



EUROPEAN
COMMISSION

Brussels, **XXX**
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Proposal for a

REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

**on the uptake of renewable and low-carbon fuels in maritime transport - FuelEU
Maritime**

EXPLANATORY MEMORANDUM

1. CONTEXT OF THE PROPOSAL

• Reasons for and objectives of the proposal

By contributing to around 75% of EU external trade volumes and 31% of EU internal trade volumes, maritime transport is an essential component of Europe's transport system and plays a critical role for the European economy. Every year, around 400 million passengers embark or disembark in EU ports, including around 14 million on cruise ships, and fulfil an important role in safeguarding the connectivity of islands and peripheral maritime regions with the rest of the internal market¹. Efficient maritime transport connections are essential to the mobility of EU citizens, the development of EU regions and the EU economy as a whole.

The maritime transport sector operates in an environment of open markets and international competition. Maritime transport services within EU Member States are open to all EU shipowners; maritime transport services between EU Member States, and between EU Member States and third countries, can be provided by operators of all nationalities. A level playing field for ship operators and shipping companies is critical to the well-functioning of the EU market for maritime transport.

In September 2020, the Commission adopted a proposal to cut greenhouse gas emissions by at least 55% by 2030² and put Europe on a responsible path to becoming climate neutral by 2050. To achieve climate neutrality, a 90% reduction in transport emissions is needed by 2050. All transport modes, including maritime transport, will have to contribute to the reduction efforts.

Achieving significant reductions in CO₂ emissions of international maritime transport requires using both less energy (increasing energy efficiency) and a cleaner type of energy (using renewable and low-carbon fuels). The Communication on the 2030 Climate Target Plan³ explains that: *“Both the aviation and maritime sectors will need to scale up efforts to improve the efficiency of aircraft, ships and their operations and to increase the use of sustainably produced renewable and low-carbon fuels. This will be assessed in greater detail in the context of the ReFuelEU Aviation and FuelEU Maritime initiatives that aim to increase the production and the uptake of sustainable alternative fuels for these sectors. The necessary technology development and deployment has to happen already by 2030 to prepare for much more rapid change thereafter.”*

Depending on the policy scenarios assessed in the framework of the 2030 Climate Target Plan and in support of the Sustainable and Smart Mobility Strategy, renewable and low-carbon fuels should represent between 6% and 9% of the international maritime transport fuel mix in 2030 and 86% and 88% by 2050 to contribute to the EU economy-wide GHG emissions reduction targets⁴.

The push for the maritime transport sector to use cleaner fuels is present also at international level. In 2018, the International Maritime Organisation (IMO) has adopted its Initial Strategy on the reduction of GHG emissions from ships. Within the list of identified candidate short-

¹ EU Transport in figures, the statistical pocketbook 2020, https://ec.europa.eu/transport/media/media-corner/publications_en

² COM(2020) 563 final

³ COM(2020) 562 final

⁴ The scenario assessing a combination of carbon pricing and regulatory measures (so-called MIX) projects a share of 7.5% for 2030 and 86% by 2050.

term measures, the IMO includes the promotion of uptake of alternative low-carbon and zero-carbon fuels and the provision of shore-side electricity.

Currently, the fuel mix in the maritime sector relies entirely on fossil fuels. This can be explained by insufficient incentives for operators to cut emissions and by the lack of mature, affordable, and globally utilisable technological alternatives to fossil fuels in the sector. A number of market failures – including interdependencies between supply, distribution and demand of fuels; lack of information on future regulatory requirements; long life span of assets (vessels and bunkering infrastructure); and insufficient access to finance – partly cause and reinforce these problems.

The FuelEU Maritime initiative proposes a harmonised regulatory framework in the EU to increase the share of renewable and low-carbon fuels in the fuel mix of international maritime transport without creating barriers to the single market.

Considerations on possible obstacles to the internal market, distortion of competition between operators and diversion of trade routes are particularly relevant in relation to fuel requirements, since fuel costs make up a substantial share of ship operators' costs. The proportion of fuel costs in the operating costs of ships can range from around 35% of the freight rate of a small tanker to around 53% for container/bulk vessels. Thus, variations in marine fuel prices may impact significantly the economic performance of ship operators.

At the same time, the price differential between conventional marine fuels of fossil origin and renewable low-carbon fuels remains high. To maintain competitiveness while still steering the sector towards the fuel transition that it must inevitably undertake, clear and uniform obligations are needed on ships' use of renewable low-carbon fuels.

An increased predictability of the regulatory framework is expected to stimulate technology development and fuel production and help the sector unlock the existing chicken-and-egg situation between renewable and low-carbon fuels' demand and supply. Clear and uniform obligations on ship's use of energy is necessary to mitigate the risk of carbon leakage, which maritime transport is prone to due to its international nature and the possibility to bunker fuel outside the EU. Owing to the inherent cross-border and global dimension of maritime transport, a harmonised maritime-specific Regulation is preferred, over a framework requiring transposition at national level, as the latter could result in a patchwork of national measures with differing requirements and targets.

- **Consistency with existing policy provisions in the policy area**

The FuelEU Maritime is part of the 'basket of measures' designed to address emissions from maritime transport while maintaining a level playing field. It is fully consistent with other measures presented as part of the 'Fit for 55' package.

A basket of measures is considered necessary to address various and distinct market failures hindering the deployment of mitigation actions in the maritime sector. Beside the FuelEU Maritime initiative that aims at increasing the demand of renewable and low-carbon fuels (RLF), the Commission announced a proposal to extend the European emissions trading system (ETS)⁵ to the maritime sector and a proposal to review the Energy Taxation Directive (ETD)⁶. These two initiatives should ensure that the price of transport reflects the impact it has on the environment, health and energy security.

⁵ Directive 2003/87/EC

⁶ Council Directive 2003/96/EC

In addition, the basket of measures will include the review of several other directives, including the Alternative Fuels Infrastructure Directive (AFID)⁷ and the Renewable Energy Directive (RED II)⁸. Next to these revised legislations, the Commission will address the need for additional research and innovation (R&I) activities, in particular through the co-programmed Zero Emissions Waterborne Transport partnership proposed by the Waterborne Technology Platform under Horizon Europe⁹. It will also revise the Guidelines on State aid for environmental protection and energy¹⁰ in line with the policy objectives of the EGD, which should allow adequate funding of the sector's green transformation (including for deployment of on-shore charging infrastructures), while avoiding any distortion of competition.

Looking more specifically at proposed actions, there is currently no mechanism, neither at the IMO level nor in the EU, to correct for the presence of negative externalities in the sector. This prevents operators from taking into account, in their operational and investment choices, the social cost of their activity in terms of climate change and air pollution. The economic literature indicates pricing mechanisms as the instruments of choice to 'internalise' external costs. The main examples would be a tax fixed at the level of the external cost, or a 'cap and trade' instrument, such as the EU emission trading system (ETS), that sets a limit to the overall emissions and lets the market determine their appropriate price. Both are described as 'market-based measures' (MBMs).

However, while emissions trading can achieve GHG emissions reductions cost-effectively and provides a correct price signal that influences decisions of operators, investors and consumers, it does not sufficiently address all barriers to the deployment of low and zero-emissions solutions.

Additional policy actions are necessary to ensure that the level playing field is maintained while removing obstacles to investments in clean energy technologies and infrastructure, thereby reducing abatement costs and complementing the action of the ETS. This is particularly relevant to support mitigation measures – such as the use of RLF in the maritime transport sector – that have a high potential to reduce emissions in the future but which, presently, face high abatement costs as well as specific market barriers.

While a carbon price is likely to further drive energy efficiency improvements and narrow the price gap between conventional and low-emission technologies, its ability to support the deployment of RLF technologies in the maritime sector would strongly depend on its actual price level, which is unlikely to reach sufficient levels for this purpose in the short to medium term.

Similarly, legislation dealing with fuel *supply* (RED II) and *infrastructure* (AFID) has not had a significant impact on the uptake of RLF in the maritime sector and needs to be complemented by measures that are capable of creating a *demand* for RLF. In addition, the review of the RED II would not be able to address the high risk of fuel bunkering outside the EU for the shipping sector.

There is currently no regulatory framework in the EU specifically addressing the use of RLF in maritime transport. This initiative intends to fill this gap by increasing the demand for RLF

⁷ Directive 2014/94/EU

⁸ Directive (EU) 2018/200

⁹ <https://www.waterborne.eu/>

¹⁰ Communication from the Commission (2014/C 200/01)

in maritime transport while maintaining a level playing field and a well-functioning EU market for marine fuels and maritime transport.

- **Consistency with other Union policies**

This initiative aims at increasing the uptake of RLFs in EU maritime transport while maintaining a level playing field, both in navigation and at berth and thereby contribute to achieving EU and international climate objectives. Ensuring a more diverse fuel mix and higher penetration of RLFs is critical to ensure the sector's contribution to the European ambition of climate-neutrality by 2050 as laid out in the European Green Deal. At the same time, a differentiated approach to the use of RLFs in navigation and in ports is important to account for different implications on air pollution (more relevant for ships in ports) and different availability of technologies (more options for ships in ports).

2. LEGAL BASIS, SUBSIDIARITY AND PROPORTIONALITY

- **Legal basis**

This initiative aims at maintaining high levels of connectivity, and preserving industry competitiveness in the maritime sector while stepping up its sustainability. Article 100(2) of the Treaty on the Functioning of the European Union empowers the Union to lay down appropriate provisions in sea transport.

- **Subsidiarity (for non-exclusive competence)**

Maritime transport is an international sector by nature. In Europe, approximately 75% of the voyages reported under the MRV are within the EEA (and could therefore be a proxy for intra-EU traffic) and only around 9% of the traffic is estimated to be domestic voyages (between ports within the same Member State). The cross-border dimension of the sector is therefore essential and calls for coordinated action at European level.

Without action at EU level, a patchwork of regional or national requirements across Member States would risk triggering the development of technical solutions that may not necessarily be compatible with each other. Several Member States are already developing national maritime strategies that include specific approaches to ship emissions and in particular the uptake of alternative fuels¹¹ with possible unintended effects and market distortions. As the problem drivers identified in the context of this initiative do not fundamentally differ from one Member State to another, and given the cross-border dimension of sector's activities, these issues can be best addressed at EU level. EU action can also inspire and pave the way for the development of future measures to accelerate the uptake of alternative fuels at global level¹².

Previous EU action on GHG issues has already stimulated a corresponding response from the IMO, notably by the adoption of the EU Regulation on Monitoring, Reporting and Verification of GHG emissions from ships that led shortly afterwards to IMO adopting a similar mandatory global GHG Data Collection System. A coordinated approach by EU Member States to developments in GHG emission reduction at IMO has more recently ensured that mandatory operational energy efficiency measures are included within IMO's

¹¹ This includes national plans being developed by the Netherlands, Sweden and Italy (in the form of their 'Guidelines for Energy and Environmental Planning Documents of the Port System Authorities (DEASP)'. Non-EU Member States like the UK and Norway have also established their own plans. It is important to mention them in this respect as their objectives may affect short-sea shipping traffic to and from the EU.

¹² Currently listed in the Initial IMO Strategy on reduction of GHG emissions from ships among candidate mid-term measures, i.e. measures to be agreed by the IMO between 2023 and 2030.

short term actions to reduce GHG. Projecting a common viewpoint from a considerable group of IMO member states within the IMO fora means that the EU can have a significant impact on the direction and outcome of IMO discussions.

- **Proportionality**

The implementation of this initiative at European level is necessary to achieve the economies of scale in the uptake of RLFs in maritime transport as well as avoiding carbon leakage, and ensuring level playing field between operators calling in EU ports and between the EU ports themselves. To give an example, obligations established at national level on the use of RLFs could divert traffic to competing ports of other Member States and distort competition. Accordingly, harmonisation at EU level is necessary to ensure a level playing field for all actors of the maritime cluster (in particular, operators, ports and fuel suppliers).

- **Choice of the instrument**

The impact assessment established that binding, regulatory measures are necessary to achieve the objectives. A regulation is the more appropriate instrument to ensure uniform implementation of the measures envisaged, while reducing the risk of distortion within the single market, which could result from difference in the transposition of requirements. As the transition to RLFs requires significant investments from fuel suppliers, fuel distribution and a strong and clear demand push, it is indispensable that the regulatory framework provides a single, long-term and robust set of rules to all investors EU-wide. In particular, it is crucial to avoid the creation of a patchwork of differing measures at national level, as would be the case if implemented under a cross-sectoral directive.

The initiative is highly technical, and there is a high likelihood that it will have to be regularly adapted to technical and legal developments. To respond to this, a number of implementing measures are also planned. These will focus particularly on the technical specifications to implement the functional requirements.

3. RESULTS OF EX-POST EVALUATIONS, STAKEHOLDER CONSULTATIONS AND IMPACT ASSESSMENTS

- **Ex-post evaluations/fitness checks of existing legislation**

As this is a new initiative, there has not been any ex-post evaluation and fitness check.

- **Stakeholder consultations**

The Commission actively engaged with stakeholders and conducted comprehensive consultations throughout the impact assessment process. Stakeholders' views started to be collected in response to the publication of the inception impact assessment (March and April 2020). The 81 feedback received allowed to refine the approach and better identify the barriers that hamper the current use of RLFs in the maritime sector.

Within the development of the initiation, other consultation activities included:

- An open public consultation, organised by the Commission, running from 2 July 2020 to 10 September 2020. A total of 136 responses were received, covering a variety of stakeholder groups. The responses came from ship owning and ship management (40), energy producers and fuel supply (37), short sea shipping (25), national public authorities (15), interest organizations (14), ports management and administrators (13), port terminal operator or other port services provider (13),

academia research and innovation (12), inland waterways sector (11), shipbuilding and marine equipment manufacturers (10), regional or local public authorities (9), logistics suppliers, shippers and cargo owners (9), technical standardization bodies and class societies (2), investment and financing (2), and other (17)¹³;

- A targeted stakeholders consultation organised by the consultant responsible for the impact assessment support study, running from 18 August 2020 to 18 September 2020 and directed at experts from the European Sustainable Shipping Forum (ESSF). The consultant also conducted a series of interviews with stakeholders, including industry representatives and national authorities, between 10 July 2020 and 1 December 2020;
- A stakeholders roundtable, organised by the Commission on 18 September 2020 with members of European Sustainable Shipping Forum¹⁴ (ESSF) and the European Ports Forum¹⁵ (EPF);
- Regular expert group meetings, in the framework of the ESSF sub-group on sustainable alternative power for shipping.

The information collected from stakeholders was key in allowing the Commission to refine the design of the policy options as well as to assess their economic, social and environmental impacts, compare them and determine which policy option is likely to maximize the benefits/costs ratio for the society.

The consultations showed that there is consensus among all stakeholder groups on the importance of addressing the uptake of RLFs in maritime transport as well as the specific problems by the initiative.

The consultations confirmed that all five drivers identified in the framework of the initiative are regarded as relevant. The results suggest that the different stakeholders agree that high fuel and investment costs together with uncertainty for investors are the most important barriers. In terms of policy objectives, *‘providing more certainty on the climate and environmental requirements for ships in operation’* appears to be the most important policy objective in view of stakeholders.

All stakeholder groups also expressed a preference for goal-based over prescriptive policy, which also concurs with another requirement for the policy voiced by most stakeholders, the technology neutrality. As regards the policy measures, setting a clear regulatory pathway for decarbonising the current marine fuel received the highest scores from the stakeholders. On geographical scope, there was no obvious preference on the right geographical scope for the measures. In terms of measuring environmental performance and how emissions should be included in the policy framework, the majority of stakeholders prefers a “well-to-wake” approach as that it takes into account not only emissions from the combustion of fuel on board the ship, but also upstream emissions from production, transport, and distribution of fuels. As regards ships at berth, requirements on the use of on-shore power supply are found to be relevant and necessary for achieving the decarbonisation objectives by most stakeholders.

¹³ <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12312-FuelEU-Maritime-/public-consultation>

¹⁴ <https://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetail&groupID=2869>

¹⁵ <https://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetail&groupID=3542>

- **Collection and use of expertise**

A study was conducted by an external contractor to support the impact assessment underpinning the present proposal. This study started in July 2020 and was concluded in March 2021. The study provided valuable insights to the Commission services notably to design the policy options, assess some of the expected impacts, and collect the views of the directly impacted stakeholders. The Commission services also relied on the support from the European Maritime Safety Agency (EMSA) on technical aspects related to the present initiative.

- **Impact assessment**

The policy measures included in this proposal are informed by the results of an impact assessment. The impact assessment report [link to exec summary] received a positive opinion from the Commission Regulatory Scrutiny Board [link to the RSB opinion]. In its opinion, the Regulatory Scrutiny Board provided a number of recommendations about the presentation of the arguments in the impact assessment report. These recommendations have been addressed; Annex 1 to the impact assessment report provides a summary outline of how this was done.

Three policy options have been considered in the context of the impact assessment to achieve the identified objectives. These three options all share two main characteristics: 1) the regulatory nature to provide legal certainty and 2) the focus on demand-side aspects to stimulate production and uptake of RLFs, address the chicken-and-egg situation and avoid carbon leakage. Policy options provided different ways to design the obligation and differed in particular on their approach to technology choice and the way the required performance is achieved.

Policy option 1 is designed as a prescriptive approach, requiring share of specific fuels / fuel types to be used. It implies a technology selection by the regulator. Both policy options 2 and 3 are goal-based approaches, requiring a maximum GHG intensity target to be met for the energy used on-board. This leaves the choice of technology to market operators. In addition, policy option 3 contains also mechanisms to reward over-achievers to encourage the development of more advanced, zero-emissions technologies (pooling and multipliers for zero-emission technologies). All options require the most polluting ships in ports (containerships, ro-pax and passenger ships) to use on-shore power supply (or equivalent zero-emission technology).

Following the assessment, policy option 3 (goal-based + overachievers) is identified as the preferred option as it strikes the best balance between the achieved objectives and the overall implementation costs. Through the goal-based approach, this policy option answers the needs for flexibility, which have been stressed by stakeholders during the consultation activities (in particular operators and ports). The mechanism for rewarding over-compliance also allows reducing the risk of technology lock-in and it ensures that several technology options can be used by operators as soon as they become mature and contribute to the defined targets.

The increased penetration of RLFs in the maritime fuel mix will translate into significant reduction of greenhouse gas emissions and air pollution emissions. The related savings in external costs have been estimated at €10bn for air pollution and €38.6bn for climate change, relative to the baseline and expressed as present value over the 2021-2050 period. Savings in the order of €2.3bn are expected to be realised by ship operators due to reduced operating costs (maintenance, crew, etc.). This reduction will be driven by somewhat lower maritime transport activity relative to the baseline. An additional noticeable impact concerned the use

of advanced fuels and propulsion technologies, and indirectly the impact it has on innovation. The initiative is expected to boost the penetration of fuel cell-powered vessels (18.9%) in the fleet as well as electric propulsion (5.4%) by 2050 (compared to no penetration of these technologies in the baseline).

The main cost resulting from the proposed intervention is borne by ship operators and amounts to €9.7bn. It results from increased capital costs (€5.8bn) and fuel costs (€3.9bn). Indirect costs for the ports will relate to the provision of the necessary bunkering infrastructure and are estimated at €5.7bn. Administrative costs for ship operators are estimated at €21.7m resulting from data collection, submission and verification of the compliance plans and the annual energy report, cooperation during audits and inspections as well as crew training. Additional €1.8m have been identified for the establishment of guidelines by ports to guarantee the safe handling of RLFs. Specific costs related to fuel certification could not be quantified. Enforcement costs for public authorities are expected to be limited (€1.5m) and focus on the provision of the necessary IT reporting tools.

The preferred option strikes the best balance between the achieved objectives and the overall implementation costs. It provides net benefits amounting to €8.4bn over the time horizon of the initiative.

- **Regulatory fitness and simplification**

[...]

[For proposals linked to REFIT and aimed at reducing regulatory burdens, provide, wherever possible, quantified estimates of the intended burden reduction.

[Outline whether the proposal exempts micro-enterprises and the reasons why if it does not do so.]

[Explain how the proposal minimizes compliance costs for SMEs (via lighter regimes, mitigating measures, etc.) and other stakeholders, as well as any positive or negative impact on sectoral EU competitiveness or international trade.]

[Explain how the proposal is consistent with the "Digital Check" and is internet ready and appropriate for both the physical and digital environment (please see Better Regulation guideline and tool on ICT impacts in the Better Regulation Toolbox for more information).]

- **Fundamental rights**

The proposal has no implications on the protection of fundamental rights.

4. BUDGETARY IMPLICATIONS

The preferred option will have budgetary implications for the Commission. The expected costs of IT services and IT system development are up to EUR 0.5 million. This is based on the cost of THETIS-MRV and experience with existing THETIS-EU modules supporting various pieces of EU legislation, such IT-developments costs are estimated at €300,000. The preferred policy option would also need an additional functionality to support the pooling of ships for the purpose of compliance. This additional tool is estimated to cost €200,000.

[Outline the budgetary implications of the initiative (if any) and, where appropriate, refer to the "financial statement" showing the budgetary implications and the human and administrative resources required.]

5. OTHER ELEMENTS

• Implementation plans and monitoring, evaluation and reporting arrangements

The Commission will follow the progress, impacts and results of this initiative through a set of monitoring/evaluation mechanisms. The Commission will measure progress towards achieving the specific objectives of the proposal, in particular through the data collected annually as part of the EU Monitoring, Reporting and Evaluation (MRV) system.

Requests for information (reports, survey replies) will be carefully balanced so as not to put an additional burden on stakeholders by creating disproportionate new reporting requests.

Five years after the end of the implementation date of the legal proposal, the Commission will initiate an evaluation to verify whether the initiative's objectives have been reached. Subsequently, the evaluation will inform future decision-making processes to ensure the necessary adjustments for reaching the set objectives.

• Detailed explanation of the specific provisions of the proposal

Article 1 of the proposal describes the subject matter of the proposed Regulation, which lays down rules to reduce the greenhouse gas intensity of energy used on-board by ships arriving at, within or departing from ports under the jurisdiction of a Member State, in order to promote the harmonious development and consistent use of renewable and low-carbon fuels across the Union, without introducing barriers to the internal market. to promote the reduction of greenhouse gas emissions from maritime transport. Article 2 lays down the scope of the Regulation. Article 3 provides several definitions of importance to the Regulation. Article 4 establishes the limits on greenhouse gas intensity of the energy used on-board. Article 5 establishes additional zero-emission limits of energy used at berth for specific ship types as well and lists possible exemptions. Article 6 lays down the common principles for monitoring compliance with this Regulation. Article 7 establishes what should be included in the monitoring plans and Article 8 lists the situations in which the monitoring plan should be modified. Article 9 establishes the principles related to the certification of biofuels, biogas, renewable liquid and gaseous transport fuels of non-biological origin and recycled carbon fuels. Article 10 lays down the scope of the verification activities to be performed by verifiers. Article 11 sets general obligations and principles for the verifiers. Article 12 provides for the main principles to be respected during the verification procedures. Article 13 lays down the rules concerning the accreditations of verifiers for the activities to be performed under the scope of this Regulation. Article 14 defines what parameters should be monitored and recorded by companies for the purpose of demonstrating compliance with this Regulation. Article 15 sets out the task for the verifiers in relation to the information provided by the companies. Article 16 provides for the creation of the compliance database and lays down the main parameters to be reported in it. Article 17 establishes flexibility provisions, allowing operators to 'bank' or 'borrow', within a certain limit, compliance units to facilitate compliance. Article 18 provides for the main principles and procedures for possible transfer of compliance units. Article 19 lays down the conditions to achieve for the issuance of a FuelEU certificate of compliance. Article 20 establishes the penalties to be incurred in case compliance has not been achieved and sets the level of financial contributions to be done to the Marine renewable and low-carbon fuels fund. Article 21 establishes the principles for the creation of the Marine renewable and low-carbon fuels fund, its sources of revenue as well as

the main objectives of spending. Article 22 establishes the obligation for ships to carry a valid FuelEU certificate of compliance. Article 23 lays down the rules related to the inspection of ships with respect to their obligations under this Regulation. Article 24 establishes the conditions for the conferral of delegated powers to the Commission under this Regulation. Article 25 establishes the committee procedure for the exercise by the Commission of the power to adopt implementing acts under this Regulation. Article 26 establishes principles concerning international cooperation with a view to align, where appropriate, this Regulation with possible future rules stemming from on-going discussion in the International Maritime Organisation. Article 27 sets the obligation for the Commission to report to the European Parliament and the Council on several aspects of the application of this Regulation, at least every five years. Article 28 provides for the date of entry into force of the Regulation. Annex I defines the methodology for establishing the greenhouse gas intensity limits of energy used on-board ships. Annex II provides the list of default values that can be used in determining the emission factors used in the formula described in Annex I. Annex III provides the list of zero-emission technologies that can be used in alternative to the connection to on-shore power supply at berth, as well as, specific criteria for their use.

REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on the uptake of renewable and low-carbon fuels in maritime transport - FuelEU Maritime

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 100(2) thereof,

Having regard to the proposal from the European Commission,

After transmission of the draft legislative act to the national parliaments,

Having regard to the opinion of the European Economic and Social Committee¹⁶,

Having regard to the opinion of the Committee of the Regions¹⁷,

Acting in accordance with the ordinary legislative procedure,

Whereas:

- (1) Maritime transport accounts for around 75% of EU external trade volumes and 31% of EU internal trade volumes. 400 million passengers embark or disembark annually in EU ports, including around 14 million on cruise ships. Maritime transport is therefore an essential component of Europe's transport system and plays a critical role for the European economy. The maritime transport market is subject to strong competition between economic actors in the EU and beyond for which a level playing field is indispensable. The stability and prosperity of the maritime transport market and its economic actors rely on a clear and harmonised policy framework where maritime transport operators, ports and other actors in the sector can operate on the basis of equal opportunities. Where market distortions occur, they risk putting ship operators or ports at a disadvantage with internal or external competitors. In turn, this can result in a loss of competitiveness of the maritime transport industry, and a loss of connectivity for citizens and businesses.
- (2) The 2030 Climate Target Plan (CTP)¹⁸ adopted in September 2020 sets out the steps towards climate-neutrality by 2050. The CTP also recognises the necessity to deploy various complementary policy instruments ('basket of measures') to ensure that maritime transport fairly contributes to the increased EU climate effort. This includes measures aimed at increasing the use of sustainably produced renewable and low-carbon fuels. The CTP also notes that the necessary technology development and deployment has to happen already by 2030 to prepare for much more rapid change thereafter. The European Commission has proposed to translate the political commitment into a legal obligation as part of the Climate Law¹⁹, which also integrates the target of reducing GHG emissions by at least 55% below 1990 levels by 2030. On

¹⁶ OJ C [...], [...], p. [...].

¹⁷ OJ C [...], [...], p. [...].

¹⁸ COM(2020) 562 final

¹⁹ COM(2020) 80 final and COM(2020) 563 final

11 December 2020, the European Council endorsed the binding EU target of a net domestic reduction of at least 55% in GHG emissions by 2030 compared to 1990²⁰.

- (3) Furthermore, in 2018, the International Maritime Organisation (IMO) has adopted its Initial Strategy on the reduction of GHG emissions from ships, which envisages to reduce CO₂ emissions by at least 40% by 2030, pursuing efforts towards 70% by 2050, compared to 2008. It also expects to peak GHG emissions from international shipping as soon as possible and to reduce the total annual GHG emissions by at least 50% by 2050 compared to 2008. Within the list of identified candidate short-term measures, the IMO includes the promotion of uptake of alternative low-carbon and zero-carbon fuels and the provision of shore-side electricity. It also calls for the development of robust lifecycle GHG/carbon intensity guidelines for all types of fuels, to prepare a programme for effective uptake of alternative low-carbon and zero-carbon fuels.
- (4) The uptake of renewable and low-carbon fuels and substitute sources of energy by ships arriving at, within or departing from ports under the jurisdiction of a Member State across the Union, is not an objective that can be sufficiently achieved by the Member States without risking to introduce barriers to the internal market and distortions of competition between ports and between maritime operators. This objective can be better achieved by introducing uniform rules at Union level that create economic incentives for maritime operators to continue operating unimpededly while meeting obligations on the use of renewable and low-carbon fuels. Accordingly, the Union may adopt measures, in accordance with the principle of subsidiarity as set out in Article 5 of the Treaty on European Union. In accordance with the principle of proportionality as set out in that Article, this Regulation does not go beyond what is necessary in order to achieve that objective.
- (5) In the context of this fuel transition, it is essential to ensure a level playing field across the EU maritime transport market regarding marine fuels, which account for a substantial share of ship operators' costs. Differences in fuel requirements across EU Member States can significantly affect ship operators' economic performance and negatively impact competition in the market. Due to the international nature of shipping, ship operators may easily bunker in third countries and carry large amounts of fuel. This may lead to carbon leakage and detrimental effects on the competitiveness of the sector if the availability of renewable and low carbon fuels in EU ports is not accompanied by requirements for their use that apply to all operators arriving at and departing from EU ports. This Regulation should take measures to ensure that the penetration of renewable low-carbon fuels in the marine fuels market takes place under the conditions of fair competition on the maritime transport market.
- (6) All journeys arriving or departing from EU ports, as well as the stay of ships in EU ports should be covered by this Regulation in order to ensure level playing field and avoid market distortion.
- (7) These rules should be applied in a non-discriminatory manner to all ships regardless of their flag. However, since this Regulation focuses on maritime transport, it should not establish specific requirements for ship movements and activities not serving the purpose of transporting cargo or passengers for commercial purposes, such as dredging, ice-breaking, pipe laying or offshore installation activities.

²⁰

Source: <https://www.consilium.europa.eu/media/47296/1011-12-20-euco-conclusions-en.pdf>

- (8) In order to limit administrative burden in particular to smaller operators, this Regulation should focus on vessels with a gross tonnage above 5,000. Even though these ships represents only circa 55% of all ships calling EEA ports, in accordance with MRV data, they are responsible for 90% of the CO₂ emissions from the maritime sector.
- (9) The decarbonisation of the maritime sector requires progress in energy efficiency and, at the same time, a rapid shift towards the use of renewable and low-carbon fuels. While instruments such as carbon pricing or targets on the carbon intensity of activity promote improvements in energy efficiency, they are not suited to bring about a significant shift towards renewable and low-carbon fuels in the short and medium term. A specific regulatory approach dedicated to the deployment of renewable and low-carbon marine fuels and substitute energy sources is therefore necessary.
- (10) The development and deployment of new fuels and energy solutions requires a coordinated approach to match supply, demand and the provision of appropriate distribution infrastructure. While the current European regulatory framework already addresses partly fuel production (via the Renewable Energy Directive – RED II²¹) and distribution (via Alternative Fuels Infrastructure Directive – AFID²²), there is also a need for a policy tool that establishes increasing levels of demand of renewable and low-carbon maritime fuels.
- (11) Policy intervention to stimulate demand of renewable and low-carbon maritime fuels should be goal-based and respect the principle of technological neutrality. Accordingly, targets should be set on the greenhouse gas intensity of the energy used by ships without prescribing the use of any particular fuel or technology.
- (12) The long lead times associated to the development and deployment of new fuels and energy solutions for maritime transport require rapid action and the establishment of a clear and predictable long-term regulatory framework facilitating planning and investment from all the stakeholders concerned. This predictable regulatory framework should be established by defining targets on the greenhouse gas intensity of the energy used by ships until 2050. Those targets should become more ambitious over time to reflect the expected technology development and increased production of marine renewable and low carbon fuels.
- (13) This Regulation should also establish the methodology and the formula that should be applied to calculate the greenhouse gas intensity of the energy used by ships. This formula should be based on the fuel consumption reported by ships and consider the relevant emission factors of these fuels. The use of substitute sources of energy, such as wind or electricity, should also be reflected in the methodology.
- (14) In order to provide the most complete picture of the environmental performance of the various energy sources, the GHG performance of fuels should be assessed on a well-to-wake basis, taking into account the impacts of production, transport, distribution and use on board. This is to incentivise technologies and production pathways that provide a lower GHG footprint and real benefits compared to the existing conventional fuels.
- (15) The well-to-wake performance of marine fuels should be established using default or actual certified values (emission factors) covering the well-to-tank and tank-to-wake

²¹ Directive (EU) 2018/2001

²² Directive 2014/94/EU

emissions. The performance of fossil fuels should however only be assessed through the use of default values as provided for by this Regulation.

- (16) A comprehensive approach on all the most relevant GHG emissions (CO₂, CH₄ and N₂O) is necessary to incentivise the energy sources providing a lower GHG footprint overall. Reflecting the global warming potential of methane and nitrous oxides, the limits set by this Regulation should therefore be expressed in terms of “CO₂ equivalent”.
- (17) The use of renewable energy sources and alternative propulsion, such as wind and solar energy, greatly reduces the greenhouse gas intensity of the overall ship energy balance. The difficulty to accurately measure and quantify these energy sources (intermittence of the energy use, direct transfer as propulsion, etc.) should not impede their recognition in the overall ship energy balance through means of approximations and bonuses.
- (18) Air pollution produced by ships at berth that draw power from their engines during their stay in the port is a significant concern for coastal areas and port cities. Therefore, specific obligations should be imposed to reduce emissions at berth from ships. According to the data collected within the framework of MRV in 2018, passenger ships and containerships are the ship categories producing the highest amount of emissions per ship at berth. Accordingly, emissions from these categories of ships should be addressed as a priority.
- (19) The use of on-shore power supply (OPS) serves maritime transport as clean power supply at berth and contributes to reducing the sector’s environmental impacts. While the provision on OPS connection points is covered by the Directive on the Deployment of Alternative Fuels Infrastructure (AFID)²³, the demand for and, as a result, the deployment of this technology has remained limited. Therefore specific rules should be established to ensure use of OPS.
- (20) In addition to OPS, other technologies might be capable of offering equivalent or superior environmental benefits. When the use of an equivalent technology is demonstrated, a ship should be exempted from the use of OPS.
- (21) Exemptions to the use of OPS should also be provided for a number of objective and certified reasons, limited to unscheduled port calls for reasons of safety or saving life at sea, for short stays of ships at berth of less than two hours as this is the minimum time required for connection, and for the use of on-board energy generation under emergency situations. As of 2035, exemptions in case of unavailability or incompatibility of OPS should be limited in order to provide the necessary incentives for maritime and port operators to make the necessary investments and avoid unfair competition.
- (22) A robust monitoring, reporting and verification system should be put in place in order to trace compliance with the requirements of this Regulation, applying in a non-discriminatory way to all ships and requiring third party verification in order to ensure the accuracy of the data submitted.
- (23) The EU Monitoring, Reporting and Verification regulation has been set in place to cater for the accurate monitoring, reporting and verification of carbon dioxide (CO₂) emissions and of other relevant information from ships arriving at, within or departing

²³ Directive 2014/94/EU

from ports under the jurisdiction of a Member State. In accordance with the 2013 Communication from the Commission on integrating maritime transport emissions in the EU's greenhouse gas reduction policies, the EU MRV system should be “*the foundation for implementation of any measure reducing GHG emissions of ships at EU level*”.

- (24) In order to facilitate achieving the objective of the present Regulation, any data already reported for the purpose of the MRV Regulation should be used, when necessary, for verifying compliance with this Regulation in order to limit administrative burden imposed on companies, verifiers and authorities.
- (25) Companies should be responsible for monitoring the amount and type of energy used on-board in navigation and at berth, as well as any other relevant information with the view to demonstrating compliance with the limits set out by the present Regulation. To facilitate the fulfilment of these monitoring and reporting obligations and the verification process by the verifiers, companies should document the envisaged method and provide further detail on the application of these rules in a monitoring plan. The monitoring plan, as well as its possible modifications, should be submitted to the verifier.
- (26) Certification of fuels is essential to achieve the objectives of this Regulation and guarantee the environmental integrity of the renewable and low-carbon fuels that are expected to be deployed in the maritime sector. With a view to facilitating certification and limiting administrative burden, the certification of biofuels, biogas, renewable liquid and gaseous transport fuels of non-biological origin and recycled carbon fuel should rely on the rules established by the Renewable Energy Directive. This principle should also apply to fuels bunkered outside the EU, which should be considered as imported fuels, in a similar way as the Renewable Energy Directive. When companies intend to depart from the default values provided for by the Renewable Energy Directive or this Regulation, this should only be done when values can be certified by one of the voluntary schemes recognised under RED (for well-to-tank values) or by means of laboratory testing or direct emissions measurements (tank-to-wake).
- (27) Verification by accredited verifiers should ensure the accuracy and completeness of the monitoring and reporting by companies and the compliance with the requirements set out in this Regulation. In order to ensure impartiality, verifiers should be independent and competent legal entities and should be accredited by national accreditation bodies established pursuant to Regulation (EC) No 765/2008 of the European Parliament and of the Council.
- (28) Based on the data and information monitored and reported by companies, the verifiers should calculate and establish the yearly average greenhouse gas intensity of energy used on-board and the ship's balance with respect to the targets, including excess or missing compliance units, as well as the respect of the requirements to use on-shore power supply at berth. Such information should be then reported by the company to the Commission.
- (29) The Commission should establish and maintain an electronic database that registers the performance of each ship and ensures its compliance with the requirements of the Regulation. In order to facilitate reporting and limit administrative burden to companies, verifiers and other users, this electronic tool should, as much as possible, build upon existing systems such as THETIS-EU, and more specifically the THETIS-MRV module.

- (30) Compliance with this Regulation would depend on elements that could be beyond control of the ship operators, such as issues related to fuel availability or fuel quality. In order to cater for this situation, the Regulation should allow operators the flexibility to roll-over excess compliance unit from one year to another or borrow them, within certain limits from the upcoming year. The use of OPS at berth, being of high importance for emissions to the port cities and coastal areas should not be eligible for similar provisions.
- (31) In order to avoid technology lock-in and continue supporting the deployment of most performant solutions, operators should be allowed to use the possible over-performance of one ship to compensate for the under-performance of another ship. This option should remain voluntary and subject to agreement of the concerned companies.
- (32) A document of compliance issued by a verifier following the procedures restablished by this Regulation, should be kept on board ships to demonstrate compliance with the limits on the level of greenhouse gas intensity of the energy used on-board. Verifiers should inform the Commission of the issuance of such documents.
- (33) The number of non-compliant port calls should be determined under a clear set of criteria taking into account all the necessary relevant information, including time, the amount of each type and energy consumed, and any excluding conditions, at stay for each port call in the EU. This information should be made available to the verifiers for the purpose of determining compliance.
- (34) Ships that do not comply with the requirements of the Regulation should be subject to a penalty payment that has dissuasive effect. The penalty should be proportionate to the extent of the non-compliance and remove any economic advantage of non-compliance, thus preserving a level playing field in the sector. It should be based on the amount and cost of renewable and low-carbon fuel that the ships should have used to meet the requirements of the Regulation.
- (35) The penalty imposed for each non-compliant port call should be proportionate to the cost of using the electricity and at sufficient level to have a dissuasive effect from the use of more polluting energy sources. The penalty should be based on the amount of energy that the vessel would use while at berth, expressed in megawatts per hour, multiplied by a fixed penalty rate in EUR. Due to lack of accurate figures on the cost of providing OPS in the EU, this rate should be based on the EU average electricity price for non-household consumers multiplied by a factor of two to account for other charges related to the provision of the service, including among others connection costs and investment recovery elements.
- (36) The revenues generated from the payment of penalties should be used to promote the distribution and use of renewable and low-carbon fuels in the maritime sector and help maritime operators to meet their climate and environmental goals. For this purpose, a 'Marine renewable and low carbon fuels fund' should be established to support these goals.
- (37) Enforcement of the obligations relating to this Regulation should be based on existing instruments, namely those established under Directive 2009/16/EC of the European Parliament and of the Council and Directive 2009/21/EC of the European Parliament and of the Council, and on information on the issuance of the FuelEU certificate of compliance, which should be added to the list of certificates and documents referred to in Annex IV to Directive 2009/16/EC.

- (38) In order to maintain a level playing field through the efficient functioning of this Regulation, the power to adopt acts in accordance with Article 290 of the Treaty on the Functioning of the European Union should be delegated to the Commission in respect of the possible revision of well-to-wake emissions factors of energy, the value of compliance units, the rules of operation of the Marine renewable and low-carbon fuels fund, the rules for verification activities and the accreditation of verifiers. It is of particular importance that the Commission carry out appropriate consultations during its preparatory work, including at expert level, and that those consultations be conducted in accordance with the principles laid down in the Interinstitutional Agreement on Better Law-Making of 13 April 2016. In particular, to ensure equal participation in the preparation of delegated acts, the European Parliament and the Council receive all documents at the same time as Member States' experts, and their experts systematically have access to meetings of Commission expert groups dealing with the preparation of delegated acts.
- (39) In order to ensure uniform conditions for the implementation of this Regulation, implementing powers should be conferred on the Commission. Those powers should be exercised in accordance with Regulation (EU) No 182/2011 of the European Parliament and of the Council.
- (40) Given the international dimension of the maritime sector, a global approach to limiting the greenhouse gas intensity of the energy used by ships is preferable as it could be regarded as more effective due to its broader scope. In this context, and with a view to facilitating the development of international rules within the IMO, the Commission should share relevant information on the implementation of this Regulation with the IMO and other relevant international bodies on a regular basis and relevant submissions should be made to the IMO. Where an agreement on a global approach is reached, the Commission should review the present Regulation with a view to aligning it where appropriate, with the international rules.
- (41) Based on experience from similar tasks related to maritime safety, the European Maritime Safety Agency (EMSA) should, within the framework of its mandate, support the Commission by carrying out certain tasks.

HAVE ADOPTED THIS REGULATION:

CHAPTER I

GENERAL PROVISIONS

Article 1

Purpose

This Regulation lays down rules to reduce the greenhouse gas intensity of energy used on-board by ships arriving at, within or departing from ports under the jurisdiction of a Member State, in order to promote the coherent development and consistent use of renewable and low-carbon fuels across the Union, without introducing barriers to the internal market. Increased use of renewable and low-carbon fuels and substitute sources of energy shall be achieved by imposing limits on the greenhouse gas intensity of the energy used on-board.

Article 2

Scope

1. This Regulation applies to ships above 5 000 gross tonnage [during their voyages from their last port of call to a port of call under the jurisdiction of a Member State and from a port of call under the jurisdiction of a Member State to their next port of call, as well as within a port of call under the jurisdiction of a Member State.]
2. This Regulation does not apply to warships, naval auxiliaries, fish-catching or fish-processing ships, wooden ships of a primitive build, ships not propelled by mechanical means, or government ships used for non-commercial purposes.

Article 3

Definitions

For the purposes of this Regulation, the following definitions apply:

- (a) ‘greenhouse gas emissions’ (GHG) means the release of carbon dioxide (CO₂), methane (CH₄) and nitrous oxides (N₂O) into the atmosphere by ships;
- (b) ‘biofuels’ means biofuels as defined in point (33) of Article 2 of Directive (EU) 2018/2001;
- (c) ‘biogas’ means biogas as defined in point (28) of Article 2 of Directive (EU) 2018/2001;
- (d) ‘recycled carbon fuels’ means recycled carbon fuels as defined in point (35) of Article 2 of Directive (EU) 2018/2001;
- (e) ‘renewable liquid and gaseous transport fuels of non-biological origin’ means renewable liquid and gaseous transport fuels of non-biological origin as defined in point (36) of Article 2 of Directive (EU) 2018/2001;
- (f) ‘food and feed crops’ means food and feed crops as defined in point (40) of Article 2 of Directive (EU) 2018/2001;
- (g) ‘substitute sources of energy’ means renewable wind or solar energy generated on-board or electricity supplied from on-shore power supply;
- (h) ‘port of call’ means a port of call as defined in Article 3(b) of Regulation (EU) 2015/757;
- (i) ‘voyage’ means voyage as defined in Article 3(c) of Regulation (EU) 2015/757;
- (j) ‘company’ means company as defined in Article 3(d) of Regulation (EU) 2015/757;
- (k) ‘gross tonnage’ (GT) means GT as defined in Article 3(e) of Regulation (EU) 2015/757;
- (l) ‘ship at berth’ means ship at berth as defined in Article 3(n) of Regulation (EU) 2015/757;
- (m) ‘energy use on-board’ means the amount of energy, expressed in mega joules (MJ), used by a ship for propulsion and for the operation of any on-board equipment, at sea or at berth;
- (n) ‘greenhouse gas intensity of the energy used on-board’ means the amount of greenhouse gas emissions, established on a well-to-wake basis, expected to be

produced by mega joule of energy used on-board, expressed in CO₂ equivalent per mega joule;

- (o) ‘well-to-wake’ means a method for calculating emissions that takes into account the greenhouse gas impact of energy production, transport, distribution and use on-board, including during combustion;
- (p) ‘emission factor’ means emission factor as defined in Article 3(j) of Regulation (EU) 2015/757;
- (q) ‘on-shore power supply’ means the system to supply electricity to ships at berth, at low or high voltage, alternate or direct current, including ship side and shore side installations, when feeding directly the ship main distribution switchboard for powering hotel, service workloads or charging secondary batteries;
- (r) ‘verifier’ means a legal entity carrying out verification activities which is accredited by a national accreditation body pursuant to Regulation (EC) No 765/2008 and this Regulation;
- (s) ‘reporting period’ means reporting period as defined in Article 3(m) of Regulation (EU) 2015/757;
- (t) ‘FuelEU certificate of compliance’ means a certificate specific to a ship, issued to a company by a verifier, which confirms that that ship has complied with the requirements of this Regulation for a specific reporting period;
- (u) ‘passenger ship’ means a ship that carries more than 12 passengers, including cruise ships and ships with facilities to enable road or rail vehicles to roll on and roll off the vessel (‘ro-ro passenger ships’);
- (v) ‘containership’ means a ship designed exclusively for the carriage of containers in holds and on deck;
- (w) ‘on-shore power supply equipped’ means a ship, which has installed and certified equipment to allow connection to onshore power supply, at a specified voltage and frequency, and whose equipment includes at least the gear specified in IEC/IEEE 80005-1 (High Voltage) and IEC/IEEE 80005-3 (Low Voltage);
- (x) ‘non-compliant port calls’ means a port call of a ship subject to the requirements in Article 5(1), when the use of on-shore power supply could not be certified and none of the exceptions provided for in Article 5(2) is demonstrated by a certificate issued in accordance with Article 5(3) and verified by the verifier;
- (y) ‘least favourable pathway’ means the most carbon-intensive production pathway used for any given fuel;
- (z) ‘CO₂-equivalent’ means the metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential, by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential;
- (aa) ‘compliance units’ means the measure of a ship’s over- or under-compliance with regards to the limits laid down in Article 4. Compliance units are established following the methodology referred to in Annex I;
- (bb) ‘administration’ means a governmental authority designated Member State as being responsible for duties related to ships flying its flag or to ships operating under its authority;

- (cc) ‘recognised organisation’ means an organisation recognised in accordance with Regulation (EC) No 391/2009 of the European Parliament and of the Council;
- (dd) ‘statement’ means a ship-specific certificate that is issued to ships flying the flag of a third country.
- (a) ‘managing body of the port’ means any public or private body as defined in Article 2 (5) of Regulation (EU) 217/352.

CHAPTER II

REQUIREMENTS ON ENERGY USED ON-BOARD SHIPS

Article 4

Greenhouse gas intensity limits of energy used on-board ships

1. The limits to the yearly average greenhouse gas intensity of energy used on-board by a ship during a reporting period shall be determined against a reference value reflecting the fleet average greenhouse gas intensity of energy used on-board by ships in 2020. The reference value shall be determined on the basis of data monitored and reported in the framework of Regulation (EU) 2015/757 and using the methodology and default values laid down in Annex I.
2. The average greenhouse gas intensity of energy used on-board by ships shall not exceed the reference value referred to in paragraph 1 reduced by the following percentages:
 - 2% by 2025;
 - 6% by 2030;
 - 13% by 2035;
 - 26% by 2040;
 - 59% by 2045;
 - 75% by 2050.
3. Ships that do not meet these limits shall be subject to the penalty laid out in Article 20(1).
4. Companies shall calculate the greenhouse gas intensity of the energy used on-board as the amount of greenhouse gas emissions per unit of energy according to the formula and methods specified in Annex I. This calculation shall be subject to assessment by the verifier.
5. The emission intensity of biofuels, biogas, renewable liquid and gaseous transport fuels of non-biological origin and recycled carbon fuels shall be determined according to the methodologies set out in the Directive (EU) 2018/2001.
6. The Commission shall adopt an implementing act for the purpose of determining the reference value referred to in paragraph 1 in accordance with the examination procedure referred to in Article 25(2).
7. The Commission is empowered to adopt a delegated act in accordance with Article 24 to amend Annex II in order to supplement or amend the list of well-to-wake

emission factors of energy to account for the use of new sources of energy or to achieve consistency with other legislation or international standards.

Article 5

Additional zero-emission limits of energy used at berth

1. A ship at berth in a port under the jurisdiction of a Member State shall connect to on-shore power supply and use it for all energy needs at berth. This requirement shall apply as of 1 January 2030 to the following ship types:
 - (a) Containerships;
 - (b) Passenger ships.
2. The previous paragraph shall not apply to ships:
 - (a) that are at berth for less than two hours, calculated on the basis of hour of departure and arrival monitored in accordance with Article 14;
 - (b) that use zero-emission technologies, determined and certified in accordance with Annex III;
 - (c) that have to make an unscheduled port call for reasons of safety or saving life at sea;
 - (d) that are unable to connect to on-shore power supply due to unavailable connection points in a port;
 - (e) whose on-board on-shore power equipment is found to be incompatible with the shore installation at the port;
 - (f) which, for a limited period of time require the use of on-board energy generation, under emergency situations representing immediate risk to life, the ship, or the environment.
3. For the purpose of demonstrating the conditions conditions c), d), e) and f) of paragraph 2, the managing body of the port of call shall provide an appropriate certificate in paper or electronic format in line with Annex IV.
4. As of 1 January 2035, exceptions listed in paragraphs (2)(d) and (2)(e) shall not apply more than [five] times for one reporting year.
5. Emergency situations resulting in the need to use on-board generators, referred to in paragraph 2(f) shall be documented and reported to the managing body of the port.
6. Ships that do not meet these limits shall be subject to the penalty laid out in Article 20(3).

CHAPTER III

MONITORING OF PERFORMANCE

Article 6

Common principles for monitoring

1. In accordance with Articles 7 to 9, companies shall, for each of their ships, monitor and report on the relevant parameters during a reporting period. They shall carry out that monitoring and reporting within all ports under the jurisdiction of a Member State and for any voyages to or from a port under the jurisdiction of a Member State.
2. Monitoring and reporting shall be complete and cover the energy used on-board, while the ships are in navigation as well as at berth. Companies shall apply appropriate measures to prevent any data gaps within the reporting period.
3. Monitoring and reporting shall be consistent and comparable over time. To that end, companies shall use the same monitoring methodologies and data sets subject to modifications assessed by the verifier. Companies shall enable reasonable assurance of the integrity of the data to be monitored and reported.
4. Companies shall obtain, record, compile, analyse and document monitoring data, including assumptions, references, emission factors and activity data, in a transparent and accurate manner that enables the determination of the greenhouse gas intensity of the energy used on-board by the verifier.
5. In undertaking the monitoring and reporting activities referred to in Articles 7 to 9 and Article 14, information and data collected for the purpose of Regulation (EU) 2015/757 shall be used where appropriate.

Article 7

Monitoring plan

1. By [31 August 2024], companies shall submit to the verifiers a monitoring plan for each of their ships indicating the method chosen to monitor and report the amount, type and emission factor of energy used on-board by ships and other relevant information.
2. Notwithstanding paragraph 1, for ships falling under the scope of this Regulation for the first time after [31 August 2024], the company shall submit a monitoring plan to the verifier without undue delay and no later than two months after each ship's first call in a port under the jurisdiction of a Member State.
3. The monitoring plan shall consist of a complete and transparent documentation and shall contain at least the following elements:
 - (a) the identification and type of the ship, including its name, its IMO identification number, its port of registry or home port, and the name of the ship-owner;
 - (b) the name of the company and the address, telephone and e-mail details of a contact person;
 - (c) a description of the energy conversion systems installed on-board, and the related power capacity expressed in MW;
 - (d) a description that the ship is equipped with substitute sources of energy or a zero-emission technology as specified in Annex III;
 - (e) a description of the intended source(s) of energy to be used on-board while in navigation and at berth to comply with the requirements set out in Articles 4 and 5;

- (f) a description of the procedures for monitoring the fuel consumption of the ship as well as the energy provided by substitute sources of energy or a zero-emission technology;
 - (g) well-to-wake emission factors referred to in Article 4(4);
 - (h) a description of the procedures used to monitor the completeness of the list of voyages;
 - (i) a description of the procedures used for determining activity data per voyage, including in particular the procedures, responsibilities, formulae and data sources for determining and recording the time spent at sea between the port of departure and the port of arrival and the time spent at berth;
 - (j) a description of the procedures, systems and responsibilities used to update any of the data contained in the monitoring plan over the reporting period;
 - (k) a description of the method to be used to determine surrogate data for closing data gaps;
 - (l) a revision record sheet to record all the details of the revision history.
4. Companies shall use standardised monitoring plans based on templates. Those templates, including the technical rules for their uniform application, shall be determined by the Commission by means of implementing acts. Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 24.

Article 8

Modifications to the monitoring plan

- 5. Companies shall check regularly, and at least annually, whether a ship's monitoring plan reflects the nature and functioning of the ship and whether any of the data it contain can be improved.
- 6. Companies shall modify the monitoring plan in any of the following situations:
 - (a) where a change of company occurs;
 - (b) where new energy conversion systems, new types of energy, including substitute sources of energy or a zero-emission technology not yet contained in the monitoring plan are in use;
 - (c) where a change in availability of data, due to the use of new types of measuring equipment, new sampling methods or analysis methods, or for other reasons, may affect the accuracy of the data collected;
 - (d) data resulting from the monitoring method applied has been found to be incorrect;
 - (e) where any part of the monitoring plan is identified as not being in conformity with the requirements of this Regulation and the company is required to revise it.
- 7. Companies shall notify to the verifiers without undue delay any proposals for modification of the monitoring plan.
- 8. Modifications of the monitoring plan referred to in points (b), (c) and (d) of paragraph 2 shall be subject to assessment by the verifier. Following the assessment,

the verifier shall notify the company whether those modifications are in conformity with requirements referred to in Article 6.

Article 9

Certification of biofuels, biogas, renewable liquid and gaseous transport fuels of non-biological origin and recycled carbon fuels

1. Where biofuels, biogas, renewable liquid and gaseous transport fuels of non-biological origin and recycled carbon fuels are to be taken into account for the purposes referred to in Articles 4(1), the following rules apply:
 - a) Biofuels and biogas that comply with the sustainability and greenhouse gas saving criteria set out in Article 29 of Directive (EU) 2018/2001 shall be considered applying data on the on greenhouse gas emission intensity determined according to the methodologies set out in the Directive (EU) 2018/2001;
 - b) Renewable liquid and gaseous transport fuels of non-biological origin and recycled carbon fuel that comply with the greenhouse gas emission savings thresholds set out in Article 25(2) of Directive (EU) 2018/2001 shall be considered applying the data on the greenhouse gas emission intensity determined according to the methodologies set out in the Directive (EU) 2018/2001;
 - c) Biofuels and biogas that do not comply with point (a) or that are produced from food and feed crops shall be considered to have the same emission factor as the least favourable pathway for this type of fuel;
 - d) Renewable liquid and gaseous transport fuels of non-biological origin and recycled carbon fuels that do not comply with point (b) shall be considered to have the same emission factor as the least favourable pathway for this type of fuels.
2. Companies shall provide data on the GHG emission intensity and the sustainability characteristics of biofuels, biogas, renewable liquid and gaseous transport fuels of non-biological origin and recycled carbon fuel, verified by a voluntary scheme that is recognised by a decision pursuant to paragraph 4 or 6 of Article 30 of the Directive (EU) 2018/2001. In the event that no scheme has been recognised by such a decision, the companies may choose an appropriate alternative means.
3. Companies shall be entitled to divert from the established default values for the tank-to-wake emission factors provided that actual values are certified by means of laboratory testing or direct emissions measurements. The Commission shall be empowered to adopt delegated acts in accordance with Article 24, in order to establish the rules to follow to certify tank-to-wake emission factors.

CHAPTER IV

VERIFICATION AND ACCREDITATION

Article 10

Scope of verification activities and verification report

1. The verifier shall assess the conformity of the monitoring plan with the requirements laid down in Articles 6 and 7. Where the verifier's assessment identifies non-conformities with those requirements, the company concerned shall revise its monitoring plan accordingly and submit the revised plan for a final assessment by the verifier before the reporting period starts. The company shall agree with the verifier on the timeframe necessary to introduce those revisions. That timeframe shall in any event not extend beyond the beginning of the reporting period.
2. The verifier shall assess the conformity of the parameters reported with the requirements laid down in Article 8 and Annexes I, II and III before performing the operations referred to in Article 15(2).
3. Where the verification assessment identifies misstatements or non-conformities with the requirements of this Regulation, the verifier shall inform the company thereof in a timely manner. The company shall then correct the misstatements or non-conformities so as to enable the verification process to be completed in time.

Article 11

General obligations and principles for the verifiers

1. The verifier shall be independent from the company or from the operator of a ship and shall carry out the activities required under this Regulation in the public interest. For that purpose, neither the verifier nor any part of the same legal entity shall be a company or ship operator, the owner of a company, or be owned by them, nor shall the verifier have relations with the company that could affect its independence and impartiality.
2. When applying the methodology referred to in Annex I, the verifier shall assess the reliability, credibility and accuracy of the data and information relating to the amount, type and emission factor of the energy used on-board, in particular:
 - (a) the attribution of fuel consumption and the use of substitute sources of energy to voyages;
 - (b) the reported fuel consumption data and related measurements and calculations;
 - (c) the choice and the employment of emission factors;
 - (d) the use of on-shore power supply or the presence of any of the exceptions listed in Article 5(2).
3. The verifier shall assess reliability, credibility and accuracy of the data and information relating to the amount, type and emission factor of the energy used on-board, based on the following:
 - (a) the reported data are coherent in relation to estimated data that are based on ship tracking data and characteristics such as the installed engine power;
 - (b) the reported data are free of inconsistencies, in particular when comparing the total volume of fuel purchased annually by each ship and the aggregate fuel consumption during voyages;
 - (c) the collection of the data has been carried out in accordance with the applicable rules; and
 - (d) the relevant records of the ship are complete and consistent.

Article 12

Verification procedures

1. The verifier shall identify potential risks related to the monitoring and reporting process by comparing reported the amount, type and emission factor of the energy used on-board with estimated data based on ship tracking data and characteristics such as the installed engine power. Where significant deviations are found, the verifier shall carry out further analyses.
2. The verifier shall identify potential risks related to the different calculation steps by reviewing all data sources.
3. The verifier shall take into consideration any effective risk control methods applied by the company to reduce levels of uncertainty associated with the accuracy specific to the monitoring methods used.
4. The company shall provide the verifier with any additional information that enables it to carry out the verification procedures. The verifier may conduct spot-checks during the verification process to determine the reliability of reported data and information.
5. The Commission shall be empowered to adopt delegated acts in accordance with Article 24, in order to further specify the rules for the verification activities referred to in this Regulation. The rules specified in those delegated acts shall be based on the principles for verification provided for in Articles 10 and 11 and on relevant internationally accepted standards.

Article 13

Accreditation of verifiers

1. Verifiers shall be accredited for activities under the scope of this Regulation by a national accreditation body pursuant to Regulation (EC) No 765/2008.
2. Where no specific provisions concerning the accreditation of verifiers are laid down in this Regulation, the relevant provisions of Regulation (EC) No 765/2008 shall apply.
3. The Commission shall be empowered to adopt delegated acts in accordance with Article 24, in order to further specify the methods and criteria of accreditation of verifiers. The methods specified in those delegated acts shall be based on the principles for verification provided for in Articles 10 and 11 and on relevant internationally accepted standards.

CHAPTER V

REPORTING, VERIFICATION AND ASSESMENT OF COMPLIANCE

Article 14

Monitoring and recording

1. Based on the monitoring plan referred to in Article 7, and following the assessment of the plan by the verifier, companies shall record, for each ship arriving in or

departing from, and for each voyage to or from a port under the jurisdiction of a Member State, the following parameters:

- (a) the port of departure and port of arrival including the time spent at berth;
 - (b) for each ship falling under the requirements of Article 5(1), the connection to and use of on-shore power or the presence of any of the exceptions listed in Article 5(2);
 - (c) the amount of each type of fuel consumed at berth and in navigation;
 - (d) the well-to-wake emission factors for each type of fuel consumed at berth and at sea, broken down by well-to-tank, tank-to-wake and fugitive emissions, covering all relevant greenhouse gases;
 - (e) the amount of each type of substitute source of energy consumed at berth and in navigation.
2. Companies shall monitor and document the information and data listed in paragraph 1 per voyage and on annual basis in a transparent manner that enables the verification of compliance with this Regulation by the verifier.
 3. By 30 March of each year, the company shall provide to the verifier the information referred to in paragraph 1.

Article 15

Verification and calculation

1. Following the verification procedures laid down in Articles 10 to 13, the verifier shall assess the quality, completeness and accuracy of the information referred to in Article 14(3).
2. On the basis of the information verified according to paragraph 1, the verifier shall:
 - a) calculate, using the method specified in Article 4 and Annex I, the yearly average greenhouse gas intensity of energy used on-board and the ship's balance with respect to the targets set out in Article 4;
 - b) in case the yearly average greenhouse gas intensity of energy used is below the limits set out in Article 4(1), determine, using the formula in Annex I, the amount of 'excess compliance units';
 - c) in case the yearly average greenhouse gas intensity of energy used is above the limits set out in Article 4(1), determine, using the formula in Annex I, the amount of 'missing compliance units';
 - d) determine the number of non-compliant port calls in the previous reporting period including the time spent at berth for each non-compliant port call.

Article 16

Compliance database and reporting

1. The Commission shall develop, maintain and update an electronic database for the monitoring of compliance with the requirements of Article 4 and Article 5. The Commission shall lay down the functional and technical specifications of this electronic tool by means of implementing acts adopted in accordance with the examination procedure referred to in Article 24.

2. By 30 April of each year, the company shall submit for each ship the information referred to in Article 15(2) to the compliance database referred to in paragraph 1, together with information allowing to identify the ship, the company, as well as the identity of the verifier that carried out the assessment.

Article 17

Flexibility provisions

1. In case the ship has excess compliance units as referred to in Article 15(2)(b) these may be transferred to the ship's balance for the following reporting period. The carry-over of compliance units to the following reporting period shall be recorded in the compliance database.
2. In case of missing compliance units as referred to in Article 15(2)(c), a ship may obtain a specified number of advance compliance units, which shall be added to the ship balance in the reporting period and be subtracted from the ship balance in the following reporting period. The amount of compliance units to be subtracted in the following reporting period shall be equal to the amount of units obtained multiplied by [1.1]. Ships shall not obtain advance compliance units:
 - a) for more than 2% of the relevant limit set out in Article 4(2) multiplied by the energy consumption of the ship calculated in accordance with Annex I;
 - b) in two consecutive reporting periods.A record of obtained advance compliance units shall be recorded by the company, following approval by its verifier, in the compliance database.
3. The use of the flexibility provisions laid down in paragraphs 1 shall not be allowed once a FuelEU certificate of compliance has been issued for the ship concerned.

Article 18

Transfer of compliance units

1. The excess compliance units referred to in Article 15(2)(b) may also be transferred by a company to the balance of another ship for the same reporting period.
2. A ship that has obtained advance compliance units under Article 17(2) may not transfer compliance units under paragraph 1.
3. The compliance units may only be transferred to another ship within 6 months after the end of the reporting period and with the consent of the companies for both the transferring and the receiving ships. Companies shall record each transfer, specifying the number of compliance units, in the compliance database for both the ceding and acquiring ships.
4. The possible transfer of compliance units shall not be allowed once a FuelEU certificate of compliance has been issued for the ships concerned.

Article 19

FuelEU certificate of compliance

1. By 30 June following the reporting year, the verifier shall issue a FuelEU certificate of compliance for the ship concerned provided that the compliance database referred to in Article 16 does not show:

- (a) any missing compliance units referred to in Article 15(2)(c), including after using possible flexibility provisions referred to in Article 17 and the transfer of compliance units as referred to in Article 18, and
 - (b) any non-compliant port call referred to in Article 15(2)(d).
2. The FuelEU certificate of compliance shall include the following information:
 - (a) identity of the ship (name, IMO identification number and port of registry or home port);
 - (b) name, address and principal place of business of the ship-owner;
 - (c) identity of the verifier;
 - (d) date of issue of the document of compliance, its period of validity and the reporting period it refers to.
3. The FuelEU certificate of compliance of compliance shall be valid for the period of 18 months after the end of the reporting period.
4. The verifier shall inform the Commission and the authority of the flag State, without delay, of the issuance of any FuelEU certificate of compliance. The verifier shall transmit the information referred to in paragraph 2 using the compliance database referred to in Article 16.
5. The Commission shall determine technical rules for the data exchange formats, including the electronic templates. Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 24.

Article 20

Penalty for failure to comply

1. In case a ship does not satisfy the criteria laid down in Article 19(1)(a) for obtaining a FuelEU certificate a compliance, the responsible company shall pay a penalty into the ‘Marine renewable and low carbon fuels fund’ referred to in Article 21.
2. The amount of the penalty referred to in paragraph 1 shall remove the economic benefits of non-compliance and shall be calculated following the methodology established in Annex I.
3. In case a ship does not satisfy the criteria laid down in Article 19(1)(b) for obtaining a FuelEU certificate, the company shall pay, for each non-compliant port call, a fixed penalty of EUR [250] per megawatt of power installed on-board and per hour spent at berth to the ‘Marine renewable and low carbon fuels fund’ referred to in Article 21.
4. Notwithstanding Article 19(1), the verifier shall issue a valid certificate of compliance once the penalties referred to in paragraphs 1 and 3 have been paid. The Annex to the certificate of compliance shall record the actions referred to in this Article as well as the proof of the financial payments made to the ‘Marine renewable and low carbon fuels fund’ referred to in Article 21.
5. The Commission is empowered to adopt a delegated act in accordance with Article 24 to amend Annex I in order to adapt the numerical factor included in the methodology referred to in paragraph 2, and the fixed penalty referred to in paragraph 3, to account for developments in the cost of energy.

Article 21

Marine renewable and low carbon fuels fund

1. The penalties referred to in Article 20(1) and 20(3) shall serve to establish a ‘Marine renewable and low carbon fuels fund’ to support the rapid deployment of renewable and low carbon fuels in the maritime sector. Projects financed by the fund shall stimulate the production of greater quantities of renewable and low carbon fuels, facilitate the construction of appropriate bunkering facilities or electric connection ports in ports, and support the testing and deployment of the most innovative technologies in the fleet.
2. The Commission is empowered to adopt delegated acts in accordance with Article 24 to supplement this Regulation concerning rules on the operation of the Marine renewable and low carbon fuels fund, including the selection procedure and criteria. These delegated acts shall also establish the modalities for the payment of the penalties referred to in Article 20(1) and 20(3).

Article 22

Obligation to carry a valid FuelEU certificate of compliance on-board

1. As of 30 June of the year following the end of a reporting period, ships calling at a port under the jurisdiction of a Member State, shall carry on-board a valid FuelEU certificate of compliance.
2. The Fuel EU certificate of compliance issued for the ship concerned in accordance with Article 19 shall constitute evidence of compliance with this regulation.
3. A Member State may detain a ship which fails more than once to submit to the relevant authorities of the port State a valid FuelEU certificate under paragraph 1, until the ship has presented the certificate of compliance in accordance with Article 19(1), or exclude the ship from the ports of that Member State. A Member State taking such action shall immediately inform the relevant authorities of the country whose flag the ship concerned is flying.

Article 23

Enforcement

1. Member States shall lay down the rules on sanctions applicable to infringements of this Regulation and shall take all measures necessary to ensure that they are implemented. The sanctions provided for must be effective, proportionate and dissuasive. Member States shall notify those provisions to the Commission by [dd/mm/20xx], and shall notify to the Commission without delay any subsequent amendments.
2. Each Member State shall ensure that inspections of ships are carried out in a port under its jurisdiction to check that a valid FuelEU certificate of compliance is carried on board.
3. For each ship in respect of which the information referred to in Article 19(2)(c) and (d) is not available at the time when it enters a port under the jurisdiction of a Member State, the Member State concerned may check that a valid FuelEU certificate of compliance is carried on board.

CHAPTER VI

DELEGATED AND IMPLEMENTING POWERS AND FINAL PROVISIONS

Article 24

Exercise of delegation

1. The power to adopt delegated acts is conferred on the Commission subject to the conditions laid down in this Article.
2. The power to adopt delegated acts referred to in Articles 4(7), 9(3), 12(5), 13(3), 20(2), 20(3), and 21(2) shall be conferred on the Commission for an indeterminate period of time from [date of entry into force of the basic legislative act or any other date set by the co-legislators].
3. The delegation of power referred to in Articles 4(7), 9(3), 12(5), 13(3), 20(2), 20(3), and 21(2) may be revoked at any time by the European Parliament or by the Council. A decision to revoke shall put an end to the delegation of the power specified in that decision. It shall take effect the day following the publication of the decision in the Official Journal of the European Union or at a later date specified therein. It shall not affect the validity of any delegated acts already in force.
4. Before adopting a delegated act, the Commission shall consult experts designated by each Member State in accordance with the principles laid down in the Interinstitutional Agreement on Better Law-Making of 13 April 2016.
5. As soon as it adopts a delegated act, the Commission shall notify it simultaneously to the European Parliament and to the Council.
6. A delegated act adopted pursuant to Articles 4(7), 9(3), 12(5), 13(3), 20(2), 20(3), and 21(2) shall enter into force only if no objection has been expressed either by the European Parliament or by the Council within a period of [two months] of notification of that act to the European Parliament and the Council or if, before the expiry of that period, the European Parliament and the Council have both informed the Commission that they will not object. That period shall be extended by [two months] at the initiative of the European Parliament or of the Council.

Article 25

Committee procedure

1. The Commission shall be assisted by a committee. That committee shall be a committee within the meaning of Regulation (EU) No 182/2011.
2. Where reference is made to this paragraph, Article 5 of Regulation (EU) No 182/2011 shall apply. Where the committee delivers no opinion, the Commission shall not adopt the draft implementing act and the third subparagraph of Article 5(4) of Regulation (EU) No 182/2011 shall apply.

Article 26

International cooperation

1. The Commission shall cooperate with the Secretariat of the International Maritime Organisation and other relevant international bodies on matters falling within the

scope of this Regulation, without prejudice to the distribution of competences or to decision-making procedures as provided for in the Treaties.

2. The Commission and, where relevant, the Member States shall maintain technical exchange with third countries, in particular with respect to the certification methods for the environmental performance of marine fuels.
3. In the event that an international agreement is reached on a specific measure concerning the uptake of alternative low-carbon and zero-carbon fuels, including through the adoption of robust lifecycle GHG/carbon intensity guidelines for all types of fuels, the Commission shall review this Regulation and shall, if appropriate, propose amendments to this Regulation in order to ensure alignment with that international agreement.

Article 27

Report / Review

1. The Commission shall report to the European Parliament and the Council, every 5 years, on the functioning of this Regulation, the evolution of the market for renewable low-carbon fuels and technologies and marine fuels in general and its impact on the maritime sector in the Union, including regarding:
 - (a) The possible revision of the limits referred to in Article 4.
 - (b) The possible extension of the ship types to which Article 5 applies.
 - (c) The possible revision of the exemptions and verification process referred to in Article 5(2).

Article 28

Entry into force

This Regulation shall enter into force on the [...] day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels,

For the European Parliament
The President

For the Council
The President

ANNEX I

METHODOLOGY FOR ESTABLISHING THE GREENHOUSE GAS INTENSITY LIMITS OF ENERGY USED ON-BOARD SHIPS

For the purpose of calculating the greenhouse gas intensity limits of the energy used on-board a ship, the following formula shall apply:

GHG intensity index	WtT	TtW
<i>GHG intensity index</i> $\left[\frac{\text{gCO}_2\text{eq}}{\text{MJ}} \right]$	$\frac{\sum_i^n \text{fuel } M_i \times \text{CO}_{2\text{eq WtT},i} \times \text{LCV}_i + \sum_k^c E_k \times \text{CO}_{2\text{eq electricity},k}}{\sum_i^n \text{fuel } M_i \times \text{LCV}_i + \sum_k^c E_k}$	$+\frac{\sum_i^n \text{fuel } \sum_j^m \text{engine } M_{i,j} \times \left(1 - \frac{1}{100} C_{\text{engine slip } j} \right) \times (\text{CO}_{2\text{eq TtW},j}) + \left(\frac{1}{100} C_{\text{engine slip } j} \times \text{CO}_{2\text{eq TtW,slippage},j} \right)}{\sum_i^n \text{fuel } M_i \times \text{LCV}_i + \sum_k^c E_k}$

Equation (1)

Where:

$$\text{CO}_{2\text{eq TtW},j} = \left(C_{f \text{CO}_2,j} \times \text{GWP}_{\text{CO}_2} + C_{f \text{CH}_4,j} \times \text{GWP}_{\text{CH}_4} + C_{f \text{N}_2\text{O},j} \times \text{GWP}_{\text{N}_2\text{O}} \right)_i$$

Equation (2)

Term	Explanation
<i>i</i>	Indices corresponding to the fuels delivered to the ship in the reference period
<i>j</i>	Indices corresponding to the fuel combustion units on board the ship. For the purpose of this Regulation the units considered are the main engine(s), auxiliary engine(s) and fired oil boilers
<i>k</i>	Indices corresponding to the connection points (<i>c</i>) where electricity is supplied per connection point.
<i>M_i</i>	Mass of fuel <i>i</i> [gFuel]
<i>E_k</i>	Electricity delivered to the ship per connection point <i>k</i> if more than one [MJ]
<i>CO_{2eq WtT,i}</i>	WtT GHG emission factor of fuel <i>i</i> [gCO _{2eq} /MJ]
<i>CO_{2eq electricity,k}</i>	WtT GHG emission factor associated to the electricity delivered to the ship at berth per connection point <i>k</i> [gCO _{2eq} /MJ]
<i>LCV_i</i>	Lower Calorific Value of fuel <i>i</i> [MJ/gFuel]
<i>C_{engine slip j}</i>	Engine fuel slippage (non-combusted fuel) coefficient as a percentage of the Mass of the fuel <i>i</i> used by combustion unit <i>j</i> [%]
<i>C_{cf CO₂,j}, C_{cf CH₄,j}, C_{cf N₂O,j}</i>	TtW GHG emission factors by combusted fuel in combustion unit <i>j</i> (values for CH ₄ and N ₂ O are set to zero unless otherwise advised) [gGHG/gFuel]
<i>CO_{2eq TtW,j}</i>	TtW CO ₂ equivalent emissions of combusted fuel <i>i</i> in combustion unit <i>j</i> [gCO _{2eq} /gFuel] $\text{CO}_{2\text{eq TtW},j} = \left(C_{f \text{CO}_2,j} \times \text{GWP}_{\text{CO}_2} + C_{f \text{CH}_4,j} \times \text{GWP}_{\text{CH}_4} + C_{f \text{N}_2\text{O},j} \times \text{GWP}_{\text{N}_2\text{O}} \right)_i$
<i>C_{sf CO₂,j}, C_{sf CH₄,j}, C_{sf N₂O,j}</i>	TtW GHG emissions factors by slipped fuel towards combustion unit <i>j</i> [gGHG/gFuel]
<i>CO_{2eq TtWslippage,j}</i>	TtW CO ₂ equivalent emissions of slipped fuel <i>i</i> towards combustion unit <i>j</i> [gCO _{2eq} /gFuel] $\text{CO}_{2\text{eq TtW slippage},j} = \left(C_{sf \text{CO}_2,j} \times \text{GWP}_{\text{CO}_2} + C_{sf \text{CH}_4,j} \times \text{GWP}_{\text{CH}_4} + C_{sf \text{N}_2\text{O},j} \times \text{GWP}_{\text{N}_2\text{O}} \right)_i$
<i>GWP_{CO₂}, GWP_{CH₄}, GWP_{N₂O}</i>	CO ₂ , CH ₄ , N ₂ O Global Warming Potential over 100 years

In the case of fossil fuels, the default values in Annex II shall be used.

For the purpose of this regulation the term $\sum_k^c E_k \times CO_{2eq\ electricity,k}$ in the numerator of Equation (1) shall be set to zero.

Method for determining [M_i]

The [M_i] mass of fuel shall be determined using the amount reported in accordance with the framework of the reporting under Regulation (EU) 2015/757 for voyages falling within the scope of this Regulation based on the chosen monitoring methodology by the company.

Method for determining WtT GHG factors

Wherever values different from the default values in Annex II are used, these shall be based on relevant Bunker Delivery Notes (BDNs), for the fuels delivered to the ship in the reference period, for at least equal quantities of fuels as the one determined as being consumed in scope of the regulated journey in accordance with point A.

The WtT GHG ($CO_{2eq\ WtT,i}$) of the fuels are established in RED II. The actual values, contained in RED II that shall be used for the purpose of this Regulation, in accordance with the methodology, are those without combustion. For those fuels for which pathways are not included in RED II and for fossil fuels, the WtT GHG emission factors ($CO_{2eq\ WtT,i}$) default values are contained in Annex II.

BDN Fuel

For the purposes of this regulation, relevant BDNs of fuels used on board shall contain at least the following information:

- product identification
- fuel mass [t]
- fuel volume [m³]
- density [kg/m³]
- WtT GHG emission factor for CO₂ (carbon factor) [gCO₂/gFuel] and for CO_{2eq}¹
- Lower Calorific Value [MJ/g]

¹wherever the company of the ship intends to use this value for the calculation of the GHG intensity of the ship, separate certificates related to the fuel production pathway shall be made available in Annex to the BDN.

BDN Electricity

For the purposes of this regulation, relevant BDNs for electricity delivered to the ship shall contain at least the following information:

- supplier: name, address, telephone, email, representative
- receiving ship: IMO number (MMSI), ship name, ship type, flag, ship representative
- port: name, location (LOCODE), terminal/ berth
- connection point: OPS-SSE connection point, connection point details
- connection time: date/time of commencement/finalization
- energy supplied: power fraction allocated to supply point (if applicable) [kW], electricity consumption (kWh) for the billing period, peak power information (if available)
- metering

Method for determining TtW GHG factors

The TtW emissions are determined on the basis of the methodology contained in this Annex as provided in Equation (1) and Equation (2)

For the purpose of this Regulation, the TtW GHG emission factors ($CO_{2eq,TtW,i}$) that shall be used to determine the GHG emissions are contained in Annex II. The CO_2 C_f factors shall be the ones established in the MRV Regulation (MEPC245(66) as amended) and are reported in the Table for easy reference. For fuels whose factors are not included in the MRV regulation, default factors as contained in Annex II shall be used.

In accordance with its compliance plan referred to in Article 6 and upon assessment by the verifier, other methods, such as direct CO_{2eq} measurement, laboratory testing, may be used if it enhances the overall accuracy of the calculation.

Method for determining TtW fugitive emissions

Fugitive emissions are emissions caused by the amount of fuel that does not reach the combustion chamber of the combustion unit or that is not consumed by the energy converter because they are uncombusted, fugitive, vented, or leaked from the system. For the purpose of this Regulation, fugitive emissions are taken into account as a percentage of the mass of the fuel used by the engine. The default values are contained in Annex II.

Methods for determining the reward factors linked to substitute sources of energy

In case zero emissions technologies are installed on board, a reward factor for substitute sources of energy can be applied. In case of wind power such reward factor is determined as follow:

Reward factor for substitute sources of energy- WIND (f_{wind})	$\frac{P_{Wind}}{P_{Tot}}$
0,99	0,1
0,97	0,2
0,95	$\geq 0,3$

The Ship GHG intensity index is then calculated by multiplying the result of Equation (1) by the reward factor.

Verification and Certification

Fuel Class	WtT	TtW
Fossil	Default values shall be used as provided in Table 1 of this Regulation	MRV Regulation CO_2 carbon factors shall be used for fuels for which such factor is provided For all other emissions factors,

		<p>default values can be used as provided in Table 1 of this Regulation, alternatively</p> <p>Certified values by mean of laboratory testing or direct emissions measurements</p>
<p>Sustainable Renewable Fuels (Bio Liquids, Bio Gases, e-Fuels)</p>	<p>CO_{2eq} values as provided in RED II (without combustion) can be used for all fuels whose pathways are included in RED II, alternatively</p> <p>RED II approved certification scheme can be used</p>	<p>Emissions factors, default values can be used as provided in Table 1 of this Regulation, alternatively</p> <p>Certified values by mean of laboratory testing or direct emissions measurements.</p>
<p>Others (including electricity)</p>	<p>CO_{2eq} values as provided in RED II (without combustion) can be used for all fuels whose pathways are included in RED II, alternatively</p> <p>RED II approved certification scheme can be used</p>	<p>Emissions factors, default values can be used as provided in Table 1 of this Regulation, alternatively</p> <p>Certified values by mean of laboratory testing or direct emissions measurements.</p>

Methods for determining the ship's balance in compliance units

Compliance units shall be calculated as any CO_{2eq}/MJ above or below the target, multiplied by the energy consumed.

Compliance units balance =	$(GHGIE_{target} - GHGIE_{actual}) \times [\sum_i^{fuel} M_i \times LCV_i + \sum_i E_i]$
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Methods for determining the penalties in case of non compliance

The level of penalties referred to in Article 20(2) of this Regulation shall be established on the basis of the following calculation, where 0,032 corresponds to a penalty factor calculated as the average price per MJ of low-sulphur fuel oil multiplied by a factor of 3:

Level of penalties (in EUR) =	$(Compliance\ units\ balance / GHGIE_{actual}) \times 0,032$
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Penalty factor (EUR 0,032) =

Average global price per mt of VLSFO x conversion factor to MJ (41.0 MJ / kg) x 3

ANNEX II

Emission factors (well-to-tank) to be based on RED values without combustion.

In the table:

- TBM stands for To Be Measured
- N/A stands for Not Available
- The dash means not applicable

Table 1 – Preliminary default factors

1	2	3	4	5	6	7	8	9
	WtT			TtW				
Class	Pathway name	LCV [$\frac{MJ}{g}$]	$CO_{2eq\ WtT}$ [$\frac{gCO_2eq}{MJ}$]	Energy Converter Class	$C_{f\ CO_2}$ [$\frac{gCO_2}{gFuel}$]	$C_{f\ CH_4}$ [$\frac{gCH_4}{gFuel}$]	$C_{f\ N_2O}$ [$\frac{gN_2O}{gFuel}$]	C_{slip} As % of the mass of the fuel used by the engine
Fossil	HFO ISO 8217 Grades RME to RMK	0,0405	9,6 - 13,5 Thinkstep	ALL ICES	3,114 MEPC245 (66) MRV Regulation	0,00005 TBM	0,00018 TBM	-
				Gas Turbine				
				Steam Turbines and Boilers				
				Aux Engines				
	LSFO	0,0405	13,2, crude 13,7 blend Thinkstep	ALL ICES	3,114	0,00005 TBM	0,00018 TBM	-
				Gas Turbine				
				Steam Turbines and Boilers				
				Aux Engines				
	ULSFO	0,0405	13,2	ALL ICES	3,114	0,00005 TBM	0,00018 TBM	-
	VLSFO	0,041	13,2 SINTEF 2020	ALL ICES	3,206 MEPC245 (66) MRV Regulation	0,00005 TBM	0,00018 TBM	-
LFO ISO 8217 Grades RMA to	0,041	13,2	ALL ICES	3,151 MEPC245 (66) MRV Regulation	0,00005 TBM	0,00018 TBM	-	

1	2	3	4	5	6	7	8	9
	WtT			TtW				
	RMD							
	MDO MGO ISO 8217 Grades DMX to DMB	0,0427	14,4 Thinkstep	ALL ICES	3,206 MEPC245 (66) MRV Regulation	0,00005 TBM	0,00018 TBM	-
	LNG	0,0491	18,5 SINTEF 2020	LNG Otto (dual fuel medium speed)	2,755 MEPC245 (66) MRV Regulation	0,0512 TBM	0,00011 TBM	3,1
LNG Otto (dual fuel slow speed)				1,7				
LNG Diesel (dual fuel slow speed)				0.2				
LBSI				N/A				
	LPG	0,046	7,8	All ICES	3,03 Buthane 3,00 Propane MEPC245 (66) MRV Regulation	TBM	TBM	
	Methane	0,05	11,4	ALL ICES	2,755	TBM	TBM	
	H2 (natural gas)	0,12	132 JEC	Fuel Cells	0	0	-	-
				ICE	0	0	TBM	
	Methanol (natural gas)	0,0199	31,3 RED II	All ICES	1,375 MEPC245 (66) MRV Regulation	TBM	TBM	-
Liquid biofuels	Ethanol E100	0,0268	-33,2 RED sugarbeet	All ICES	1,913 MEPC245 (66) MRV Regulation	TBM	TBM	-
	NH3 (natural gas)	0,0186	121	No engine	0	0	TBM	-
	Bio-diesel Main products / wastes / feedstock mix /rapeseed	0,0372	115,1 Rapeseed incl. LUC 306,7 Palm incl. LUC	ALL ICES	2,834	0,00005 TBM	0,00018 TBM	-

1	2	3	4	5	6	7	8	9
	WtT			TtW				
	Bio-diesel Main products / wastes / Feedstock mix	0,0372	-26,1 RED II	ALL ICES	2,834	0,00005 TBM	0,00018 TBM	-
	HVO Main products / wastes / Feedstock mix	0,044	-20,7 RED II	ALL ICES	3,115	0,00005 TBM	0,00018 TBM	-
	Bio-LNG Main products / wastes / Feedstock mix	0,05	-38,9 RED II	LNG Otto (dual fuel medium speed)	2,755 MEPC245 (66) MRV Regulation	0,00005 TBM	0,00018 TBM	3,1
				LNG Otto (dual fuel slow speed)				1,7
LNG Diesel (dual fuels)				0.2				
LBSI				N/A				
Gas biofuels	Bio-H2 Main products / wastes / Feedstock mix	0,12	N/A	Fuel Cells	0	0	0	-
				ICE	0	0	TBM	
e- fuels	e-diesel EU electricity mix	0,0427	-47,6 RED RES D1 (from RES)	ALL ICES	3,206	0,00005 TBM	0,00018 TBM	-
	e-methanol EU electricity mix	0,0199	-67,1 RED REME1a (from RES)	All ICES	1,375 MEPC245 (66) MRV Regulation	0,00005 TBM	0,00018 TBM	-
	e-LNG EU electricity mix	0,0491	-26,6 RED WFLG2 (from biomass gasification)	LNG Otto (dual fuel medium speed)	2,755 MEPC245 (66) MRV Regulation	0,0512 TBM	0,00011 TBM	3.1
				LNG Otto (dual fuel slow speed)				1,7
				LNG Diesel (dual fuels)				0.2
LBSI				N/A				
e-H2	0,12	3,6	Fuel Cells	0	0	0	-	

1	2	3	4	5	6	7	8	9
	WtT			TtW				
	EU electricity mix		JEC	ICE	0	0	TBM	
	e-NH3 EU electricity mix	0,0186	0 SINTEF 2020	No engine	0	N/A	TBM	N/A
Others	Electricity EU electricity mix	-	106,3 EU MIX 2020 72 EU MIX 2030	OPS	-	-	-	-

(*) **Note for column 4:** for the values in column 4, make mostly reference to RED II values without combustion for reference and testing.

Column 1 identifies the class of the fuels namely Fossils, Liquid Biofuels, Gaseous Biofuels, e-Fuels;

Column 2 identifies the name or the pathway of the relevant fuels within the class. For the Liquid Biofuels, Gaseous Biofuels, e-Fuels the values for the WtT section shall be taken from the RED II without combustion; for fossils fuels only the default values in the table shall be used.

Column 3 contains the Lower Calorific Value of the fuels expressed in [MJ/g].

Column 4 contains the CO_{2eq} emissions in [gCO_{2eq}/MJ]. For the Liquid Biofuels, Gaseous Biofuels, e-Fuels the values for this column shall be taken from the RED II without combustion; for fossils fuels only the default values in the table shall be used.

Column 5 identifies the main types/classes of energy converters such as 2 and 4 strokes Internal Combustion Engines (ICE) Diesel or Otto cycle, gas turbines, fuels cells etc.

Column 6 contains the emission factor C_f for CO₂ in [gCO₂/gfuel]. Emissions factors values as specified in the MRV Directive (or IMO MEPC245 (66) as amended) shall be used. For all those fuels not contained in the MRV Directive the default values contained in the table should be used. Values certified by a by a trusted certifier (such as REDCERT) can be used in place of the default values.

Column 7 contains the emission factor C_f for methane in [gCH₄/gfuel]. Default values as contained in the table shall be used. Values certified by mean of testing can be used in place of the default values.

Column 8 contains the emission factor C_f for nitrous oxide in [gN₂O/gfuel]. Default values as contained in the table shall be used. Values certified by mean of testing can be used in place of the default values.

Column 9 identifies the part of fuel lost as fugitive emissions (C_{slip}) measure as % of mass of fuel used by the specific energy converter. Default values as contained in the table shall be used. Values certified by mean of testing can be used in place of the default values. For fuels such as LNG for which the fugitive emissions (slip) exists, the amount of fugitive emissions as presented in Table 1 is expressed in % of the mass of fuel used (Column 9). The values contained in Column 9 shall be used, in accordance with equation (1), in the calculation in place of the values of Column 7, or viceversa. The values of C_{slip} in Table (1) are calculated at 50% of the engine load.

ANNEX III

CRITERIA FOR THE USE OF ZERO-EMISSION TECHNOLOGY AS REFERRED TO IN ARTICLE 5(2)(b)

The following table provides a list of zero-emission technologies as referred to in Article 5(2)(b), as well as, specific criteria for their use as applicable.

Zero-emission technology	Criteria for use
Fuel cells	In order to achieve the requirements of Article 5, fuel cells used on board for power generation while at berth should be fully powered by renewable and low carbon fuels.
On-board Electricity Storage	In order to achieve the requirements of Article 5, the use of on-board electricity storage is allowed irrespective on the source of energy that produced the stored power (on-board generation or on-shore in case of battery swapping).
On-board Electricity production from renewables	Any ship capable to sustain energy needs at berth through the use of renewable energy sources (such as wind and solar) would be deemed to achieve achieve the requirements of Article 5.
Microgeneration by mobile containerized generator units	<p>For the purpose of energy supply during time at berth, the use of power supply from mobile generators is allowed if powered by renewable and low carbon fuels.</p> <p>Mobile units can be installed on the shore-side or on-board.</p> <p>Connection of mobile generators with the ship electricity grid shall comply with the standard onshore power supply connection requirements as per IEC/IEEE 80005 series.</p>

In order to fulfil the requirements set out in Article 5, the use of these zero-emission technologies shall continuously achieve emissions that are comparably equivalent to the emissions reductions that would be achieved by using on-shore power supply.

Where justified in the light of scientific and technical progress and in such a way as to ensure strict consistency with the requirements set out in this Regulation, the Commission shall be empowered to adopt delegated acts with a view to revise the list of applicable zero-emission technologies in the meaning of Article 5(2)(b) or the criteria for their use.

ANNEX IV

CERTIFICATE TO BE ISSUED BY THE MANAGING BODY OF THE PORT IN CASES WHERE SHIPS CANNOT MAKE USE OF OPS FOR JUSTIFIED REASONS (ARTICLE 5(3)) - MINIMUM ELEMENTS TO BE INCLUDED IN THE CERTIFICATE

For the purposes of this Regulation, the certificate referred to in Article 5(3) shall contain at least the following information:

1. Ship identification
 - a. IMO number
 - b. Ship name
 - c. Call sign
 - d. Ship type
 - e. Flag
2. Port of call
3. Location/terminal name
4. Arrival date and time (ATA)
5. Departure date and time (ATD)

The confirmation from the managing body of the port that the ship was found among any of the following cases:

- the ship made an unscheduled port call for reasons of safety or saving life at sea (Article 5 (2)(c))
 - the ship was unable to connect to on-shore power supply due to unavailable connection points in the port (Article 5 (2)(d))
 - the on-shore power supply equipment on board was found to be incompatible with the shore installation at the port (Article 5 (2)(e))
 - that the ship used, for a limited period of time on-board energy generation, under emergency situations representing immediate risk to life, the ship, or the environment (Article 5 (2) (f)).
6. Details of the managing body of the port
 - a. Name
 - b. Contact (phone, email)
 7. Date of issue