A Maritime Book & Claim Compliance Pathway for the IMO Net Zero Framework

1. Introduction

Although adoption by member states has been delayed,[1] the International Maritime Organisation's Net-Zero Framework (NZF) will mandate a global fuel standard for shipping via amendments to Annex VI of the International Convention for the Prevention of Pollution from Ships (MARPOL).[2] The NZF consists of two interconnected parts: a technical component that progressively tightens the required annual global fuel intensity (GFI) reduction for ships, and an economic component that applies a two-tiered charge on any greenhouse gas (GHG) emissions exceeding those limits. The funds collected are then used to reward the use of zero or near-zero GHG emission fuels and to support the overall implementation of the NZF. To practically implement this framework, both compliance pathways and technology pathways will need to be developed for the necessary uptake of zero or near-zero fuels (ZNZs). Technology pathways relate to infrastructure development, scalability, retrofits and cost competitiveness, while compliance pathways refer to the regulatory and market tools that deploy ZNZs including flexibility mechanisms (banking and selling), innovative commercial structures, technology platforms, certification schemes, carbon accounting models and traceability methodologies. This Article focuses on the potential of one compliance pathway that is starting to gain attention in global shipping, namely B&C or "insetting" schemes. B&C is a chain-of-custody model in which emissions credits can be bought and claimed through a registry by entities that are not directly connected to the activity that generated those credits.[3] This effectively separates, or 'decouples', the physical combustion of fuels from the ability to make the related emissions-reduction claim.

Presently, no regulatory instrument governing ZNZs in the global maritime sector includes the use of B&C systems as a compliance tool. However, B&C systems are already being explored in the aviation sector by the European Union (EU) Parliament as a regional compliance solution for sustainable aviation fuels (SAFs)[4] within the ReFuelEU Aviation framework.[5] In a shipping context, it is unclear whether the IMO's Intersessional Working Group on the Reduction of GHG Emissions from Ships (ISWG-GHG) will pursue B&C as a potential traceability option for fuel certification under the NZF. B&C was raised in a Submission to the ISWG-GHG's 18th session by several key stakeholders, but the submission simply asserts that any decision on chain of custody models

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[1] The IMO has agreed to adjourn the extraordinary session of the Marine Environment Protection Committee (MEPC/ES.2) until October 2026 to consider the adoption of the NZF.

[2] See MEPC Circular Letter No.5005 (11 April 2025) for draft amendments to MARPOL implementing the Net-Zero Framework (Draft NZF).

[3] Tristan Smith, Haydn Francis, Nishatabbas Rehmatulla, The role of insetting in supporting shipping's energy transition (UMAS & UCL Report, July 2025) 4.

[4] European Parliament, Priority question for written answer P-001878/2024: 'Book and claim' mechanism for sustainable aviation fuel in Regulation (EU) 2023/2405 (ReFuelEU Aviation): Part1/2 (30 September 2024) https://www.europarl.europa.eu/doceo/document/P-10-2024-001878_EN.html#:~:text=Article%2015(2)%20of%20Regulation,claim%20mechanism%20in%20aviation%20fuel? Accessed 24 April 2025. See also Jan Pechstein, Nils Bullerdiek, and Martin Kaltschmitt, 'A "book and Claim"-Approach to account for sustainable aviation fuels in the EU-ETS – Development of a basic concept' (2020) 136 Energy Policy 111014.

[5] Regulation (EU) 2023/2405 of the European Parliament and of the Council of 18 October 2023 on ensuring a level playing field for sustainable air transport (ReFuelEU Aviation), OJ L, 2023/2405, 31.10.2023; Art 15(2) requires the Commission to assess possible additional compliance measures including the possibility of setting up or recognising a system of tradability of SAF – a 'book and claim' mechanism for aircraft operators or fuel suppliers, or for both.

should be done under committee purview.[6] This Article explores the practicality of B&C systems as a compliance pathway for the IMO's Global Fuel Intensity (GFI) Standard. In particular, how a set of robust regulatory enabled administrative tools can overcome some of the prevailing legal risks associated with B&C systems in voluntary carbon markets. It is posited that B&C systems can continue to supplement prevailing regulatory regimes for ZNZs as enablers of voluntary carbon product offerings, and/or they can be integrated into the regulatory regime as a workable compliance pathway. The latter option has the advantage of being able to 'fill in the gaps' identified by a legal analysis of voluntary B&C systems and would be preferable to an unregulated supplementary regime that is rife with legal challenges.

2. Voluntary Book & Claim (B&C) Systems

B&C, also known as 'insetting', is generally considered a creation of the voluntary carbon markets as it enables the trading of 'environmental attributes' of fuels. The Smart Freight Centre defines B&C as a chain of custody system whereby, 'materials, products, and their attributes are transferred, monitored, and controlled as they move through a supply chain', which can 'track the environmental attributes of low emission transport solutions separately from the physical delivery, allowing ambitious buyers to, for example, purchase the greenhouse gas emissions reductions from clean fuels even if a plane, ship, or truck they use may not receive the physical fuel itself'.[7] In practice, a fuel producer or ship operator supplies a verified amount of sustainable or low-carbon fuel into the maritime fuel system (the "book") and issues certificates that represent the associated emissions reductions. Shippers or cargo owners can then buy these certificates (the "claim") to account for lower emissions in their own supply chains, even if the ships transporting their goods use conventional fuel. B&C offers an opportunity to access ZNZs without a physical supply therefore offering greater flexibility in realising compliance pathways, while also accelerating technology pathways as the demand for ZNZs grows. The underpinning logic for adopting B&C systems is that ZNZs are not currently available at the scale needed to meet decarbonisation targets. Similar realities apply to SAFs, whereby the call for the integration of B&Cs within the ReFuelEU Regulation is garnering increasing support to overcome geographical barriers and technical limitations while also supporting SAF uptake and stimulating SAF development.[8] Decoupling the environmental attributes of marine fuels is also purported to democratise access to these attributes and upscale production for a market that is much larger than those who can directly access ZNZs only.[9] Advocates of B&C propose that the decoupling and exchanging of emissions can bring many of these sorts of benefits for stakeholders across the maritime value chain.[10] This is because B&C allows carriers and their customers to employ

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[6] Brazil, Japan, Singapore, ICS, IPIECA, RINA, IBIA , WSC, SGMF and MI, *Proposal for an IMO sustainable fuels certification framework in the context of the IMO LCA Guidelines and the IMO net-zero framework* ISWG-GHG 18/2/17 (3 January 2025).

[7] Smart Freight Centre,Voluntary Market Based Measures Framework for Logistics Emissions Accounting and Reporting (2003) available for download at https://smartfreightcentre.org/en/about-sfc/news/new-accounting-framework-to-address-barriers-to-transport-decarbonization/ accessed 28 November 2025.

[8] Future Clean Architects, *Book and Claim – A system for Sustainable Aviation Fuels (SAFs) - Recommendations by Future Cleantech Architects* (June 2024) https://fcarchitects.org/wp-content/uploads/2024/06/Aviation-Report-Book-and-Claim.pdf accessed 20 May 2025. See also Christine Kranich and Sarah Joanna Haas, Book and Claim System for Sustainable Aviation Fuels (2024) 1(89) *Journal of Air Law and Commerce*.

[9] World Energy, 'Book the Fuel, Claim the Benefits' (2024) https://worldenergy.net/our-approach/book-claim/ accessed 28 May 2025.

[10] MMMCZCS and RMI, *Maritime Book & Claim - System overview* (April 2023) at 3 https://www.zerocarbonshipping.com/publications/maritime-book-claim/ accessed 24 April 2025.

alternative fuels even where they encounter logistical constraints regarding direct bunkering. Critics of current B&C models state that the practical benefits of B&C for lowering overall CO_2 emissions need to be studied further considering, 'the bunker supplier's objective of maximizing profit and the varying price sensitivities of different shippers towards clean fuels'.[11] Presently, B&C systems in maritime transport remain voluntary initiatives and purport to sell decarbonised transport services to customers (i.e. shippers). Notable examples include DHL Global Forwarding[12], Maersk ECO Delivery[13], Hapag-Lloyd Ship Green[14], and Stena Line's Direct and Indirect Solutions[15]

2.1 Environmental Attributes

In order to understand how B&C systems work, it is important to consider the concept of "environmental attributes" (EAs). B&C systems essentially trade the EAs of a fuel,treating the emissions reductions or sustainability benefits associated with producing and using that fuel as a separate, tradable commodity that can be purchased and claimed independently of the fuel's physical consumption. There is no uniform definition of an EA and the term is broad enough to cover various types of environmental benefits accruing to a fuel 'intervention'. An 'intervention' is a term which is used to describe the replacement or removal of a fossil fuel with a more environmentally sustainable or lower GHG emission fuel option.[16] In relation to CO_2 emissions, the benefit is a reduction in CO_2 compared to a fossil fuel baseline.[17] EAs can also be derived from operational energy efficiency interventions with the net result of emission savings compared to business-as-usual operational practices. In the realm of GHG emissions, EAs enjoy several labels depending on the benefit traded: from 'carbon reduction credits', 'scope 3 energy savings', 'GHG emission profiles', to 'avoided emissions'. Legally, there is no standardised nor universally accepted definition. In a supply chain context, transport (whether road, rail, air or sea) contributes to every commercial organisation's indirect emissions. EAs sold within the shipping sector therefore focus on scope 3 emission reductions to offer benefits to cargo interests and/or shippers (i.e. those contracting for the carriage of goods by sea).

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[11] Shuaian Wang, Yuan Liu, Haoqing Wang, and Yuquan Du, 'Emission Reduction in Maritime Operations Management: Mathematical Models and Numerical Experiments', 11(2) *Mathematics* 4410 https://doi.org/10.3390/math11214410.

[12] DHL Global Forwarding, *Insetting Solutions: Switching to Sustainable Fuels to Reduce CO_2 Emissions* https://www.dhl.com/us-en/home/global-forwarding/freight-forwarding-education-center/focus-on-sustainability-glossary/switching-to-sustainable-fuels.html accessed 24 April 2025.

[13] Maersk, *ECO Delivery Services* https://www.maersk.com/transportation-services/eco-delivery accessed 24 April 2024.

[14] Hapag-Lloyd Ship Green, *Emission-Reduced Container Shipping That Takes No Effort* (Online Business Suite) https://www.hapag-lloyd.com/en/online-business/book/ship-green.html accessed 24 April 2025.

[15] Stena Line Freight, *Insetting for Decarbonising Transports* (2024) https://stenalinefreight.com/insetting/ accessed 24 April 2025.

[16] Brian C. Prest, Harrison Fell, Deborah Gordon, and TJ Conway, 'Estimating the Emissions Reductions from Supply-side Fossil Fuel Interventions', 136 *Energy Economics* 107720 (2024).

[17] Julio Friedmann and M atthew D. Potts, *Carbon removal, reduction, and avoidance credits explained* (Carbon Direct, 2023 and revised 31 Jan 2025) https://www.carbon-direct.com/insights/how-do-carbon-credits-actually-work-removal-reduction-and-avoidance-credits-explained accessed 25 April 2025.

'Scope 3 emissions' is a term categorised by the GHG Protocol Corporate Accounting Standard, which has become a quasi-regulatory tool due to its widespread acceptance.[18] The GHG Protocol sets out three scopes for GHG emission inventories:[19]

- Scope 1: Direct emissions (from assets owned or controlled by reporting company);
- Scope 2: Indirect emissions (from the production of electricity, heat, and steam purchased by the reporting company); and
- Scope 3: Indirect emissions from the reporting company's supply chain, also covering production and distribution of fuels burned in scope 1.

From a shipping customer's perspective all emissions arising from the 'transportation and distribution of products' purchased between a, 'company's tier 1 suppliers and its own operations in vehicles not owned or operated by the reporting company' are included in Scope 3, category 4 (Upstream transportation and distribution).[20] Third-party transportation services and distribution services purchased by the reporting company are also included in this category.[21] If a carrier reduces its scope 1 emissions through a fuel intervention (e.g. replacing fossil fuel bunkers with ZNZs), this will lower the scope 3 emissions of its customers.

While EAs correlate to a particular benefit, namely a quantifiable amount of reduced CO_2 emissions, the concept on an EA is difficult to define from a legal perspective. It is unclear whether EAs are intangible property, financial assets, or an actionable right. In English law, Emission Allowances under the EU's Emission Trading System have been held to constitute 'other intangible property', yet a key requirement applied by the court was that there is a statutory definition in place and a regulatory framework that confers entitlement.[22] In the absence of a regulatory framework, EAs are facilitated by commercial arrangements and their legal effects are determined by contracts. Haris and Bryant have identified some commonly accepted features of EAs as creatures of the voluntary carbon markets:[23]

(i) characteristics of the fuel that comprise benefits from the use of that fuel; that are
(ii) separated from the physical use of the fuel (i.e. segregated from the physical combustion); and are
(iii) capable of being measured/calculated and verified; and
(iv) give rise to reporting rights (i.e. may be claimed) under GHG reporting schemes.[24]

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[18] World, Resources Institute, GHG Protocol Corporate Standard (2004, revised) https://ghgprotocol.org/corporate-standard accessed 27 April 2025.
[19] GHG Protocol: Technical Guidance for Calculating Scope 3 emissions https://ghgprotocol.org/sites/default/files/2022-12/Chapter4.pdf accessed 27 April 2025.
[20] Ibid.
[21] Ibid.
[22] *Armstrong DLW GmbH v. Winnington Networks Ltd.* [2012] EWHC 10 see paras [50] – [58].
[23] Haris Zografakis and Ben Bryant, 'Contractual considerations relating to marine green fuels (Part I)', *Lloyd's Shipping & Trade Law* (June 2023).
[24] Requirement (i) refers to the characteristics of the environmental attributes, while (iv) is about their reporting and compliance value.

Various methodologies allow for the calculation of emission reductions that equate to tradable EAs.. These include the International Standard Organization ISO14083 standard[25] on the quantification and reporting of greenhouse gas emissions arising from operations of transport chains, and the Global Logistics Emissions Council (GLEC v 3.1) Framework[26] developed by the Smart Freight Centre. GLEC v3.1 is aligned with the GHG Protocol and has earned the "Built on GHG Protocol" mark. [27] If supplying fuel to an EU market, a methodology is provided by the EU's Renewable Energy Directive (RED) in conjunction with the FuelEU Maritime Regulation.[28]

Once the nature of an EA has been identified and it has been calculated and verified using a robust methodology such as GLEC v3.1 and ISO14083, it then needs to separated from the physical fuel and "booked" on a B&C platform, following which it is "claimed" by the customer who then obtains the rights to report the EA. Further details on B&C systems are set out below, but it should be stated that B&C systems are presently incompatible with existing GHG reporting standards (e.g. GHG Protocol and GLEC v3.1). Although these accounting models may eventually evolve to account for voluntary EA trading, they only allow for actual emissions within each scope to be reported at present. Hence, the purchase of EAs cannot result in deductions or manipulations of existing scope inventories. The GHG Protocol refers to benefits obtained from 'climate positive' or 'net positive' accounting methodologies as 'avoided emissions'. The term "scope 4" is often employed to describe avoided emissions to indicate that these are separate from existing scope inventories.[29] GLEC v3.1 reiterates this in stating, 'the outcomes of any form of carbon offsetting actions or GHG emissions trading are excluded' from calculations.[30]

2.2 Existing Chain of Custody Models & Methodologies

Chain of custody models are fundamentally tracking systems for environmental attributes. The first thing a chain of custody model seeks to overcome the fact that ZNZs are rarely 'pure' and are often added as 'drop in' fuels or are mixed in pipeline transport with fuel of the same kind which may not necessarily meet the requisite sustainability criteria for certification under a regulatory or voluntary scheme. E.g. biofuel meeting the RED's sustainability criteria in terms of land use change risk is transported in the same pipeline as biofuel that did not meet these criteria. To overcome this practical hurdle, mass balance systems are widely employed as a chain of custody model. Mass balance relies on a closed-loop infrastructure system where certified fuels are mixed with non-certified fuels. While the fuel's physical features are mixed and cannot be distinguished within the mix anymore, their sustainability and GHG emission data remain

[25] ISO 14083:2023 Greenhouse gases — Quantification and reporting of greenhouse gas emissions arising from transport chain operations (Edition 1, 2023) https://www.iso.org/standard/78864.html accessed 28 March 2025.
[26] GLEC Framework (v 3.1, 2024) https://www.smartfreightcentre.org/en/our-programs/emissions-accounting/global-logistics-emissions-council/calculate-report-glec-framework/
[27] For more on the GHG Protocol, see https://ghgprotocol.org/ accessed 28 March 2025.
[28] Directive (EU) 2018/2001 OJ L 328/82 (RED II) as amended by Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652 [2023] PE/36/2023/REV/2 (RED III). Regulation (EU) 2023/1805 of the European Parliament and of the Council of 13 September 2023 on the use of renewable and low-carbon fuels in maritime transport, and amending Directive 2009/16/EC (FuelEU).
[29] The GHG Protocol
[30] GLEC Framework v 3.1 page 19.

assigned to the batches of fuel in the bookkeeping.[31] The EU's RED endorses mass balance and provides rules for the certification of fuels under such a chain of custody model.[32] It is certain that the IMO's Net-Zero framework will make use of mass balance systems for certification of ZNZs as all major fuel certification schemes employ mass balance to overcome the practical realities of fuel supply chains.

B&C systems are based on mass balance but are not confined to closed loop supply infrastructure. Once a batch of fuel is certified (using a mass balance system), B&C allows for the EAs (evidenced by way of the certificate) to be decoupled from the fuel itself and sold separately. In the contexts of SAFs, it has been proposed that the certificate itself is what is tradeable.[33] Whoever owns the certificate can retire (i.e. submit it to a central registry) that certificate to claim the EA's of the fuel. Practically, any carrier or fuel supplier can create a B&C product for its customers and product offerings may differ in both substance and terminology. The Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping (MMMCZCS) and RMI have provided guidance on how shipowners and charterers can design a maritime B&C system enabling customers to reduce their scope 3 emissions.[34] Scope 3 reduction products involve the trading of EAs where the EA represents energy savings or reduced emissions, usually evidenced by way of certificate. MMMCZCS has tokenised these scope 3 emissions which directly correlate to the scope 1 emissions of the carrier. These sorts of B&C products are drawing increasing interest by shipowners to access a new market of cargo owners who are willing to invest in eco-friendly transport services.[35]

To address growing demand, the SFC and World Economic Forum have headed the development of the Voluntary Market Based Measures Framework for Logistics Emissions Accounting and Reporting (MBM Framework).[36] This MBM Framework supplements the GLEC Framework, by allowing for the emissions calculated under GLEC v3.1 to be physically segregated from the underlying fuel and to be passed through the supply chain. The MBM Framework tracks fuel characteristics through a chain of custody system, these characteristics include energy content, mass, or volume of the fuel; life cycle GHG emission factor of the fuel; feedstocks (including the percentage of biogenic material in the feedstock, where applicable) and production processes

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[31] ISCC EU Mass Balance Guidance Document (Version 1.0, 2 April 2025) https://www.iscc-system.org/wp-content/uploads/2025/04/ISCC-EU-Mass-Balance-Guidance-Document_Version-1.0.pdf accessed 25 April 2025.

[32] RED III (supra n 32), Art 30, read with Art 15 (auditing) and Art 19 (implementation) of the Commission Implementing Regulation (EU) 2022/996 of 14 June 2022 on rules to verify sustainability and greenhouse gas emissions saving criteria and low indirect land-use change-risk criteria OJ L 168, 27.6.2022, p. 1–62.

[33] Science Based Targets Initiative, Book-and-Claim for Sustainable Aviation Fuel (November 2023) https://sciencebasedtargets.org/resources/files/Call-for-Evidence/251_Lufthansa-Group_2023_Book-and-Claim-for-Sustainable-Aviation-Fuel.pdf accessed 25 April 2025.

[34] MMMCZCS, Maritime Book & Claim: Design decisions and justifications (April 2023) https://cms.zerocarbonshipping.com/media/uploads/documents/Book-Claim-Design-decisions-and-justifications.pdf accessed 20 May 2025.

[35] Shuaian Wang, Yuan Liu, Haoqing Wang, and Yuquan Du, 'Emission Reduction in Maritime Operations Management: Mathematical Models and Numerical Experiments', 11(2) *Mathematics* 4410 https://doi.org/10.3390/math11214410.

[36] Smart Freight Centre, Voluntary Market Based Measures Framework for Logistics Emissions Accounting and Reporting (2023) available for download at https://smartfreightcentre.org/en/about-sfc/news/new-accounting-framework-to-address-barriers-to-transport-decarbonization/ (MBM Framework); supplemented by Smart Freight Centre, SFC-SPEC-001 v01: MBM SPECIFICATION (2004) https://smart-freight-centre-media.s3.amazonaws.com/documents/SFC-SPEC-001_v01_MBM_Specification.pdf (MBM Specs) accessed 28 April 2025.

for the fuels.[37] The MBM Framework describes how shippers can purchase the GHG emission profile and for what purpose:

(i) A shipper wants to apply the GHG emission profile of a low emission marine fuel towards its organisation's ocean freight transportation footprint (e.g. its scope 3 category for transport and distribution).
(ii) The shipper calculates how much low emission fuel is needed to correlate to its use of fossil-based marine gas oil (MGO) fuel in the shipper's ocean freight emission reporting for the reporting period.
(iii) A 'solution provider' (a fuel supplier or carrier) offers to sell the shipper the emission profile of a low emission marine fuel for the requisite amount of fuel. The shipper can then calculate its GHG emissions based the emission factor provided for low emission fuel to have overall lower emissions, even though in reality, its cargo was transported using MGO.

Scope 3 GHG reduction products can add an additional step by calculating emissions either by using the above methodology or a similar one, but then also calculating how much GHG was reduced through the adoption of the fuel intervention. E.g. by purchasing and applying the emission profile of a fuel, one has reduced their scope 3 emissions by [X] metric tonnes of CO_2. MMMCZCS uses 'tokens' as the basis of its B&C system where tokens representing emissions are the EAs traded. Tokens represent the emissions from one mega joule (MJ) of either ordinary very-low sulphur fuel (VLSFO) or one MJ of biomethanol. Consuming 10 MJ of VLSFO creates 10 tokens, representing 920 gCO2eq of emissions. Consuming 10 MJ of biomethanol creates 10 tokens, representing 130 gCO2eq. Swapping 10 VLSFO tokens with 10 biomethanol tokens reduces emissions by 790 gCO2eq.

The diversity of options for selling EAs, which are essentially GHG fuel profiles and emission reductions in this context, can present several legal risks. As an initial enquiry, it is not entirely clear how users can make use of these purchased GHG reduction products as standard accounting practices would not allow these to be offset against actual scope 3 emission inventories. Purchasing a low-carbon GHG emission profile of a fuel should, in theory, allow one to report lower emissions within their scope 3 inventory. However, existing reporting standards are still premised on a physical connection to certain practices and fuel consumption. The Smart Freight Centre recognises that, 'today's standards and frameworks are largely bound to physical inventory accounting and are only now opening up to market-based inventory accounting'.[38] Hence, B&C methodologies are necessary to reflect commercial realities.

2.3 Legal Issues with B&C in maritime transport chains

The first major problem with B&C systems relates to the diversification of EA products, inconsistent definitions and a lack of clarity on how claiming EAs correlate to standard carbon accounting practices (already addressed in Subsection 1.1). In addition to this major conceptual hurdle, the MBM Framework has identified 3 key constraints regarding B&C systems: 1) the additionality constraint; 2) the modal constraint; 3) the risk of double counting.

2.3.1 Additionality

[37] MBM Framework (supra n 40) p18.
[38] MBM Specs (supra n 40) p 4.

'Additionality' will not pose major problems for the application of a B&C compliance pathway within the IMO Net-Zero Framework as the concept is entirely irrelevant to the application of regulatory frameworks. Additionality in the context of voluntary MBMs refers to voluntary actions that are 'additional' to actions take for regulatory compliance.[39] The possible rationale underpinning additionality is that you cannot profit from what you are already mandated to do by law. This is similar to one of the features of the contract law doctrine of consideration, i.e. consideration (the exchange of promises) can never constitute the performance of a pre-existing legal duty.[40] If one attempts to exchange the performance of a pre-existing legal duty, the contract is void for a lack of sufficient consideration. In the context of the EU, market-based mechanisms already exist under 2 regulatory frameworks: the EU ETS[41] and the FuelEU Maritime Regulation[42]. For this reason alone, additional and voluntary MBMs can prove complicated or may become obsolete if the regulated MBMs achieve sufficient incentives to decarbonise the sector -e.g. trading of compliance surplus. The Global Maritime Forum (GMF) and the MMMCZCS notes that the concept of 'additionality' for voluntary B&C products is simpler to conceive with respect to the EU ETS.[43] As the EU ETS does not require low-emission fuels, the use of low-emission fuel by a carrier on voyage subject to EU ETS is considered additional. Here, the carrier is selling "avoided" EU allowances (EUAs) – 'how many EUAs would have been purchased if conventional fuel had been used instead of a low-emission alternative.'[44]

On the other hand, the FuelEU Maritime Regulation has shifting annual benchmarks for emission reductions. Its MBM is created through the flexibility mechanisms allowed for compliance – i.e. banking, borrowing, and pooling. If there is compliance 'surplus', then the compliance entity will need to decide whether to bank that surplus for future compliance or sell it in a pooling arrangement. If that compliance surplus is not used towards either of these regulatory arrangements, the compliance surplus could be sold on the voluntary markets. Similarly, in the context of the IMO's Net-Zero Framework, ships with an attained GFI below the Direct Compliance Target can also earn 'surplus units' which can be traded to other vessels that need them to balance a deficit, or 'banked' for future use. Where a robust regulatory framework is in place for MBMs, it remains unclear whether voluntary MBMs maintain their usefulness. The trading of compliance surplus and regulatory 'banking' option for future compliance could very likely see shipowners opt for these incentives instead and abandon the development of voluntary models. This Article has therefore posited that B&C accounting models are more likely to survive if recognised as a regulatory compliance pathway as the principle of "additionality" is becoming increasingly complex due to regulatory developments. On the other hand, B&C systems may very well maintain their relevance for voluntary reporting if standard accounting practices (such as

[39] Not to be confused with the RED III delegated act on the 'additionality' principle for electricity sourcing requirements, as per Commission Delegated Regulation (EU) 2023/1184 of 10 February 2023.
[40] *Glasbrook Bros v Glamorgan County Council* [1925] AC 270.
[41] Directive (EU) 2023/959 of the European Parliament and of the Council of 10 May 2023 amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union and Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading system [2023] OJ L130/134 (EU ETS Directive).
[42] Regulation (EU) 2023/1805 of the European Parliament and of the Council of 13 September 2023 on the use of renewable and low-carbon fuels in maritime transport, and amending Directive 2009/16/EC [2023] OJ L 234/48 (FeulEU Maritime Regulation).
[43] GMF, 'Defining additionality in the voluntary book and claim market in deep-sea shipping' (November 2024) https://globalmaritimeforum.org/report/defining-additionality-in-the-voluntary-book-and-claim-market-in-deep-sea/ accessed 29 March 2025.
[44] Ibid 6.

the GHG Protocol) evolve to recognise such products within GHG inventory reporting. These predictions, however, are a matter of speculation and how the markets react to recent and extensive regulatory developments remains to be seen.

2.3.2 Modal constraint

The modal constraint posits that the low emission solution is constrained by transport mode.[45] Hence, one cannot apply a purchased emission factor of a quantity of marine fuel to other forms of transport. This is because maritime transport adheres to particular calculation methodologies that would not be appropriate for other modes of transport. It is also worth noting that there is a 'vintage requirement' noted by the Voluntary MBM Framework which requires that LETS or solutions must be booked within 12 months of generation (for LETS) or production, and the emission profile of a LETS must be included in the emission inventory of the organization that claims the LETS within 24 months of the LETS being booked. This vintage requirement accounts for shifting benchmarks in successive compliance reporting periods. An EA that is claimed and used for reporting purposes, must have a strong temporal link to its reporting period.

2.3.3 Double counting

Double counting refers to a situation where two customers try to claim the positive impact or EA of a low carbon solution.[46] This sort of double claiming can occur when an EA is decoupled from the physical fuel and sold to a buyer who has no physical connection to the actual ZNZ used; however, shippers *with* a physical tie to the ZNZ also claim lower scope 3 emissions. The latter would be accurate in reality, as their transportation was physically tied to a ZNZ, however they have not paid for the EAs associated with the ZNZ. Commercially, the providers of low emission solutions who decouple the EAs from the solution itself, are completely reliant on contractual mechanisms to protect themselves from non-paying customers also claiming the reporting rights (or other associated rights) of EAs. For this reason, commercial entities designing their own B&Cs have developed registries or ledgers which sell tokens or certificates to customers to evidence their rights to reporting lower scope 3 emissions. Such registries also depend heavily on robust verification frameworks. MMMCZCS notes that governance of its proposed B&C system for maritime transport is based on three pillars: a set of underlying principles, an overarching governance structure, and a robust verification framework.[47] A centralised registry or database, along with a verification system that audits relevant data, can also avoid the double issuance of EAs – where EAs are issued based on the same voyage data.

There is also a major risk of multiple entities in the supply chain designing their own B&C products based on the same data. E.g. a bunker supplier decouples EAs from the fuel sold and sells the fuel to a carrier, who in turn, also decouples the EAs from the fuel used on board and sells them to shippers in its value chain. It is therefore extremely important that EAs are tracked and traced along the value chain, which is hard to achieve without a central and uniform platform for the sector. From a contractual perspective, purchasers of ZNZs should ensure that they are also purchasing any EAs decoupled from that fuel, particularly in relation to scope 3 rights that they may want to pass on to their own customers.

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[45] MBM Framework (supra n 40) p 35.
[46] MBM Framework (supra n 40), Section 11 p 49.
[47] MMMCZCS, Maritime Book & Claim: Design decisions and justifications (supra n 38) 42.

The possibility of overlapping B&C products presents numerous greenwashing risks for users who do indeed report lower scope 3 emissions and advertise accordingly. Multiple end users of B&C systems (i.e. those claiming EAs) could be reporting lower scope 3 emissions based on the data of the same voyages to which none of them have physical tie. Under most legal systems, this would constitute a misrepresentation and would likely breach advertising standards. Voluntary B&C systems struggle to overcome this issue of double use because of existing accounting standards (e.g. the lack of recognition of voluntary credits), the absence of a central registry, inconsistent methodologies, and insufficient contractual controls with customers in respect of who can claim the EAs of a fuel. If the IMO's Net-Zero Framework takes cognisance of these legal issues and above constraints in the voluntary markets, it is possible for B&C systems to be far more effective in a regulated market.

3 How a regulated B&C can overcome issues with existing voluntary B&C systems

This section evaluates how B&C models could be integrated as a compliance pathway into the IMO NZF, to overcome the limited availability and uneven geographic distribution of cleaner marine fuels, enabling demand and investment to grow while physical supply scales up over time.

If the IMO were to accept a B&C pathway for NZF compliance, many of the legal issues noted in Section 1.3 would be directly addressed. As a starting point, additionality would not feature as a constraint as the B&C will be used to track EAs within a regulated market for the sole purpose of compliance. Action therefore need not be 'in addition to regulatory compliance', but rather 'towards regulatory compliance'. The main question is therefore: *why would B&C be a useful compliance pathway?* Indeed, the NZF already allows for the trading of surplus or the purchase of compliance deficit which would essentially decouple the compliance balance from the actual ship voyages and the fuel used onboard. However, this embedded MBM within the NZF (based on a compliance balance) is entirely different from a chain of custody model that traces and allocates the emission profiles of fuels for evidencing performance in relation to the Base Target and the Direct Compliance Target. Essentially, a B&C system would form part of the methodology employed to calculate the GHG Fuel Intensity (GFI) – a step taken before the compliance entity can even calculate their compliance balance. Chain of custody models would therefore supplement, or find themselves embedded in, the IMO's 2024 Guidelines on Life Cycle GHG Intensity of Marine Fuels.[48] A B&C system could also be facilitated through: 1) the GFI Registry and third-party verification; 2) tradeable certificates; and 3) a robust methodology for B&C chain of custody.

3.1 The GFI Registry

Draft Regulation 38 of the NZF (via proposed amendments to MARPOL Annex VI) provides that the Secretary-General of the IMO will establish a GFI Registry wherein each ship account will record the ship's compliance balance, including credited surplus units, banked surplus units, transferred surplus units, the cancellation of surplus units and credited remedial units acquired

[48] MEPC.391(81) adopted on 22 March 2024.

by means of GHG emissions pricing contributions to the IMO Net-Zero Fund. Draf Reg 38.6 provides that:

> *The IMO GFI Registry shall record for each ship account for each reporting period the following information:*
>
> 1. *the ship account statement;*
> 2. *the verified attained annual GFI;*
> 3. *the total energy consumption;*
> 4. *the total energy consumption of each ZNZ;*
> 5. *the GHG emissions avoided by the uptake of ZNZs;*
> 6. *Statement of Compliance related to the annual GHG fuel intensity …*

All ships must register with the IMO GFI Registry by 1 October 2027 and submit verified GFI data annually. Verification will be carried out by authorized organizations, and the data will be used to track emissions, trading activity, and compliance status.[49] This framework is similar to the FuelEU Maritime Regulation which makes use of an analogous "FuelEU database" that registers the performance of each ship and ensures its compliance with the FuelEU Regulation.[50] The FuelEU Regulation also depends heavily on third-party verification to ensure the accuracy of the data submitted within that system. Verifiers under the FuelEU Maritime will be accredited by national accreditation bodies or the Commission itself.[51] These verification schemes ensure that fuels meet the requirements of REDIII, which contains the lifecycle methodology for fuels that can contribute towards FuelEU targets and compliance – much like the NZF has the accompanying LCA Guidelines for calculating the GHG intensity of marine fuels. There is definitely an alignment here of the approach taken by the IMO with the EU's framework for fuel certification. This noteworthy similarity between the two regimes is no coincidence. In 2022, the EU Commission submitted a Working document to the IMO's 11th session of the ISWG-GHG on Updated Draft Lifecycle GHG and Carbon Intensity Guidelines for marine fuels.[52] It appears that these recommendations made their way, in the most part, into the IMO's 2024 LCA Guidelines.

A B&C chain of custody model would be relevant to calculating points 2 and 5 of Draf Reg 38.6 above for entry into the GFI Registry. B&C models would provide a tracking system for the EAs (i.e. GHG profiles) of the ZNZs used to calculate the attained annual GFI. This, in turn, would also inform the calculation of emissions avoided (point 5). B&C models require a platform where the EAs of a fuel can be 'booked' so that other users may 'claim' those EAs towards their own GFI calculations. The result of this claiming should be reflected in the compliance entity's reporting. A centralised system avoids issues of double counting which emerge from both double issuance and double usage of the same EA. Claiming and reporting the EA to the GFI registry should have

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[49] Draft Reg 37.3. Also see Code for Recognized Organizations (RO Code) (resolutions MSC.349(92) and MEPC.237(65)).

[50] Fuel EU (supra n 46), Recital 55.

[51] This is done in accordance with Commission Delegated Regulation (EU) 2025/192 of 9 September 2024 on procedures for the accreditation of verifiers pursuant to Regulation (EU) 2023/1805 of the European Parliament and of the Council on the use of renewable and low-carbon fuels in maritime transport, and amending Directive 2009/16/EC of the European Parliament and of the Council.

[52] Union submission to the International Maritime Organization's 11th Intersessional Working Group on Reduction of GHG Emissions from Ships on Updated Draft Lifecycle GHG and Carbon Intensity Guidelines for marine fuels, Brussels, 11.1.2022 SWD(2022) 5 final.

the effect of "retiring" it for compliance purposes. A time limit should be placed on how long users have between claiming and reporting an EA – e.g. an EA claimed needs to be reported in the same verification and reporting period in which it was issued. This is aligned with the 'vintage requirement' or constraint applicable to voluntary frameworks discussed in section 1.3.2 above.

The GFI Registry could provide such a platform so that each EA (i.e. the emission profile of a ZNZ) is booked into the system with verified documentation of the fuel batch it was segregated from along with documentary evidence that the ZNZ met all requirements and was calculated in accordance with the LCA methodology. Much of this data would need to be inserted into the GFI registry in any event. If the added traceability system for decoupled EAs is too complex, the GFI could outsource this function and the enabling IT infrastructure to approved verifiers that must share a common B&C registry for the booking and claiming of EAs which are then reported by compliance entities in the GFI registry. Essentially, the GFI registry could be blind as to whether EAs are decoupled or not. However, given that the GFI Registry is already tasked with tracking the trading activity from surplus and remedial units, tracking EA trading activity (i.e. the booking and claiming) might not be an overstretch of its capacity.

3.2 Tradeable Certificates

A B&C system is modelled on energy/environmental attribute certificates, which serve to evidence who has the rights to an EA. In the voluntary markets, EAs have manifested as tokens, credits, fuel/energy certificates or other variations of a decoupled sustainability benefit. In the absence of a central registry, any reporting rights related to these EAs are only evidenced through commercial contracts. However, regulatory regimes have shown capacity for centralised systems that issue certificates for the EAs of an energy source and track their trading between user accounts. For example, the EU has already created a MBM tool for renewable electricity known as "guarantees of origin" (GOs) which have helped the energy sector to accelerate demand for renewable energy. According to RED III, '[g]uarantees of origin issued for the purposes of this Directive have the sole function of showing to a final customer that a given share or quantity of energy was produced from renewable sources'.[53] GOs are traded independently from the energy source, and when an end-user buys a GO for electricity consumption from the grid, it is cancelled at the issuing body's registry in the country of consumption. Energy from the GO that has been decoupled and sold separately, should not be sold to the final customer as energy from renewable sources. In the case of GOs, EU member states are members of the Association of Issuing Bodies (AIB),[54] where they have jointly agreed upon the EECS (European Energy Certificate System) rules to make sure GOs are issued and traded in the same way.

EAs for the GHG profiles of fuels will need to be evidenced in this way and issued from a central source. As noted in 3.1, the GFI Registry could issue such certificates, or an alternative centralised system could be agreed between ratifying states and approved certification schemes. Certificates issued and decoupled from the ZNZ would evidence that the certificate holder has

[53] RED III (supra n 32) Preamble 55.
[54] AIB, EECS https://www.aib-net.org/eecs#:~:text=The%20European%20Energy%20Certificate%20System%20(EECS%C2%AE)%20operated%20by%20AIB,based%20on%20the%20EECS%20Rules accessed 28 May 2025.

the rights of using the GHG emission profile of a ZNZ for calculating its attained GFI as part of the documentary package verified and submitted to the GFI Registry.

3.3 Robust Methodology

A regulated centralised system such as the GFI Registry or an approved supplementary system would overcome a diversification of methodologies for the generation of EAs. It would ensure the integrity of the product as one specific to the maritime sector (i.e. the modal constraint) for a particular regulatory regime where all baseline comparators, WTW emission factors and low calorific values are consistent. The 2024 LCA Guidelines would require build on provisions to allow for a B&C chain of custody model as a compliance pathway. Much in the same way that the Smart Freight Centre's Voluntary MBM Framework (2023) allows for the decoupling of GHG emission profiles of a fuel that are determined by the underpinning GLEC v3.1 Framework, the 2024 LCA Guidelines would need to be supplemented for this additional compliance step. A regulated methodology removes the risks associated with inconsistent calculations and approved schemes would be able to verify that such calculations are undertaken in a manner that is accurate and certified. This would include proof of sustainability, which is evidenced by a Proof of Sustainability certificate under the analogous EU RED III and FuelEU Marime regime, while the IMO envisions a 'Fuel Lifecycle Label' (FLL).[55] The FLL serves to indicate compliance with the regulatory regime and may accompany a bunker delivery note.[56] Whether this results in the FLL itself representing the sort of tradeable certificate envisioned in section 3.2 above, is for the IMO to consider.

4 Conclusion

Whether the IMO will consider a B&C system for compliance with the Net Zero Framework remains to be seen. In an EU context, there are strong proponents for B&C in the context of SAFs for the ReFuel Aviation regime,[57] yet B&C has not received much attention from a FuelEU Maritime perspective. It may well be that the FuelEU Maritime regime requires more time to overcome initial implementation concerns before additional compliance pathways are considered by the EU Commission. The IMO has a wider range of member state interests to balance and B&C systems could contribute to overcoming the equity issues related to accessing ZNZs. B&C models can also address the reality that immediate investment is needed upscale the production of ZNZs to meet IMO GHG reduction targets. B&C would enable a wider global market for ZNZs where supply and demand can be matched more easily. B&Cs can reduce logistical complexity and increase flexibility for users who can purchase EAs from any producer regardless of their location. Of course, the system is not without risk. However, these risks can be mitigated through a regulated framework that provides for centralised traceability and uniformity in methodology. This Article advocates for, at the very least, a thorough consideration of B&C as a compliance pathway under the IMO's NZF. The IMO's Working Group on Reduction of GHG Emissions from Ships should consider the benefits of B&C systems, building upon the lessons learned from voluntary B&C models. Nevertheless, this enquiry only matters if the IMO's Net Zero Framework

[55] Draft Regulation 34 of the Draft NZF (supra n 2).
[56] Draft Regulation 34.3.
[57] European Business Aviation Association, *Joint industry letter on sustainable aviation fuels and book and claim* (2025) https://www.ebaa.org/press/ebaa-and-industry-partners-call-on-the-european-commission-to-enable-saf-market-efficiency-with-book-and-claim/ accessed 29 May 2025.

actually sets sail in 2026. Until then, any meaningful exploration of B&C models remains confined to the voluntary markets.