management (e.g. reimbursement structure in case of non-delivery).
- **Control over sold surplus:** Make sure to maintain control over sold surplus not allowing buyers to further sell surplus to other companies to prevent stakeholder chaos and contractual confusion.

Report and Verify Compliance Data and Mechanisms

Ensure that all relevant (EU MRV) data, including surplus and deficit calculations, is submitted to a verifier on time. Make sure to also report compliance mechanisms, including the use of surpluses, deficits, and penalties, as required by FuelEU Maritime regulations.

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CHAPTER THREE

Intricacies

Ice Class & FuelEU Maritime: Navigating Compliance in Harsh Conditions

As the maritime industry adapts to the upcoming FuelEU Maritime regulation, one area that presents unique challenges is the compliance of ships with ice class. These are essential for maintaining global trade routes that pass through colder climates. The ships are designed to handle harsh sea ice conditions, but their unique operational needs and technical characteristics also mean higher energy consumption, complicating their efforts to meet the regulation's greenhouse gas (GHG) intensity targets.

To ensure that this regulation does not unfairly burden ice-class ships, the FuelEU Maritime regulation supports such ships and offers specific exemptions. In this chapter, we explore these exemptions in more detail and outline how this is different from the current EU ETS. For more information on the alignment of different ice classes, please follow the HELCOM recommendation 25/7.

FuelEU Maritime Exemptions for Add. Energy Consumption of Ice Class and Sailing in Ice

Under the FuelEU Maritime regulation, some provisions allow companies operating ice-class ships to exclude additional energy consumption due to the technical characteristics of the ship and navigation in ice conditions from their compliance balance.

Technical Characteristics of Ice-Class Ships: According to Article 8(3)(n) and Annex V of the regulation, companies may request to exclude additional energy used due to the ship's ice class from the compliance balance. This provision applies specifically to ships with ice classes IA or IA Super.

Sailing in Ice Conditions: Article 3(23) defines "sailing in ice conditions" as the navigation of an ice-class ship in areas within the ice edge. The regulation permits companies to exclude the energy used during such voyages from their compliance balance. To do so, companies must provide detailed information on the vessel's ice class, the distance traveled in ice conditions, and the fuel consumed during these voyages.

Note, that EU ETS does not allow for the inclusion of the second bullet point, sailing in ice conditions, but only considers the higher energy consumption due to the physical difference of ice-class ships.

How to Calculate Adjusted Energy for Ice-Class Ships

The process of adjusting for additional energy consumption is detailed in Annex V of the regulation:

- **Additional Energy Due to Ice Class:** For ships with ice class IA or IA Super, the additional energy consumption due to their technical characteristics is calculated as a percentage (5%) of the total energy used on all voyages (excluding additional energy due to sailing in ice conditions).
- **Additional Energy Due to Ice Conditions:** For ships navigating through ice and ice class IC, IB, IA, or IA Super, the additional energy consumption is calculated by subtracting the energy used for open-water voyages and the adjusted energy for ice voyages from the total energy used.
- **Total Additional Ice Energy:** The total additional energy due to ice is the sum of both the technical and operational energy (as per above) for ice-class ships, which is then allocated to the different fuel types used during the year.

Please find the exact formulas for calculating ice class exemptions in Annex V of the FuelEU Maritime regulation.

Reporting Requirements and Verification

To benefit from these exemptions, companies must ensure that they provide accurate and verifiable data, as outlined in Article 15(1)(g-h). This includes information on the ship's ice class, the distance traveled in ice conditions, and the corresponding fuel consumption. This data collection is not known from EU ETS and therefore must be established.

Next Steps for Ice-Class Ships

Responsible entities for ice-class ships need to prepare for the documentation requirements outlined in the regulation and should stay informed about any updates of the regulation as this provision is valid only until **December 31, 2034.**

Key Considerations for Drafting Charter Clauses under FuelEU Maritime

The Baltic and International Maritime Council (BIMCO), one of the world's largest international shipping associations representing ship owners, is actively working on draft clauses for time charter parties to help maritime stakeholders navigate FuelEU Maritime. In this chapter, we share our thoughts on key considerations for FuelEU charter clauses and also touch upon implications on SHIPMAN agreements.

Key Considerations for FuelEU Maritime Charter Clauses:

Flexibility in Fuel Procurement: It's important to build flexibility for charterers to supply fuels that meet the vessel's greenhouse gas (GHG) intensity targets. Clauses should allow charterers to choose the combination of fuels and energy that aligns with their decarbonization strategies while ensuring that these choices are compatible with the vessel's technical capabilities. Otherwise, the owner's imposed mitigation strategy might not align with the charterers' already ensured fuel supply and vessel operations.

Regular Reviews and Updates: Given future FuelEU reviews, charter clauses should include provisions for regular updates. This ensures that the contracts remain aligned with any changes to the FuelEU Maritime Regulation and continue to protect the interests of all parties involved.

Managing Surplus and Deficit Scenarios: A critical aspect of FuelEU compliance is how to handle the scenarios where a vessel either exceeds (surplus) or falls short (deficit) of its GHG intensity targets. Charter clauses should include clear provisions for managing surpluses and deficits, including options for banking, borrowing, or pooling. In this respect, it is essential to address how the value of any surplus will be determined, for which the charterer will be compensated, especially considering the potential volatility in trading markets. If this is not sufficiently done, charterers and owners will not be able to agree on the value resulting in corresponding disputes.

Time Charters less than a Full Compliance Year: It is likely (and advised) that charter clauses will allow passing on the ability to pool from owner to charterer. If the charter period is less than the compliance year, it must be ensured that a vessel is only pooled in one pool per compliance year. Therefore, the ability to pool shall preferably not be passed on to more than one charterer to avoid a complex stakeholder landscape requiring complex reimbursement and control mechanisms.

The Impact of FuelEU Maritime on SHIPMAN Contracts

The introduction of the FuelEU Maritime Regulation will further have implications for SHIPMAN contracts, which govern the relationship between ship owners and ship managers. A few initial thoughts below:

Risk Management and Liability: SHIPMAN contracts should clearly define the ship manager's liability for non-compliance with the FuelEU Maritime Regulation. This is essential to protect both ship owners and managers from potential disputes.

Collaboration with Charterers: Given the flexibility charterers may receive to supply alternative fuels, ship managers will need to work closely with them to ensure appropriate technical facilities and crewing. SHIPMAN contracts may include provisions to facilitate this collaboration.

Regular Reviews and Updates: Just as the BIMCO FuelEU clauses include provisions for regular reviews, SHIPMAN contracts should incorporate mechanisms for periodic assessments to ensure compliance with evolving regulations.

Conclusion:

The FuelEU Maritime Regulation requires updated contracts, influencing not only charter parties but also ship management agreements. By updating these contracts to reflect the new compliance landscape, stakeholders must be aware of financial risks while ensuring alignment with their own decarbonization strategies.

RFNBOs under FuelEU Maritime

Which of the following is considered an RFNBO under the FuelEU?

- ❑ e-Methanol
- ❑ HFO/Biofuel blend
- ❑ Bio-LNG
- ❑ Blue Ammonia

General Overview: Understanding RFNBOs and Their Incentives

Renewable Fuels of Non-Biological Origin (RFNBOs) are synthetic fuels produced from renewable electricity and carbon captured directly from the air. Here's a concise overview of RFNBOs and how they are incentivized under the FuelEU Maritime Regulation:

Definition & Compliance

RFNBOs must satisfy the definition in the Renewable Energy Directive (RED) II Article 2(36). They must achieve at least 70% GHG emissions reduction compared to the RED comparator. Compliance with renewable hydrogen criteria, including rules on sourcing renewable electricity, is required as per RED III Article 27(6).

Incentives for RFNBOs

Multiplier Effect: Until the end of 2033, energy from RFNBOs counts twice in GHG intensity calculations.

Sub-target: A minimum use target of 2% RFNBOs of the total yearly energy use by ships applies from 2034 if the share of reported RFNBOs used by ships is less than 1% by 2031.

These measures support the uptake of RFNBOs, signaling shipping companies and fuel suppliers to invest in these sustainable fuels despite their higher production costs compared to conventional fuels.

Here is why e-Methanol is the only RFNBO in the list

E-methanol is considered green methanol, produced using renewable energy and captured carbon dioxide, making it an RFNBO under FuelEU. It complies with the criteria for renewable hydrogen and its derivatives according to RED.

Why Not the Other Options?

HFO/Biofuel blend: Not considered an RFNBO due to its biological origins. However, it can help reduce GHG intensity under FuelEU if it meets the sustainability criteria set out in RED II Article 29.

Bio-LNG: Similarly, Bio-LNG is not an RFNBO because of its biological origin but can aid in reducing GHG intensity if it meets the necessary sustainability criteria.

Blue Ammonia: Produced from natural gas with carbon capture and storage, Blue Ammonia is a low-carbon fuel (LCF) and not an RFNBO.

Regulatory Context

The relevant portion of the FuelEU Maritime Regulation regarding RFNBOs is in Article 5.1 and onwards:

"For the calculation of the GHG intensity of the energy used on board by a ship, from 1 January 2025 to 31 December 2033 a multiplier of '2' can be used to reward the ship for the use of RFNBO. The methodology for this calculation is set out in Annex I."

General Overview: The Role of Ports under FuelEU Maritime

Under FuelEU Maritime, ports play a vital role in promoting cleaner maritime fuel options. They provide essential infrastructure, enforce regulations, and can offer incentives to help the shipping industry adopt alternative fuels.

By improving efficiency, using sustainable technologies, and working with various stakeholders, ports drive significant changes towards maritime decarbonization.

How FuelEU Maritime Regulates Ships in European Ports

The FuelEU Maritime regulation outlines the requirement for containerships and passenger ships to connect to the onshore power supply (OPS) while moored ar berth for a period exceeding 2 hours. Note that zero emission technologies can exempt the respective ships from the requirement. The requirement is following a timeline that allows both ships and ports to implement the technology needed for OPS:

From 1 January 2030, the above mentioned is required in ports covered by Article 9 of Regulation (EU) 2023/1804

From 1 January 2035, this is extended to ports not covered by the mentioned regulations but equipped with OPS.

Between 2030 and 2035, member states can decide to impose the usage of OPS in ports not covered by the regulation but equipped with OPS when communicated to the Commission a year earlier. Further, member states may decide to extend the requirement of OPS usage to ships at anchorage.

How the EU secures Onshore Power Supply (OPS) in European Ports

While FuelEU Maritime sets the OPS requirements for ships, the Commission also ensured the availability of the necessary infrastructure by Regulation (EU) 2023/1804. As of the regulatory text, Trans-European Transport Network (TEN-T) core and comprehensive ports must take the necessary measures to provide at least 90% of quayside energy through OPS by 31 December 2029 to containerships, high-speed passenger crafts, and passenger ships above 5,000 GT.

Background information: TEN-T (Trans-European Transport Network) Ports & Onshore Power Supply (OPS)

These ports are a key part of the EU's initiative to create an integrated and efficient transport network across Europe. They are strategically selected for their critical role in facilitating international trade and transport, and they are divided into two main categories:

Core Network Ports

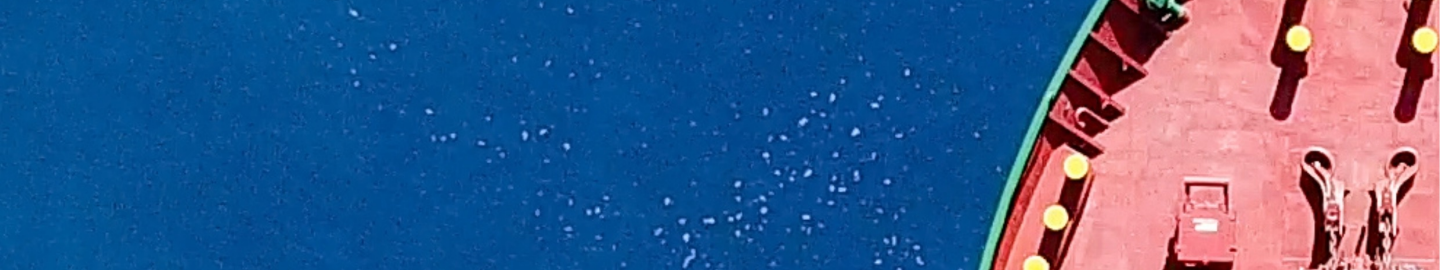
These are the most significant ports within the TEN-T network. They handle large volumes of cargo and passenger traffic and are prioritized for EU funding and development. Core network ports are essential for the smooth functioning of the entire European transport system.

Comprehensive Network Ports

These ports complement the core network by enhancing regional and national connectivity. While they handle less traffic compared to core network ports, they still play a vital role in the transport network and receive support for infrastructure improvements.

What is Onshore Power Supply (OPS)?

Onshore Power Supply, also known as cold ironing or shore-side electricity, allows ships to plug into the local power grid while docked, instead of running their auxiliary engines on fossil fuels. This significantly reduces emissions of air pollutants and greenhouse gasses, improving air quality and contributing to climate goals.



Regulatory Context

The relevant portion of the FuelEU Maritime Regulation regarding OPS is in Article 6(1) and onwards:

"From 1 January 2030, a ship moored at the quayside in a port of call which is covered by Article 9 of Regulation (EU) 2023/1804 and which is under the jurisdiction of a Member State shall connect to OPS and use it for all its electrical power demand at berth."

For more detailed information, refer to the full text of the FuelEU Maritime Regulation (EU) 2023/1805 on the EUR-Lex website.

The relevant portion of the regulation on the deployment of alternative fuel infrastructure regarding OPS is in Article 9(1) and onwards:

"Member States shall ensure that a minimum shore-side electricity supply for seagoing container ships and seagoing passenger ships is provided in TEN-T maritime ports."

For more detailed information, refer to the full text of the Regulation (EU) 2023/1804 on the EUR-Lex website.

In summary, both regulations work together to not only ensure emission reduction at sea but also at berth through the application of OPS, an essential enabler for comprehensive maritime decarbonization. On top, OPS helps to reduce air emissions and related health impacts, especially in port cities.

A FuelEU Maritime Controversial: The Rising Tide of LNG and the Complexities of Boil-Off Gas Management

With Maersk's recent change of heart in its decarbonization strategy, diversifying its fuel portfolio including previously criticized liquified natural gas (LNG), the fuel takes center stage demanding a closer look at its role under FuelEU Maritime regulation. The fuel brings the critical challenge of managing boil-off gas (BOG) within the regulation's framework.

What is Boil-Off Gas and how is it accounted for under FuelEU?

Boil-off gas is the vaporized LNG that naturally occurs as the liquid fuel warms up during storage in a ship's cryogenic tanks. This gas needs to be managed carefully to prevent pressure buildup within the tanks.

The different ways of managing boil-off gas ultimately define how it is accounted for in calculating the GHG intensity under FuelEU:

BOG as Fuel: If the BOG is utilized as fuel in the ship's engines, the resulting emissions are included in the GHG intensity calculation as part of the energy consumed. This is a straightforward scenario where BOG contributes to the total GHG emissions. The use of BOG as fuel is common, especially in LNG carriers.

BOG Reliquefication: If the BOG is reliquefied, the energy consumed in this process contributes to the overall energy use and indirectly affects the GHG intensity. The emissions associated with the energy used for reliquefication are factored into the GHG intensity calculation, albeit as an indirect contribution.

BOG Venting: Venting BOG is the most concerning scenario. When BOG is released into the atmosphere without being burned, it contributes directly to methane emissions. Under the FuelEU Maritime regulation, the 'lost fuel' is used with the default emission factor and corresponding methane slip percentage to calculate the related emissions but the direct emission of unburnt methane is not at all accounted for.

The Challenge of Boil-Off Gas and Onshore Power Supply

The occurrence of boil-off gas presents a significant operational challenge—especially when ships are connected to onshore power supply (OPS). With engines shut down, the typical use of BOG as fuel is interrupted, forcing companies to consider either reliquefication (using OPS) or venting. The latter results in significant methane emissions that are not accounted for under FuelEU.

The reliance on OPS, mandated by FuelEU Maritime for container and passenger ships by 2030, adds another layer of complexity. The integration of OPS is intended to reduce emissions in port areas by shifting the energy burden to the local electricity grid. However, without a clear strategy for managing BOG during these periods, the very environmental benefits that OPS is designed to achieve are undermined.

A Controversial Trade-Off: Are We Truly Reducing Emissions?

This scenario presents a controversial trade-off. On one hand, OPS represents a step forward in reducing emissions at berth, particularly in densely populated port cities. On the other hand, the potential increase in emissions from improperly managed BOG during these periods could offset these gains while not even quantified.

Will the shift to LNG, combined with OPS requirements, truly result in lower overall emissions? Or are we simply shifting the burden, trading one environmental challenge for another? This debate is far from settled!

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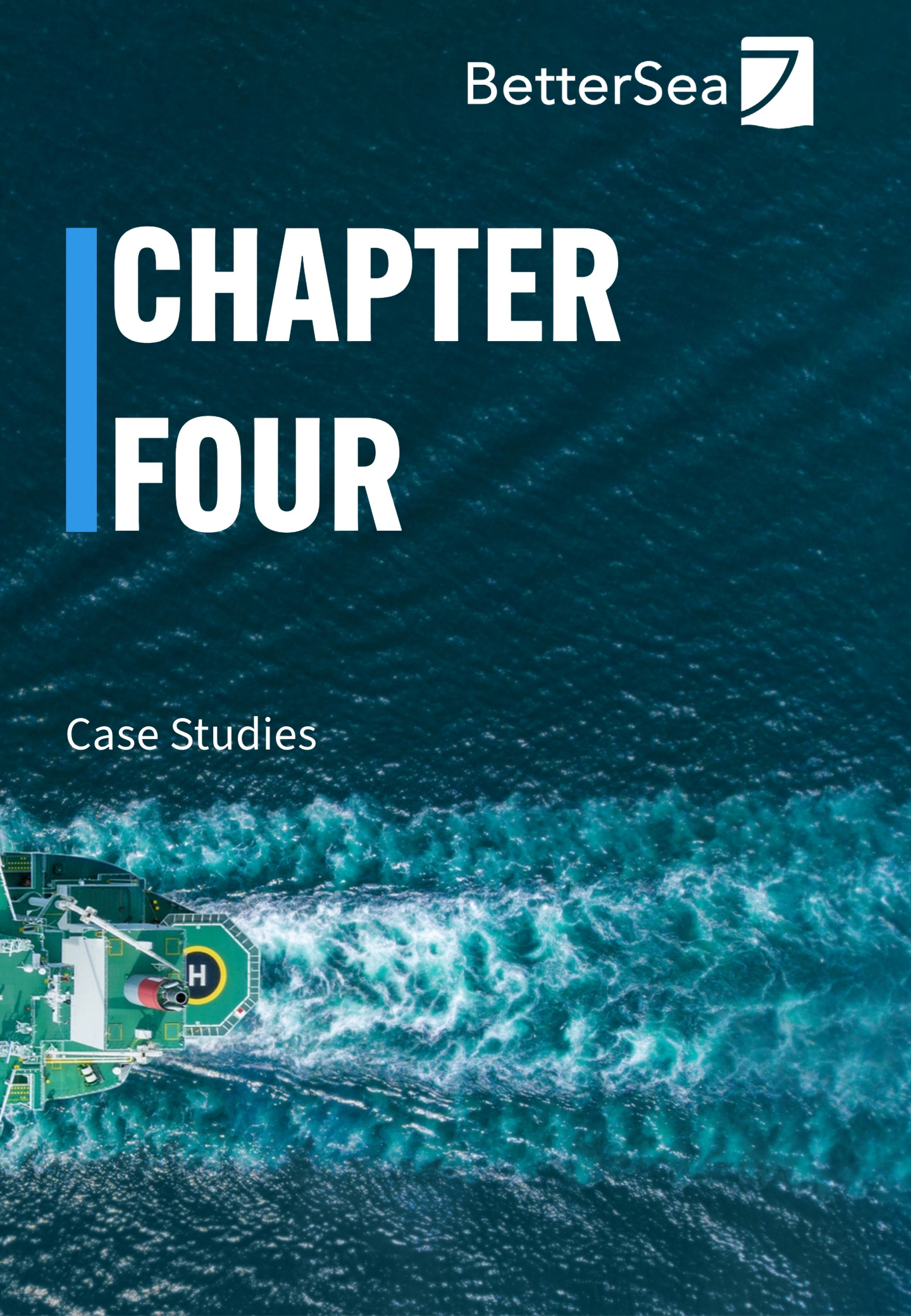
CHAPTER FOUR

Case Studies



Case Study:
FuelEU Maritime Penalty for a 15k TEU Containership

In this chapter, we're exploring a case study to illustrate the impact of FuelEU Maritime penalties using a 15,000 TEU containership as an example.

General Overview of FuelEU Maritime Regulation

The FuelEU Maritime Regulation aims to reduce the maritime sector's greenhouse gas (GHG) emissions, targeting a 6% reduction by 2030 and 80% by 2050. The regulation mandates stricter emissions reporting and compliance with GHG intensity limits for ships operating to/from or within the EU, promoting the use of cleaner fuels and innovative technologies to drive sustainability.

Case Study: FuelEU Maritime Penalty for a 15,000 TEU Containership

We will calculate the penalty for a 15,000 TEU containership under the FuelEU Maritime Regulation to provide insights into the financial implications of non-compliance.

Main data

- **Capacity:** 15,000 TEU
- **Annual Fuel Consumption:** 15,000 tonnes
- **Annual Fuel Consumption in Regulatory Scope:** 10,000 tonnes
- **Fuel Mix:**
    - Heavy Fuel Oil (HFO): 55%
    - Light Fuel Oil (LFO): 40%
    - Marine Diesel Oil (MDO): 5%
- **Emission Factors and Lower Calorific Values:** As per FuelEU Maritime Regulation (EU) 2023/1805 and IPCC AR5

Guide on how to calculate the FuelEU Maritime Penalty

1. **Fuel Consumption Distribution:** Source the consumption per fuel type in tonnes
2. **Total CO_2e Emissions:** Calculate by multiplying each fuel type's consumption by its respective emission factor
3. **Total Energy Used:** Calculate by multiplying each fuel type's consumption by its lower calorific value as per FuelEU Maritime Regulation (EU) 2023/1805
4. **GHG Intensity:** Calculate by dividing total CO_2e emissions by total energy used
5. **Excess GHG Intensity:** Calculate the difference between actual GHG intensity and the regulatory target.
6. **Penalty Calculation:** Calculate based on the excess GHG intensity and the penalty rate (2,400 € per equivalent metric ton of VLSFO).

Results

In this case, the GHG intensity is higher than the regulatory target (between 2025 and 2030: 2% less than the reference value of 91.16 CO_2e/MJ).

Penalty: 540,000 €

The Impact of the FuelEU Maritime Penalty: Comparison with the Annual Fuel Costs

To understand the penalty's impact, let's compare it with the annual fuel costs using current market prices.

Market prices:

- Heavy Fuel Oil (HFO): 580 €/t
- Light Fuel Oil (LFO): 670 €/t
- Marine Diesel Oil (MDO): 880 €/t

Results

In this case, the annual fuel costs faced by the vessel equal 6,300,000 €. Therefore, the FuelEU Maritime Penalty amounts to 9% of the annual fuel costs in 2025.

Key Takeaways

Even a slight excess in GHG intensity can result in significant penalties, around 9% of annual fuel costs for our example vessel. Investing in alternative fuels, carbon capture, and wind propulsion is crucial to avoid such penalties and ensure regulatory compliance. Alternatively, pooling represents a cost-effective option for compliance with FuelEU Maritime.

This case study demonstrates the importance of meeting FuelEU GHG intensity targets and the impact of non-compliance. By understanding the financial implications, shipping companies can better prepare and adopt necessary measures to ensure compliance, avoiding substantial penalties.

Click here

for our free online FuelEU Maritime Calculator & Strategizer

Case Study: Fuel Allocation on International Voyages under FuelEU Maritime

In this chapter, we're exploring a case study to illustrate the impact of the fuel allocation mechanism under the FuelEU Maritime.

General Overview of FuelEU Maritime Regulation

The FuelEU Maritime Regulation aims to reduce the maritime sector's greenhouse gas (GHG) emissions, targeting a 6% reduction by 2030 and 80% by 2050. The regulation mandates stricter emissions reporting and compliance with GHG intensity limits for ships operating to/from or within the EU, promoting the use of cleaner fuels and innovative technologies to drive sustainability.

The Geographical Scope

All ships that call an EU/EEA port are exposed to the FuelEU Maritime Regulation irrespective of their company's origin or flag state. A difference is made between intra-EU voyages, voyages to/from outermost regions, and voyages to/from the EU (international voyages):

- Intra-EU voyages: 100% of the energy used is subject to the regulation
- Voyages to/from outermost regions: 50% of the energy used is subject to the regulation
- International voyages: 50% of the energy used is subject to the regulation

Note, that the FuelEU Maritime regulation further uses the concept of transshipment ports similar to the EU ETS. Stops in transshipment ports do not count as port calls.

The Fuel Allocation on non-EU to/from EU voyages

While the fuel (energy) allocation on all intra-EU voyages is straightforward, 100% of the energy used onboard must be accounted for, the allocation on international voyages provides flexibility in the form of an allocation mechanism.

The allocation mechanism, or the flexibility in allocating renewable and low-carbon fuels to international voyages, stems from the fact that the GHG intensity is calculated using the total energy used per reporting period (annually). This allows for what can be called a fuel allocation optimization ensuring that the maximum amount (50%) of renewable and low-carbon fuels is allocated to the scope of the FuelEU Maritime regulation. Further details can be found under Question A.1 in the official FuelEU FAQ.

Case Study A: Fuel Allocation for Lower 50% Renewable or Low-carbon Fuel

The below illustrates a simple example of an international voyage with a 70/30 fossil/biofuel blend:

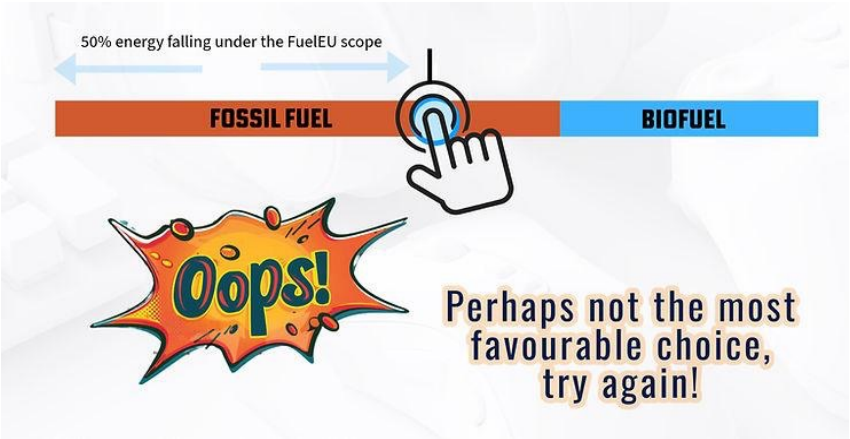


Image 2: Case Study A – Allocation Trial 1

In Image 2, the fuel allocation is not optimal. As chosen, the energy content in scope would be 50% fossil fuel, despite having used 30% biofuel on the international voyage. The resulting GHG intensity for this voyage would be above the limit and the penalty would amount to about 15,000 €.

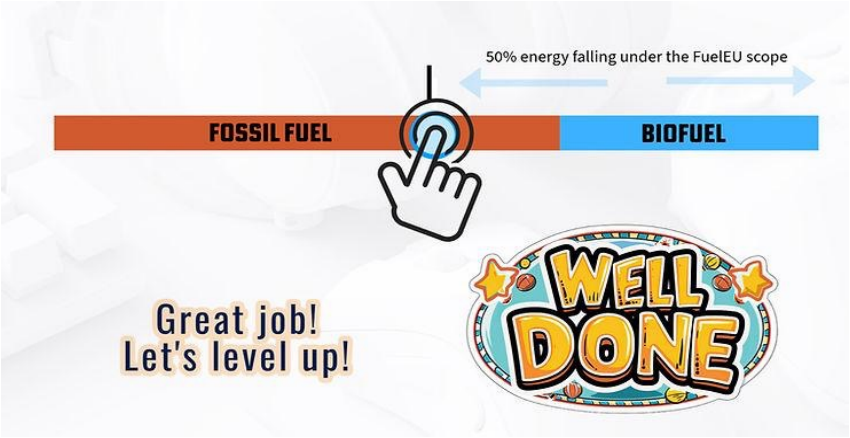


Image 3: Case Study A – Allocation Trial 3

In Image 3, the fuel allocation is optimal. The energy content in the scope includes the maximum amount of lower emission fuel resulting in 20% fossil and 30% biofuel in scope for the respective international voyage. The resulting GHG intensity for this voyage would be way below the limit, no penalty payment would be required, and the resulting surplus could potentially be monetized for about 85,000 €.

Case Study B: Fuel Allocation for Above 50% Renewable or Low-carbon Fuel

The below illustrates a simple example of an international voyage with a 40/60 fossil/biofuel blend:

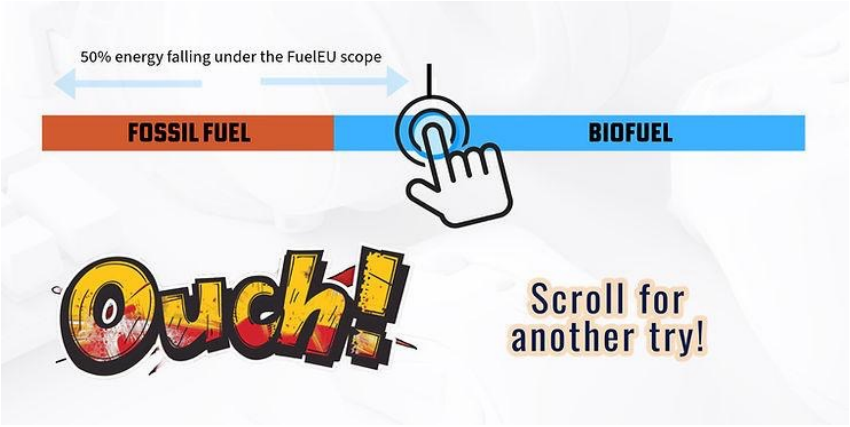


Image 4: Case Study B – Allocation Trial 1

In above Image 4, the fuel allocation is not optimal. As chosen, the energy content in scope would be 40% fossil fuel and 10% biofuel, despite having used 60% biofuel on the international voyage. The resulting GHG intensity for this voyage would be below the limit and the resulting surplus could potentially be monetized for about 15,000 €.

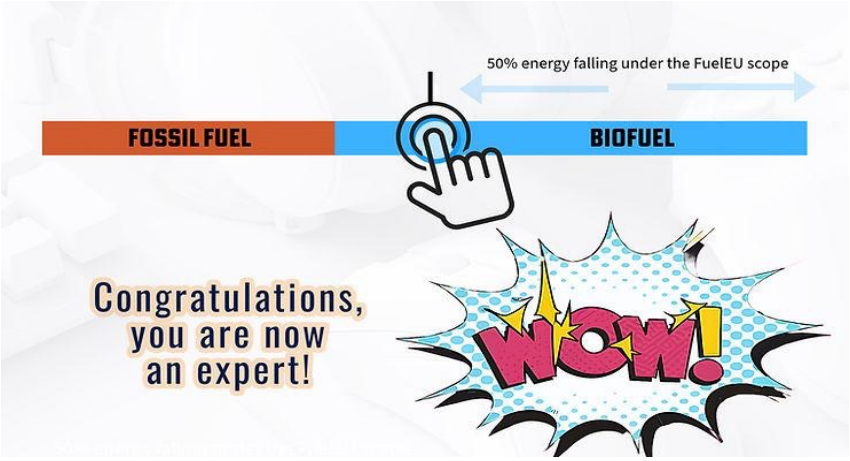


Image 5: Case Study B – Allocation Trial 2

In Image 5, the fuel allocation is optimal. The energy content in the scope includes the maximum amount of lower emission fuel resulting in 50% biofuel in scope for the respective international voyage. The resulting GHG intensity for this voyage would be way below the limit, and the resulting surplus could potentially be monetized for about 360,000 €.

Since the GHG intensity is calculated using the total energy used per reporting period (annually), the allocation can further be improved. As only 50% of the 60% biofuel has been used, the remaining 10% can be added to a future voyage with less than 50% of renewable or low-carbon fuel within the same reporting period.

Further Benefits of the Flexibility in Fuel Allocation on International Voyages under FuelEU Maritime

The previous case studies clearly outlined the benefits of the fuel allocation mechanism for the GHG intensity and respectively the penalty and potential surplus earnings related to compliance with the FuelEU Maritime regulation. Another reason for this flexibility and additional benefit might arise in the future. As other countries are currently discussing a similar regional regulation, international voyages between two similar regional regulations might be exposed to different penalties. The allocation mechanism allows to account for the renewable and low-carbon fuels in the regulation that is preferential from a financial perspective. This ultimately incentivizes the shipping companies consuming such fuels by improving their business cases.

RFNBO Incentive under FuelEU Maritime: A Critical Case Study

In this chapter, we're taking the example of one of the case studies to assess the incentive for RFNBOs under FuelEU Maritime.

General Overview: RFNBO Incentive under FuelEU Maritime

The FuelEU Maritime regulation is clear when it comes to incentivizing RFNBOs:

"In order to create a clear and predictable legal framework and thereby encourage the early market development and deployment of the most sustainable and innovative fuel technologies with growth potential to meet future needs, a dedicated incentive for renewable fuels of non-biological origin (RFNBO) is necessary." as per FuelEU Maritime Regulation (EU) 2023/1805.

Until 2033, FuelEU Maritime aims to foster the uptake of RFNBOs through a reward factor (RWD). This reward factor is essentially a multiplier that enables counting the energy of RFNBOs twice. If the incentive doesn't result in the intended effect, defined as a share of reported RFNBOs equal to or larger than 1% by 2031, then a 2% RFNBO subtarget shall apply by 2034.

In Practice: How does FuelEU Maritime incentivize RFNBOs?

The regulation's annexes help understand how the reward factor incentivizes RFNBOs. As a reminder, the compliance balance is the essential variable under FuelEU that defines whether a ship has a surplus or deficit. The surplus makes it eligible for banking and/or pooling, the larger the better.

The first step to reveal a ship's surplus is to calculate its GHG intensity as defined under Annex I. Here the GHG emissions are divided by the energy used onboard. The reward factor (RWD) that incentivizes the use of RFNBOs under FuelEU Maritime is represented by a multiplier of 2 in the denominator, essentially counting the energy related to RFNBOs twice and as such reducing the GHG intensity of the ship.

ENERGY CALCULATION FOR DETERMINING THE GHG INTENSITY (ANNEX I)

$$\sum_i^{n\ fuel} M_i \times LCV_i \times RWD_i + \sum_k^c E_k$$

RFNBO MULTIPLIER

The second step is the actual calculation of the compliance balance as defined under Annex IV. Here the difference between a ship's GHG intensity and the regulation's GHG intensity limit is multiplied by the ship's energy used onboard to determine the compliance balance. Unfortunately, the reward factor is not included in this formula despite the regulation's intent to incentivize RFNBOs.

ENERGY CALCULATION FOR DETERMINING THE COMPLIANCE BALANCE (ANNEX IV)

$$(GHGIE_{target} - GHGIE_{actual}) \times \left[\sum_i^{nfuel} M_i \times LCV_i + \sum_k^c E_k\right]$$

NO RFNBO MULTIPLIER

The regulation's omittance of the reward factor when calculating the compliance balance has a significant impact on the degree with which RFNBOs are incentivized, especially as the compliance balance is the ultimate number defining the surplus that can for example be monetized through pooling.

Case Study: RFNBO Incentive for a 15,000 TEU Containership

In a previous chapter, we calculated the FuelEU penalty for a 15,000 TEU containership. The same assumptions shall be used to determine the impact of the missing reward factor for RFNBOs when calculating the sample ship's compliance balance. Instead of the previously chosen fossil fuel mix, it is assumed that the ship consumes an RFNBO at a well-to-wake (WtW) greenhouse gas (GHG) emission factor 70% less than the one of heavy fuel oil (HFO).

Case I: Calculation as per regulation

If calculated according to Annex I and Annex IV as of today, the sample ship has the following values:

- **GHG intensity:** 13.74 g CO_2e / MJ
- **Compliance Balance:** 30 billion t CO_2e
- **Number of equal ships to pool:** 36
- **Add. revenue through pooling:** 3.3M EUR

Case II: Including the reward factor in the compliance balance calculation

Instead of following the compliance balance calculation as per Annex IV (see above), this case includes the reward factor when determining the sample ship's compliance balance. The formula has therefore been changed as per below:

ENERGY CALCULATION FOR DETERMINING THE COMPLIANCE BALANCE (ANNEX IV)

$$(GHGIE_{target} - GHGIE_{actual}) \times [\sum_{i}^{nfuel} M_i \times LCV_i \times RWD_i + \sum_{k} E_k]$$

RFNBO MULTIPLIER ADDED

Ensuring a comprehensive application of the reward factor throughout the regulation has an immense effect on the intended RFNBO incentive.

- **GHG intensity:** 13.74 g CO_2e / MJ
- **Compliance Balance:** 60 billion t CO_2e
- **Number of equal ships to pool:** 72
- **Add. revenue through pooling:** 6.6M EUR

Key Takeaways

The FuelEU Maritime regulation undoubtedly outlines the reasoning behind incentivizing RFNBOs and the intended effect:

"However, the production costs of RFNBO are currently much higher than the market price of conventional fuel and are expected to retain such higher costs in the mid-term. Therefore, this Regulation should provide for a combination of measures to ensure the support for the uptake of sustainable RFNBO (...)" as per FuelEU Maritime Regulation (EU) 2023/1805.

The regulation aims to reward decarbonization leaders by significantly reducing their higher OPEX costs due to the early adoption of RFNBOs. The case study shows that this has not been achieved to the extent it could have been possible when consistently applying the reward factor throughout the calculation.

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CHAPTER FIVE

Outlook & Opportunities

Navigating Compliance & Capitalizing on Opportunities: Fuel Suppliers under FuelEU Maritime

This chapter looks ahead and focuses on the challenges and opportunities for fuel suppliers under FuelEU Maritime. We'll explore the key obstacles suppliers may face, such as the need for certification and reporting, as well as the strategies that can help you turn these challenges into opportunities.

Infrastructure and Investment Challenges

FuelEU Maritime's mission of increasing the uptake of alternative fuels in shipping requires significant investments in infrastructure for producing and supplying renewable and low-carbon fuels, particularly Renewable Fuels of Non-Biological Origin (RFNBOs). The regulation emphasizes a well-to-wake approach, meaning suppliers must track and report emissions across the fuels' entire upstream—from production to bunkering.

Compliance and Reporting Complexities

Fuel suppliers are required to rigorously document and report the GHG intensity of the fuels they provide. This involves maintaining records throughout the supply chain and ensuring that all relevant data is verified by an accredited third party. For the non-fossil fuels, this means that:

RFNBOs must satisfy the definition in Article 2(36) of Directive 2018/2001, showcase at least 70% GHG emissions reduction against the Renewable Energy Directive (RED), and comply with the renewable electricity sourcing rules as per Article 27(6) of Directive 2018/2001. Please also note the additionality requirements for sourcing renewable electricity as per Delegated Act 2023/1184.

Biofuels must meet the criteria in Article 29(2 to 7) of Directive 2018/2001 and satisfy the minimum GHG emission savings as per Article 29(10) of Directive 2018/2001. Please note that all fuels from food or feed crops are not allowed under FuelEU Maritime except those under Annex IX of the Delegated Act 2024/1405.

Other fuels eligible for compliance are recycled carbon fuels (RCFs) as per Article 2(35) of Directive 2018/2001 and low-carbon fuels (LCFs) as per Article 2(13) of Directive 2024/1788.

The complexity increases when suppliers are involved in the production of mixed fuels or biofuel blends, as each component must be certified and tracked under schemes like the Mass Balance approach within the RED framework (refer to Article 30 of Directive 2018/2001)

The **Mass Balance** system allows for the mixing of sustainable and conventional fuels, with the sustainability characteristics of the inputs being traced and attributed to outputs proportionally. This is particularly important when suppliers need to demonstrate the renewable content and sustainability of the fuels they provide to comply with FuelEU Maritime's requirements.

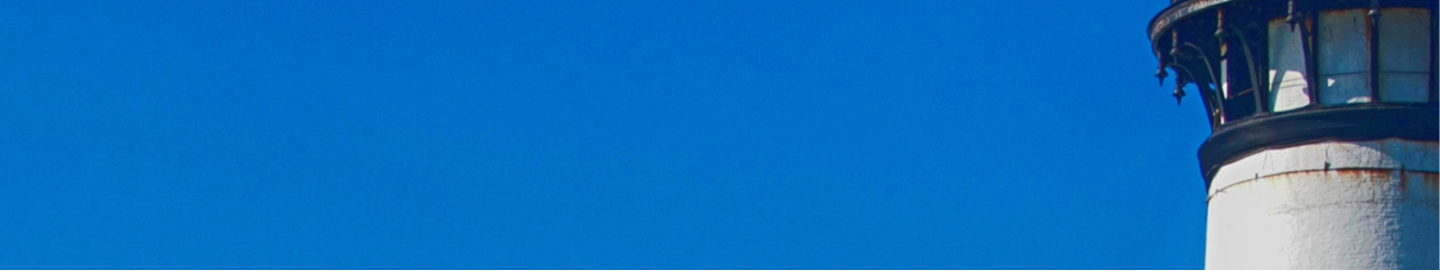
Reporting and certifications are essential for ensuring that the fuels supplied are compliant with the regulation and can be confidently used by shipping companies seeking to meet their GHG intensity target under FuelEU Maritime. The fuel suppliers' document stating adherence to the above-mentioned criteria and certification schemes is ultimately the so-called Proof of Sustainability (PoS).

Leveraging Flexibility Mechanisms and Innovative Strategies

Under the FuelEU Maritime regulation, the ISM company, in most cases the ship manager, is responsible for a ship's compliance. This entity also 'owns' any compliance surplus generated by the ship, which can be traded or banked for future use, if not otherwise stated in contractual agreements between the different stakeholders.

The latter-mentioned contractual arrangements, however, can create new opportunities for fuel suppliers:

Subsidized Fuel Provision: A fuel supplier may agree to provide a more expensive, yet highly compliant fuel to the shipping company on a long-term offtake agreement at a subsidized price. In exchange, the fuel supplier retains ownership of any compliance surplus generated by the ship throughout the agreement.



Trading Surplus on a Marketplace: The fuel supplier can then trade this surplus on a compliance marketplace, like BetterSea's FuelEU Marketplace, where it can be pooled with other ships to optimize compliance. This allows the supplier to recover the subsidies provided and potentially profit, by taking on the risk associated with fluctuating market prices.

These mechanisms offer a unique, new way for fuel suppliers to participate in the emerging compliance trading landscape, beyond merely supplying fuel. By owning and trading compliance surpluses, suppliers can provide shipping companies with planning security, de-risking their investments through subsidized long-term offtake agreements, while potentially increasing revenues through trading the surplus smartly throughout the compliance year.

Strategic Steps Forward for Fuel Suppliers Under FuelEU Maritime

To capitalize on these opportunities, fuel suppliers should consider the following strategies:

Invest in Certification: Ensure all fuels are certified under recognized schemes to meet the stringent requirements of FuelEU Maritime.

Innovate Contractually: Explore new contractual arrangements that allow you to own and trade compliance surpluses, improving the price attractiveness of your fuels and potentially adding a new revenue stream to your business.

FuelEU Maritime & The Future of Carbon Markets in Shipping

With more and more decarbonisation regulations, the shipping industry is seeing a growing influence from carbon pricing mechanisms. The FuelEU Maritime regulation is the EU's most recent way of tackling shipping emissions, but it's not the only one. Regulatory carbon markets, such as the existing EU Emissions Trading System (EU ETS), and other globally or regionally discussed systems are setting the stage for a future where carbon costs will shape maritime. In this chapter, we explore how FuelEU Maritime interacts with existing carbon markets, the rise of other regional and global initiatives, carbon pricing's potential for commercially viable decarbonisation, and what this means for shipping companies.

Understanding Carbon Pricing in Shipping

Carbon pricing refers to mechanisms that put a cost on carbon emissions, typically in the form of either a carbon tax or emissions trading systems (ETS). In regulatory carbon markets, governments set limits on total emissions and allow companies to trade allowances for emissions within those limits, incentivizing emissions reductions.

The EU ETS is a prime example of a regulatory carbon market extended to shipping. From this year, shipping companies operating to/from or within the EU must buy allowances for their CO_2 emissions, covering 50% of international and 100% of intra-EU voyages.

FuelEU Maritime vs. EU ETS: What's the Difference?

While FuelEU Maritime and EU ETS aim to reduce emissions, they differ in approach:

FuelEU Maritime focuses on reducing the GHG intensity of fuels used by ships, requiring companies to meet emissions targets through alternative fuels and with the help of compliance mechanisms like banking, borrowing, and pooling. The latter opens up a regulation-specific carbon market, where pooling can be performed B2B, between companies.

On the other hand, EU ETS is a cap-and-trade system, where companies must purchase allowances/credits for each ton of CO_2 emitted. The EU caps the amount of allowances in the market, creating an artificial or regulatory market.

Global Carbon Pricing and Markets: Emerging Trends

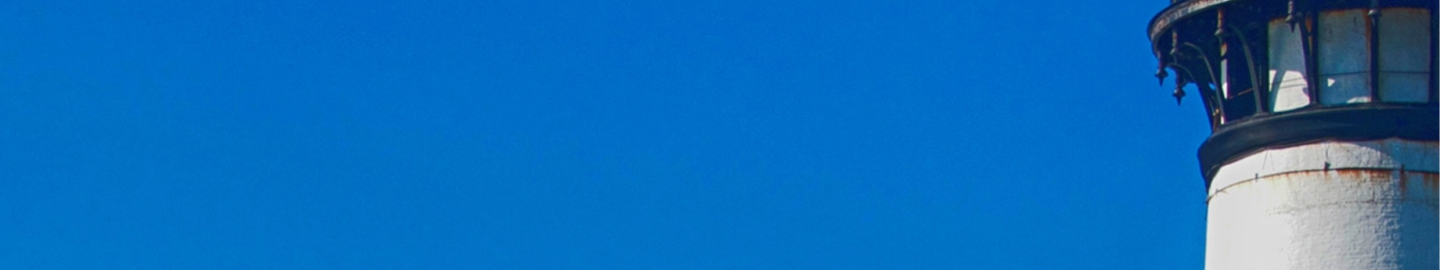
The push for decarbonization is not confined to the EU. Across the globe, regulatory frameworks are emerging. Turkey is set to launch its own ETS, Japan, and the UK are considering national ETS schemes, while China and the US are debating carbon taxes. The US Clean Shipping Act closely resembles the EU's FuelEU Maritime.

At the IMO, international efforts are underway to create a global system through mechanisms like a carbon levy and/or a fuel standard. These mechanisms fall under candidate mid-term measures of the IMO which will be discussed further at the upcoming Marine Environment Protection Committee (MEPC) 82 at the end of September this year.

One notable IMO proposal is the World Shipping Council's (WSC) Green Balance Mechanism (GBM), a mid-term measure aimed at creating a global pricing system for GHG emissions. Under this system, fuels are grouped into zones based on their emissions. Ships using cleaner fuels receive financial benefits and ships using fossil fuels face penalties. WSC's approach centers around a fee vs allocation principle based on a global fuel standard to equal out the increased fuel costs of cleaner fuels.

Selling Low-Carbon Shipping Solutions: Mass Balancing and Book & Claim

Another angle relevant for shipping when it comes to carbon markets is offering low-carbon transport solutions. Here, methods like mass balancing and book & claim are becoming crucial when offering sustainable logistics options to customers and can especially help make decarbonisation commercially viable.



In mass balancing, low-carbon fuels such as bio-LNG are blended with conventional fuels. While the physical fuel used to transport customers' cargo might be conventional, the sustainability attributes of the biofuel portion are tracked and attributed to the customers' cargo. This allows shipping companies to offer services where a proportion of the fuel used is certified as lower carbon, even if the customer receives conventional fuel. Mass balancing is already widely accepted under frameworks like the Global Logistics Emissions Council (GLEC) Framework.

The book & claim system decouples the physical asset from the sustainability benefits. Under this system, companies can buy certificates representing the carbon reductions achieved through the use of low-carbon fuels. These certificates can be claimed by customers, allowing them to demonstrate a reduction in their carbon footprint, regardless of the specific fuel used in their shipment. Although book & claim is not accepted under all frameworks, it is widely used in voluntary carbon markets.

Preparing for the Future: FuelEU Maritime and Carbon Markets in Shipping

As regulatory and voluntary carbon markets continue to grow, shipping companies must be proactive in aligning their decarbonisation strategies:

- **Invest in Alternative Fuels**: Reducing emissions and GHG intensity through fuels like bio-LNG, methanol, and ammonia is essential.
- **Global Regulatory Affairs:** As more countries adopt decarbonisation regulations with economic impact, companies should track international developments, beyond the EU.
- **FuelEU Surplus Trading:** The creation of compliance marketplaces—such as BetterSea's FuelEU Marketplace—enables the trade of FuelEU surpluses. Companies with excess compliance surpluses can sell them, gaining additional revenue, and providing cost savings for companies struggling to meet emissions targets.
- **Low-carbon products:** By participating in voluntary carbon markets, companies can monetize their decarbonisation efforts by offering low-carbon transport solutions.

A Note on Additionality in Carbon Accounting

When selling low-carbon products, one key concept to consider is additionality. This principle requires that the carbon savings attributed to a product must represent an actual, additional reduction in emissions beyond what would have occurred without the intervention. Companies need to be cautious about how they account for carbon savings, particularly when using mechanisms like mass balancing and book & claim.

For example, biofuels used to comply with FuelEU Maritime may raise questions about whether the same carbon savings can be double-counted when offering low-carbon products to customers. Ensuring that the emissions reductions used for compliance are not also sold as low-carbon benefits in a different market can be essential for maintaining transparency and credibility. Companies should closely monitor their claims to avoid overstating the environmental impact of their actions.

Conclusion

Carbon pricing, whether through FuelEU Maritime, EU ETS, or upcoming global measures, will fundamentally alter the economics of shipping. Companies that act early, align with these frameworks and explore new technologies that will not only reduce emissions but also unlock new market opportunities.

Imprint

Other FuelEU Maritime Resources

FuelEU Maritime Calculator & Strategizer

BetterSea's free online FuelEU Maritime Calculator & Strategizer allows you to not only calculate penalties but also to find the most cost-effective way to comply through surplus and biofuel cost analysis.

Start calculating & planning for free here!

FuelEU Maritime Pooling Platform

BetterSea's end-to-end FuelEU Maritime Pooling Platform provides a marketplace for FuelEU surplus trading and streamlines the full compliance process.

Get access to our FuelEU Maritime Pooling Platform here!

Other BetterSea Resources

Monday Newsletter

BetterSea's weekly Monday Newsletter sheds light on the recent developments in maritime decarbonization and regulation through case studies, controversies, guides, and expert opinions.

Subscribe in the bottom of the linked page!

Wavemakers Podcast

Don't miss the private coffee chats with the real changemakers steering the maritime industry towards a sustainable future. BetterSea's very own Gordana Ilic has in-depth discussions on maritime regulations, innovation, and best practices with representatives from among others Hapag-Lloyd, Pacific International Lines, and Swire Shipping.

Subscribe to our Youtube channel here!

More Maritime Decarb Nibbles

BetterSea's LinkedIn page posts short and simple maritime decarbonization and regulation content every day, from 1-minute Tuesday Tutorials to Tech Thursdays. Free knowledge sharing just a few clicks away.

Follow BetterSea on LinkedIn here!

Interested in BetterSea's other commercial products?

BetterSea provides a suite of solutions to tackle the main maritime decarbonization problems from the bespoken FuelEU Maritime regulation to primary Scope 3 emission data.

Book a call with us to learn more here!

Schroer, M. & Ilic, G. (2024). Monday Newsletter Booklet: FuelEU Maritime Compliance Insights. *BetterSea LDA*.