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**FURTHER CONSIDERATION OF THE DEVELOPMENT OF CANDIDATE MID-TERM
MEASURES IN THE CONTEXT OF PHASE III OF THE WORK PLAN FOR THE
DEVELOPMENT OF MID AND LONG-TERM MEASURES**

Consideration of a ‘Green Balance Mechanism’

Submitted by the World Shipping Council

SUMMARY

Executive summary: This paper outlines how development of a ‘Green Balance Mechanism’ (GBM) can help deliver the environmental outcomes identified in IMO’s 2023 GHG Strategy while also providing a targeted economic and regulatory means to incentivise and enable the use of net-zero and near-zero fuels and technologies critical to the needed energy transition. The Green Balance Mechanism is designed to work as part of an integrated measure, a levy / GHG Fuel Intensity (GFI) approach, or as a hybrid measure to be considered in the development and discussion of mid-term measures.

Strategic direction, if applicable: 3

Output: 3.2

Action to be taken: Paragraph 40

Related documents: MEPC 81/7/2, ISWG-GHG 15/3, ISWG-GHG 15/3/2, ISWG-GHG 15/3/4, ISWG 15/3/7, ISWG-GHG 14/3/1, ISWG-GHG 13/4/6, MEPC 79 INF.29, MEPC 78/7, MEPC 78/7/5, Resolution MEPC.304(72), and Resolution MEPC.328(76)

Introduction

1. The 2023 IMO GHG Strategy adopted at MEPC 80 emphasizes the importance of a goal-based GHG fuel intensity standard and a maritime GHG emissions pricing mechanism.
2. One of the most important challenges before the Workgroup and Committee is how to structure an economic measure that provides a just transition and which is commercially viable

in light of the fact that ships powered by a wide spectrum of fuels and technologies, with a correspondingly wide range of operating costs, will be operating in the same trades. The fuel / technology spectrum will include conventional fossil-based fuels, bio-fuels, blends, and e-fuels that may be produced using a variety of energy sources which are 100% renewable, partially renewable, or fossil fuel based. Moreover, it will also include a number of technologies including wind assisted propulsion, direct electrification, fuel cells, etc. The operational costs of these different fuels and technologies will vary significantly as will the Well-to-Wake (WtW) GHG reductions achieved.

3. How IMO structures the economic and regulatory provisions in the forthcoming mid-term measure or measures will determine whether the regulations enable ships delivering deep GHG reductions to compete with ships operating in the same trades that are delivering lower reductions and sailing with much lower operating costs. Addressing this issue is one of the most important challenges in the ongoing discussion of mid-term issues. The environmental effectiveness and commercial viability of any agreement the Organization considers in the next two years will hinge on whether we successfully address this core issue.

4. This paper presents a Green Balance Mechanism that reconciles emissions reductions with economic realities by using a cost balancing approach. In this context, we outline how a Green Balance Mechanism would function and how it can be fully integrated with a GHG fuel-intensity / GFI standard. The Green Balance Mechanism (GBM) can be viewed as a variant of a feebate mechanism, a targeted GHG pricing mechanism, or possible addition to an integrated measure.

Background

5. The concept of a carbon price or GHG price has been a long-standing mechanism under consideration and debate in the climate policy arena. Most GHG pricing proposals apply a specific cost on each tonne of CO₂ equivalent (tCO₂e) emitted with the objective of discouraging GHG emissions and eliminating the cost differential with those fuels and technologies that result in net-zero, near-zero, or zero GHG emissions. This comes with at least three challenges:

- First, and depending on the model chosen, the magnitude of the GHG price can be very high if one truly closes the price gap between conventional fossil-based fuels and other fuels delivering net-zero, near-zero or what we might generally refer to as 'deep' GHG emission reductions.
- Secondly, the magnitude of the GHG price imposed can be expected to cause significant economic impacts in the global economy and even greater economic impacts in the many countries that are especially vulnerable to higher transport costs.
- Third, ships delivering very significant GHG reductions need to be able to operate in a commercially viable manner in light of the fact that the operating expenses of these ships are far higher than a ship using conventional fuel.

6. A conventional GHG price would need to be very significant to close the price gap between conventional fuels and net-zero or near-zero fuels and technologies. To demonstrate this point, we assume conventional bunker/VLSFO is 600 USD per tonne of fuel and more advanced net-zero and near-zero fuels are around 2,000 USD per tonne of fuel oil equivalent (tFOE). Using a conventional GHG price the GHG price to be applied to conventional bunker fuels for net-zero and near-zero fuels and technologies to be competitive would be 1,400 USD per tonne of fuel. That would represent a 233% increase in the effective price of conventional fuel, thereby

adding significant cost to international trade. When expressed as a GHG levy or price, the figure would be 368 USD per tonne CO₂-equivalent (tCO₂e), where the price difference is 1400 USD per tFOE. Each tonne of fossil fuel – VLSFO - emits approximately 3.8 tCO₂e (WtW), hence $\$1400/3.8 = 368$ USD tCO₂e.

7. The GBM is designed to create a focused economic measure that enables the introduction and commercial viability of net-zero and near-zero fuels and technologies that come with significantly higher operating costs. Instead of making fossil fuels as expensive as net-zero and near-zero fuels via a conventional GHG levy, a more targeted and financially efficient mechanism is applied that distributes the additional cost of net-zero and near-zero fuels and technologies across all the energy used in the sector such that the effective cost to all ships is roughly equal.

8. An effective regulatory regime and economic measure (integrated or separate, but complementary) is necessary for the energy transition to occur at a pace consistent with the objectives set forth in the IMO's revised GHG Strategy. WSC considers that both a levy/feebate mechanism combined with a low GHG fuel standard, or an integrated measure could be effective depending on the specific regulatory and economic provisions included within the respective proposals.

9. An integrated measure could also link payment, both into and out of a fund, to a reference line linked to the required reduction in GHG intensity. This would link the financial measure with the emissions reduction trajectory necessary to achieve IMO's revised GHG Strategy, so that both components would be fully integrated into a single legal instrument.

10. An additional alternative would be to develop a hybridised approach, which leverages the most positive aspects of each of the options already mentioned. Development of a low GHG Fuel Intensity (GFI) standard as a technical measure alongside a financial measure would provide a clear regulatory requirement for shipping to reduce GHG intensity along a clearly defined trajectory that is consistent with the objectives of the revised strategy, whilst also facilitating pooled (flexible) compliance to enable shipping companies to funnel investment into new and innovative fuels and technologies.

Proposed Outline for a 'Green Balance Mechanism'

11. To help readers better understand the proposed GBM, we first define those terms used in this paper as we outline how the GBM could work:

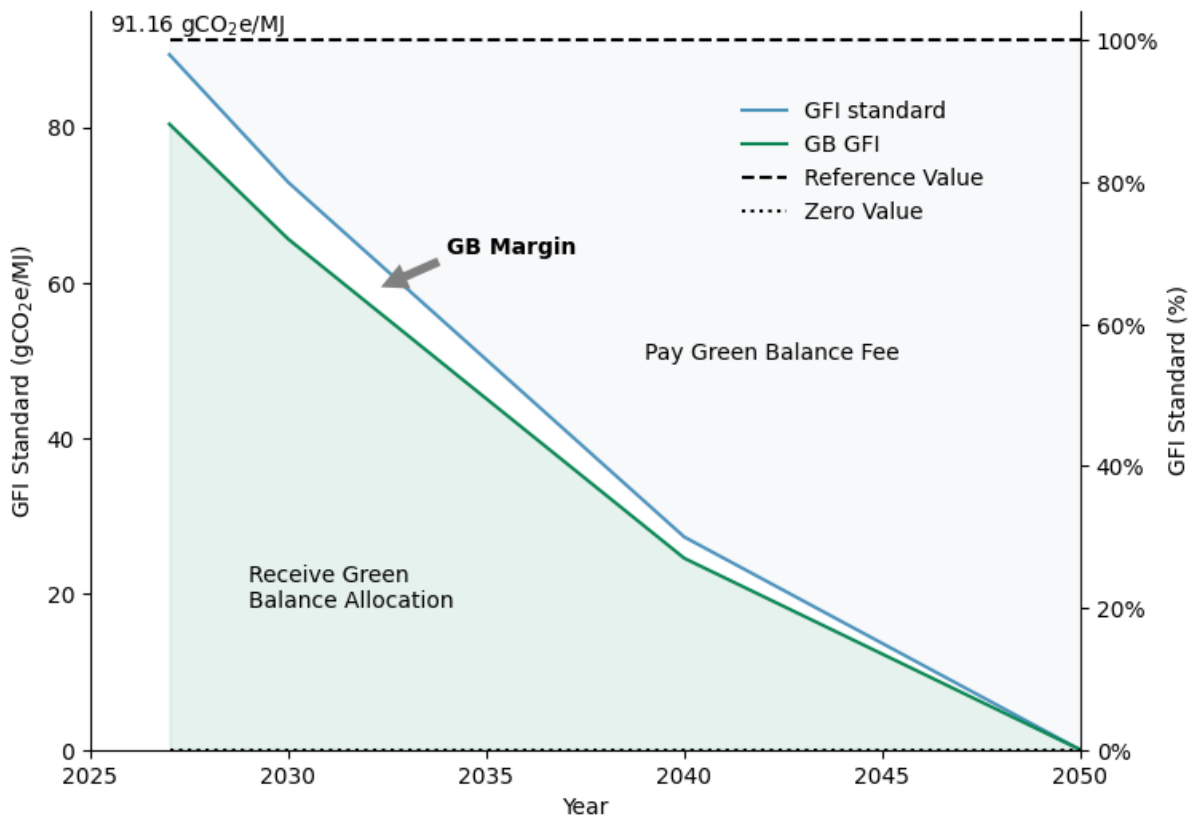
- a. GFI: The GHG Fuel Intensity standard applicable in a given year.¹
- b. Green Balance GFI: GHG Fuel Intensity threshold established at a defined margin (e.g., [10%] more stringent than the GFI). The Green Balance GFI serves to define a specific threshold for determining whether a given fuel or technology meets an Attained GFI that qualifies for an allocation of Green Balance funds.
- c. Green Balance Margin: The margin established between the GFI and GBM GFI. The margin may be defined as a percentage relative to the GFI.
- d. Attained GFI: The actual annual and independently verified WtW GFI value achieved by a given vessel, or group of vessels for a given year based on the fuels and other energy sources used.

¹ Note: the GBM proposal is constructed on the assumption that the Committee has adopted a complete series of GFI standards that increase in stringency from 2027 to 2050.

- e. Reference GFI represents the Attained GFI for the fossil-derived fuel(s) with no reduction in GHG-intensity on a WtW basis.² This can be considered the baseline for calculating the GBM Fees and Allocations.
- f. Green Balance Fee: A financial fee applied to all ships using fuels and technologies³ that have an attained WtW GHG intensity at, or inferior to the GFI value applicable in a given year.
- g. Green Balance Fund: The total monies collected from Green Balance Fees.
- h. Green Balance Allocation: The amount of GBM funds allocated (distributed) to a ship using fuels or technologies that meet or exceed the Green Balance GFI threshold.

12. A Green Balance Mechanism (GBM) would apply a Green Balance Fee to all ships using fuels and technologies that have an attained WtW GHG intensity at, or inferior to the GFI value applicable in a given year. The Green Balance Fee is set at a quantity to balance the Green Balance Allocation available for achieving performance equal to or superior to the GBM GFI (i.e., defined via the Green Balance (GB) Margin). Figure 1 illustrates the GBM conditions based on a GFI consistent with the 20% percent indicative checkpoint for 2030 and the 70% checkpoint for 2040 included in IMO's GHG Strategy.⁴

Figure 1. Illustration of the GBM concept relative to a GHG Fuel Intensity standard (GFI) with WtW GHG intensity on left axis and corresponding percent reduction on right axis.



² For this example, we employ 91.16 grams CO₂e per megajoule (gCO₂e/MJ) on a WtW basis. This value may be specified to match past IMO GHG Studies, or other value.

³ Please note that the terms 'technology' or 'technologies' as used in this paper is intended to include wind and other non-liquid or gaseous energy sources.

⁴ Note: The GBM represents a design for implementing fees and allocations that approximates a Marginal Abatement Cost (MAC) policy design. MAC policy designs have been shown to be more economically efficient than purely economic or purely command-and-control policy designs. MAC pathways have been presented in each of the previous IMO GHG Studies and in earlier submittals to the Committee.

13. Funds collected through the GBM would be allocated to all ships using fuels or technologies that deliver a WtW GHG intensity value that performs equal to or better than the established Green Balance GFI standard. Ships using fuels or technologies with an Attained GFI equal to or better than the Green Balance GFI would then qualify to receive a Green Balance Allocation proportionate to the WtW GHG reductions achieved as demonstrated through verified data on the amount of fuel consumed for the year as well as the consolidated GHG intensity of the respective fuels and technologies used.

14. The Green Balance Fees illustrated in this paper are calculated in light of the net-zero and near-zero fuels required to meet IMO's 2023 GHG Strategy objective that the "uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources to represent at least 5%, striving for 10%, of the energy used by international shipping by 2030" as well as the 20% reduction in absolute emissions identified as an indicative checkpoint for 2030 and the 70% reduction in 2040. The specific Green Balance Fee applicable for a given year will depend upon the availability and use of fuels that meet or perform better than the Green Balance GFI. The Green Balance Fee applicable in a given year would also be responsive to the price differentials between conventional fuel and those fuels meeting the GBM GFI. This calculation would be adjusted annually to reflect prevailing market conditions using market indexes for conventional, near-zero and net-zero fuels as well as market considerations for wind and other relevant technologies.

15. The quantum of the GBM payment allocated to a given ship or group of ships would be based on two factors:

- a) The Attained WtW GFI value of the fuels and or technologies used that meet or perform better than the defined threshold which we refer to as the '*Green Balance GFI value.*'
- b) The total GBM funds available for a given year.

16. Ships that meet or perform better than the prescribed *Green Balance GFI* threshold will qualify for Green Balance funds. Furthermore, Green Balance funds would be allocated based on energy consumed with a GHG-intensity value measured in grams CO₂e per megajoule (gCO₂e/MJ) that performs equal to or better than the *Green Balance GFI* threshold.⁵ Use of WtW GFI values ensures that the GBM allocation is proportionate to the WtW GHG emission reductions achieved.

17. The GBM will not necessarily accumulate excess funds⁶ from one year to the next because the Fund can be 'cleared' each year and readjusted for the next period in a manner consistent with the provisions identified in the preceding paragraphs 12 through 16.

18. Equally important, the GBM can work in either an integrated measure or in a GHG economic measure coupled with a GFI. The critical consideration is that the architecture chosen contains the provisions that enable the commercial investments and operations necessary to meet the objectives set forth in IMO's revised 2023 GHG Strategy.

Modelling the Green Balance Mechanism

19. To illustrate the proposal, we include two brief examples of how the GBM may work over time. Two examples are provided: The first example (see paragraph 20 and Figure 2) considers

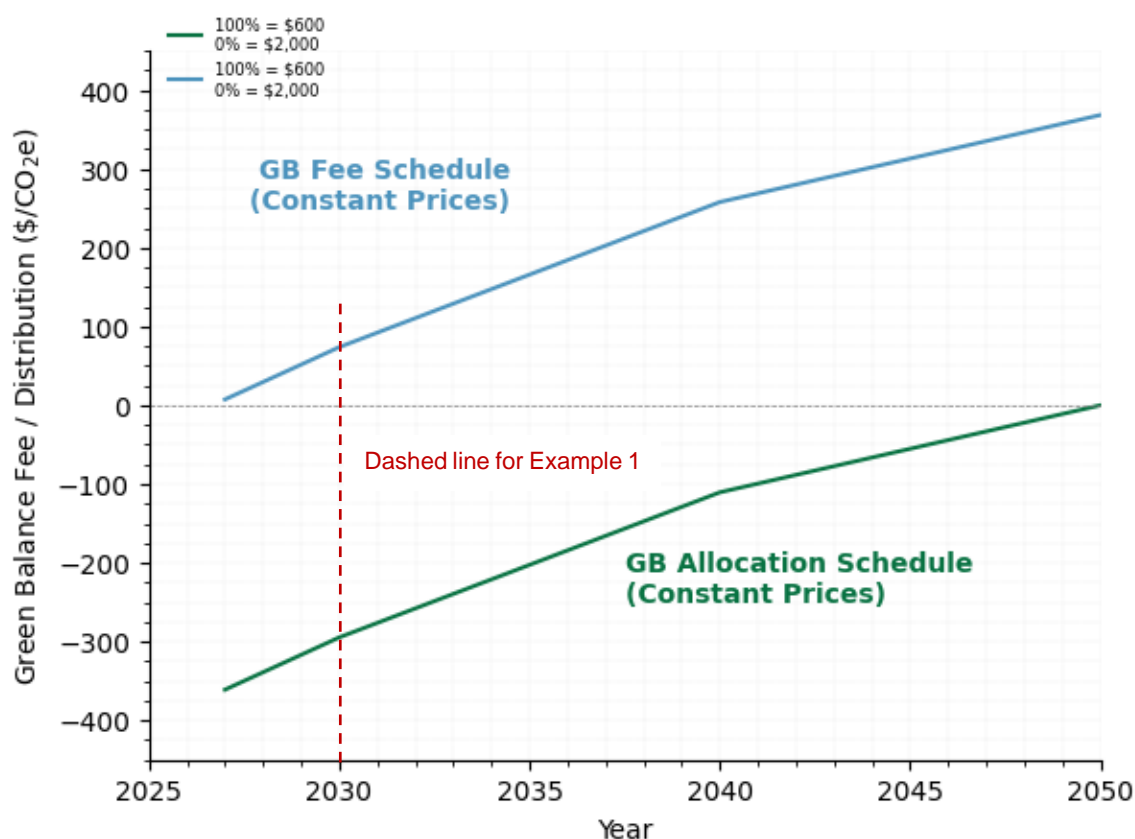
⁵ Consideration would need to be given to how to handle ships using wind energy, or other non-gaseous or liquid energy sources

⁶ Some limited GBM Funds could be retained for administrative and operational costs.

two fuels: a fuel with the Reference GFI and a fuel with an Attained GFI of 0. The second example (see paragraph 21 and Figure 3) illustrates an intermediate fuel with an Attained GFI of 0.35, representing a 65% reduction in GHG-intensity.

20. Example 1 (see Figure 2, dashed vertical line): A Green Balance Fee established for fossil marine fuel at the Reference GFI (with 0% GHG-intensity reduction). The GBM in 2030 would result in a Green Balance Fee of 74 USD per tonne CO₂e and a Green Balance Allocation in 2030 of 295 USD per tonne CO₂e.

Figure 2. GBM Fee and Allocation schedules for reference fuel and fuel with zero or near-zero WtW GFI.

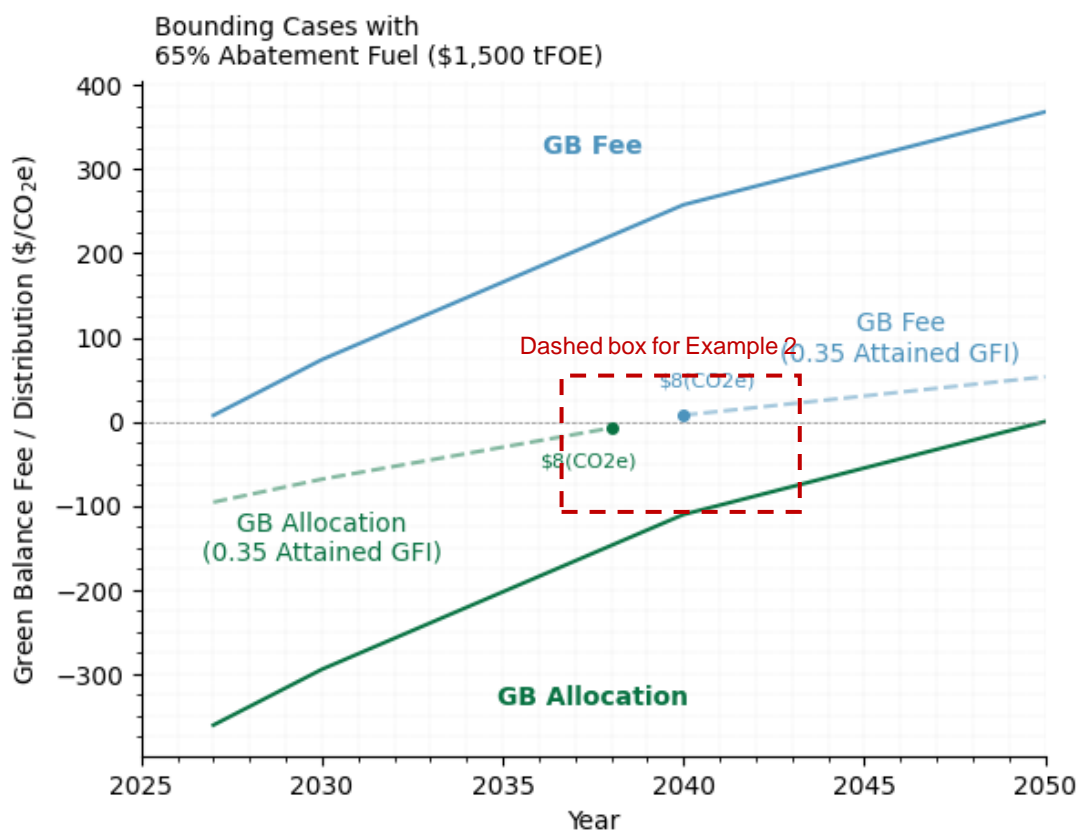


The left axis represents the Fee and Allocation schedules in USD per tonne CO₂-equivalent (\$/tCO₂e).

21. Example 2 (see Figure 3, dashed box area) Figure 3 illustrates an intermediate fuel scenario with delivers a 65% GHG-intensity reduction (0.35 Attained GFI). The Attained GFI for the intermediate fuel qualifies for a Green Balance Allocation in the years prior to 2039 proportional to the GHG-intensity achieved. After 2039, the Attained GFI for this fuel requires payment of Green Balance Fees because the GFI and GBM GFI have reached a new step as part of the energy transition to net-zero called for in the IMO GHG Strategy.

22. Under inputs for Example 2, in 2036 the Green Balance Allocation for a fuel with an Attained GFI equal to 35% of the Reference GFI will be 8 USD per tonne CO₂e in 2038; for 2040, the GB Fee for a fuel with Attained GFI equal to 35% of the Reference GFI will be 8 USD per tonne CO₂e.

Figure 3. GBM Fee and Allocation for intermediate fuel(s) with Attained GFI representing 65% GHG-intensity reduction.

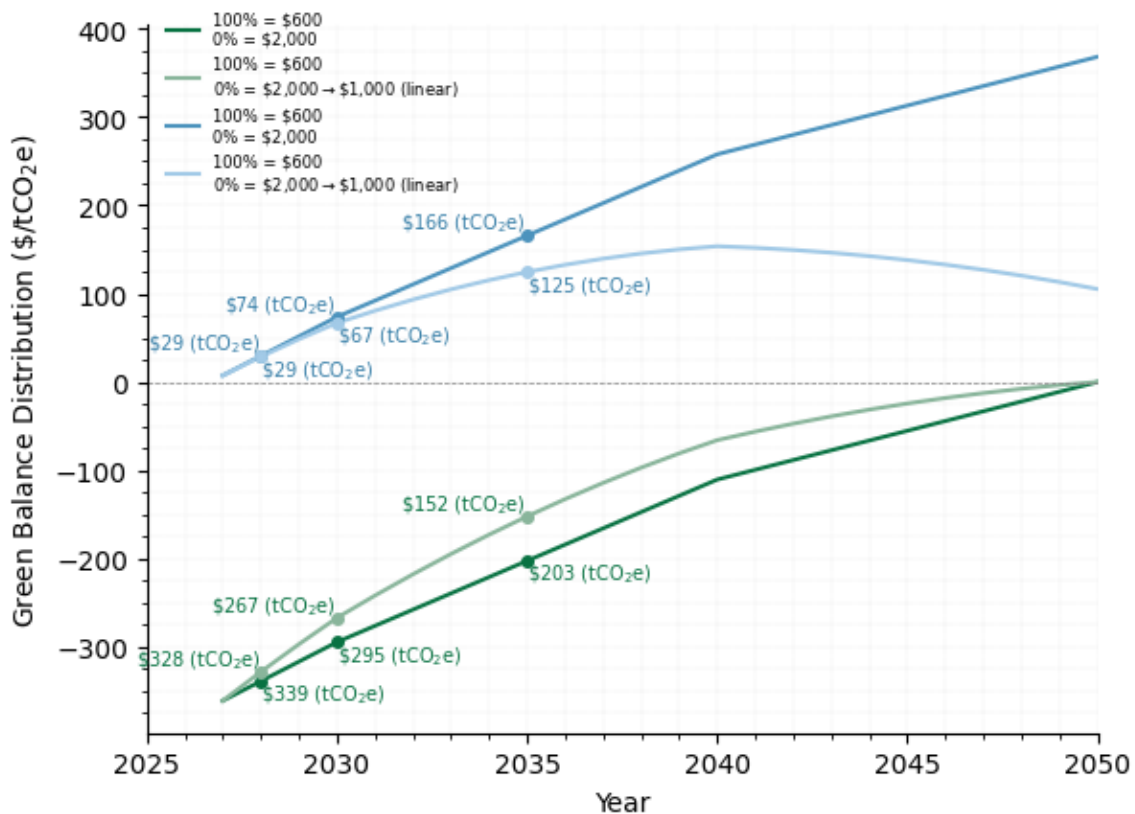


23. These examples reveal several GBM advantages:

- a. The GBM would immediately enable the use of net-zero and near-zero fuels early in the transition and create a strong demand signal for energy producers to make the necessary investments in green fuel production while also incentivizing ship owners and operators to use fuels and technologies that deliver deep GHG reductions.
- b. The GBM would also improve the likelihood that the dual-fuel vessels being built are able to operate on the lowest GHG emission fuels available.
- c. The GBM provides proportional benefits to intermediate fuels early in the transition because the Green Balance Allocations are available for early achievement of Attained GFI values that equal or perform better than the Green Balance GFI. This mitigates concerns related to stranding of investments that need to be made early in the energy transition to accelerate GHG reductions and increase the uptake of renewable marine fuels.

24. Figure 4 illustrates the comparative Green Balance Fee and Green Balance Allocation schedules under the constant price assumptions used above, and under conditions where the price of the fossil fuel remains constant while prices decline over time as the fuel(s) that perform with ~0 Attained GFI. For this example, a linear decline in pricing is assumed from \$2000 to \$1000 USD per tFOE. With a declining price difference between the fuel for the Reference GFI and fuel(s) with ~0 Attained GFI, the GB Fee and GB Allocation is reduced. Fees and Allocations are called out by labels for years 2028, 2030, and 2035.

Figure 4. Green Balance Fee and Allocation schedules comparing constant and declining price conditions. Specific values are highlighted for 2028, 2030, and 2035.



25. The GBM incentivizes and supports the use of fuels and technologies that exceed the GFI by a specified margin (the GBM GFI) via a mechanism that distributes the cost premium (relative to fuels that have an Attained GFI equal to or inferior to the GFI) of fuels and technologies that meet or exceed the GBM GFI across all fuels used. This scenario results in a situation where the effective price of all fuels become the same. Put another way, the GBM does not attempt to make fossil fuels as expensive as the highest performing GHG fuels and technologies - instead it only raises the funds necessary to make net-zero and near-zero fuels and technologies competitive in a transitional market. For this reason, the GBM is a highly efficient financial and regulatory measure when compared to a more traditional GHG pricing approach.

How Green Balance Funds are Collected and Distributed

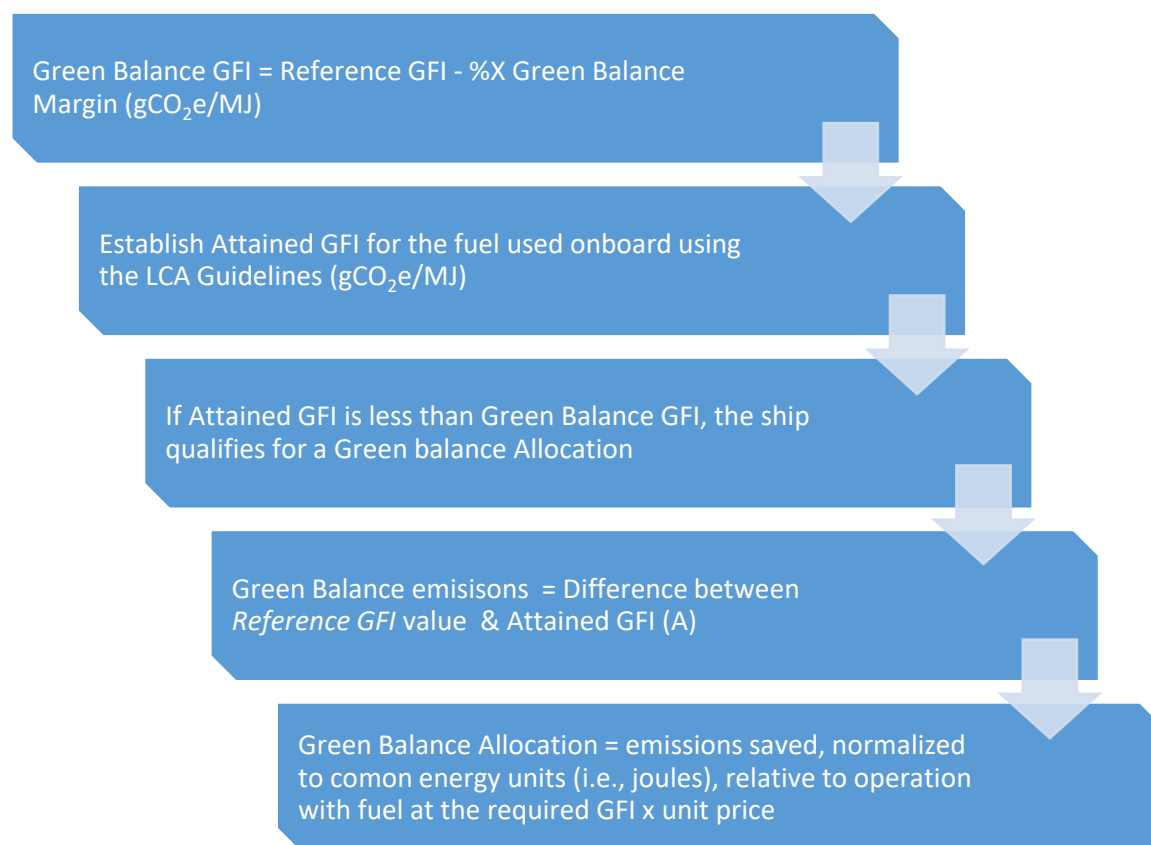
26. Green Balance Fees and distribution of Green Balance funds to ships reporting an Attained GFI equal to or better than the Green Balance GFI would follow the following structure:

- Ships which have an Attained GFI equal to, or inferior to the GFI value applicable in a given year would be required to contribute into the Green Balance Fund;
- Ships with a WtW GHG intensity better than the GFI value, but not meeting the GBM GFI threshold would neither pay into nor receive payment from the Green Balance Fund; and
- Ships with a WtW GHG intensity equal to or better than the GBM GFI threshold would receive a Green Balance allocation from the Green Balance Fund.

27. Recognizing that fuels that are better than the Green Balance GFI threshold will cover a spectrum of fuel types and blends with different WtW GHG-intensity values, the Green Balance funds would be distributed based on the Attained GFI values of a given ship or group of ships. This is a critically important attribute of the GBM as it ensures that the achieved GHG reductions and the Green Balance Allocation received are proportional to the actual WtW GHG reductions achieved.

28. Ships will report both the quantity of fuels consumed as well as the GFI values of fuels consumed by the ship or group of ships. At the end of the annual reporting period, the Green Balance Fund Administrator sums the total WtW GHG reductions achieved (using the relevant quantity of fuels and their GFI values) by the fleet. The Administrator then distributes funds in proportion to the reductions achieved that are equal to or better than the Green Balance GFI. As a result, the funds of the previous year are effectively cleared. This process is then repeated on an annual basis. Figure 5 below provides an illustration of how Green Balance funds collected in a single year are distributed the following year after the reporting period is completed.

Figure 5 Green Balance Fund Allocation Schematic



Relevant notes:

- Reference GFI value = Required GFI value for the reporting period as defined in GHG fuel standard or integrated measure (as applicable) on a WtW basis.
- %X = Green Balance Margin for the reporting period, set by the Committee when agreeing the Green Balance Mechanism.
- Allocation value to be determined for the reporting period.

29. The Green Balance GFI value would therefore follow the established GFI standard applicable at a given point in time with a specific margin (reduction factor) applied that defines the Green Balance GFI. Initially the Green Balance Margin could be set at a more demanding level, reducing as the required GHG intensity for all marine fuels and energy reduces so that both lines converge on net-zero in 2050. Most importantly, ships utilizing the cleanest fuels which achieve the highest emissions reduction will receive the highest Green Balance Allocation.

Why WtW Calculations are Essential

30. Well-to-Wake (WtW) emission calculations are essential for accurately assessing the GHG reductions delivered. Consequently, an effective regulatory and economic measure also requires WtW analysis. This is best understood by considering two examples that are directly applicable to fuels that will be used in the energy transition. The first example concerns biofuels. To accurately assess the GHG reduction value of a biofuel, full WtW lifecycle analysis is necessary as the emission benefits of a given biofuel explicitly require consideration and accounting of the total lifecycle benefits derived from using a renewable feedstock. In contrast, use of Tank-to-Wake (TtW) values that do not account for lifecycle benefits would render biofuels as a less attractive alternative fuel source.

31. Ammonia presents a second compelling case of why WtW analysis is not simply a nice to have background calculation, but is critical to avoiding regulatory outcomes with a negative climate effect. Green ammonia produced with renewable energy presents a very significant reduction in GHG emissions compared to conventional heavy fuel oil (HFO) or VLSFO. On the other hand, brown ammonia, which is produced with fossil fuel energy sources, presents a radically different GHG profile. Brown ammonia actually results in a very substantial GHG emissions increase when compared with conventional marine fuel. This critically important difference between green and brown ammonia is invisible if one uses TtW values because the significant increase in GHG emissions is only apparent when evaluating the fuel on a WtW basis.

32. The preceding examples demonstrate why a WtW regulatory basis is essential not only for effective regulation and accurate accounting, but also to avoid investment decisions that have negative climate implications, or which may result in stranded assets. The importance of using WtW values in a Green Balancing Mechanism is equally important because WtW analysis is necessary to properly assess the relative GHG improvements, or negative consequences, that are associated with a given fuel / technology choice. More specifically, the consideration of a *GBM allocation* as described in this paper is very much dependent on accurate and verified WtW values.

Chain of Custody and Enforcement

33. Chain of custody procedures are necessary to enable accurate assessment of GHG-intensity values and consistent enforcement. Quantification of the Green Balance Allocation will require certified GFI performance on a WtW basis, i.e., across all stages of the marine energy and fuel value chain. Transparency in chain of custody reporting will help ensure that Green Balance Allocations are accurate and that the relevant documentation requirements are consistent across States.

34. Chain of custody procedures to track the Well-to-Tank (WtT) portions of energy and fuels will be necessary for the GFI and will be equally important to the Green Balance Mechanism. Chain of custody procedures will support the necessary reporting and verification of Well-to-Tank stages of fuels and technologies that result in reduced GFI values relative to conventional fossil fuels. Chain of custody reporting underpins lifecycle WtW reporting because credentialed

WtT emissions can be added to the TtW emissions for full lifecycle reporting. With transparent chain of custody procedures (i.e., reporting and verification), ships can demonstrate compliance with GFI requirements. Chain of custody reporting also offers visibility, consistency, and confidence in WtW accounting.

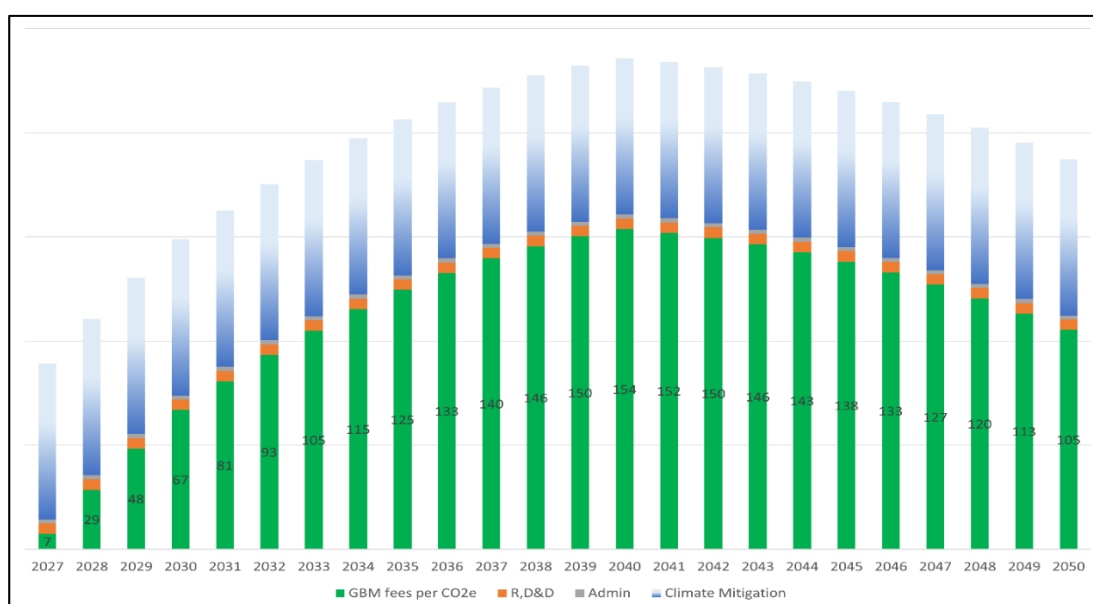
35. Certification approaches can be implemented that are consistent with IMO LCA guidelines. These will specifically address both feedstocks and production stages. Chain of custody procedures may initially rely upon default GHG values for each stage of the value chain (e.g., collection, production, liquefaction and distribution). During the uptake of near-zero, net-zero and zero emission energies and fuels, default values for chain of custody stages can be updated with actual GHG values for each stage or aspect, enabling the most accurate emissions assessment of the performance of innovative process/technologies. Hence, chain of custody procedures can provide a robust Well-to-Tank (WtT) and Tank-to-Wake (TtW) certification process to deliver full and accurate Well-to-Wake (WtW) reporting.

The Green Balance Mechanism Could be Coupled with Other Assistance Programmes

36. This paper focuses on how a Green Balance Mechanism (GBM) could be employed in a mid-term measure to create a platform for the use of net-zero and near-zero fuels in a transitional environment where conventional fuels are still used by many ships. For this reason, the primary focus of this submission is describing the basic structure and operation of a Green Balance Mechanism. That having been said, the Committee may wish to add other funding objectives as deemed appropriate to the overall economic measure. For example, funding requirements beyond those needed for the GBM could be added as a separate, but integrated financial measure. These could provide the necessary funding for developing States, or for applied RD&D to further develop and expand work to advance the most cost-effective technologies and energy solutions to meet IMO's GHG ambitions.

37. Figure 6 provides a simplified graphic illustration of how complementary, but different funding objectives can be built on top of the GBM if the Committee decides to pursue such funding initiatives.

Figure 6 Illustration of GBM Coupled with Other Programme Funds

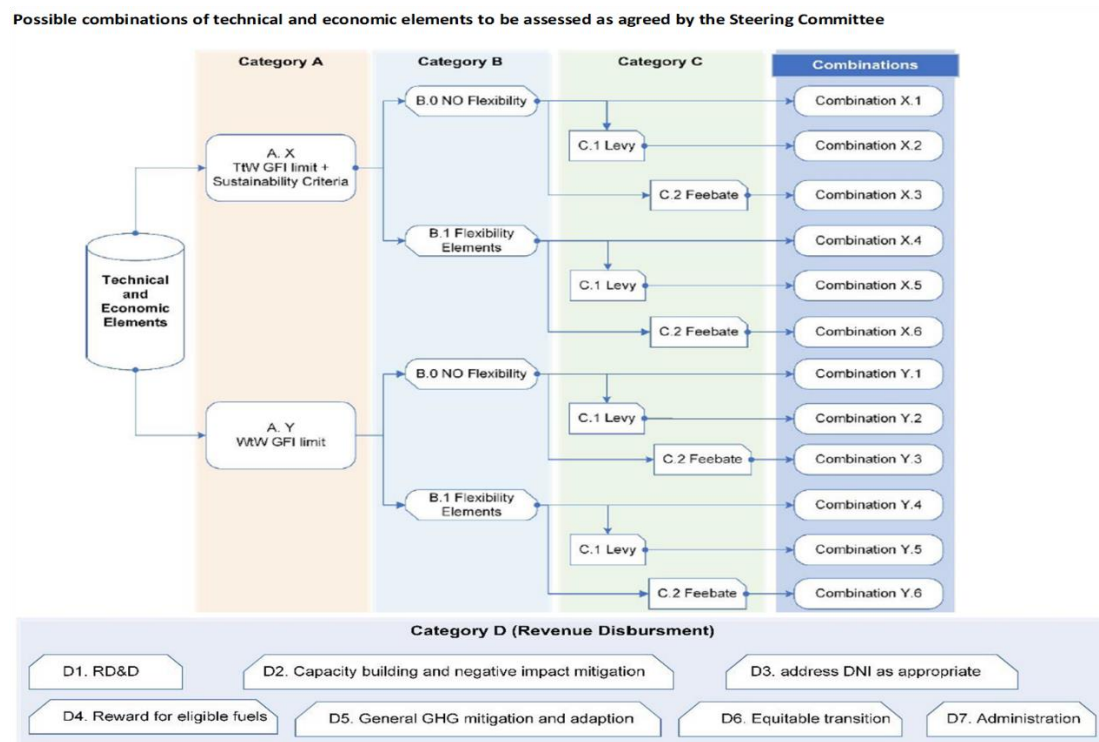


Above graphic for illustrative purposes

Impacts on States

38. WSC has consciously designed the Green Balancing Mechanism to be used in either an integrated measure or a levy / GHG fuel standard. If we consider the work underway by UNCTAD and the IMO Steering Committee on the comprehensive impact assessment of the basket of candidate mid-term measures, the Green Balance Mechanism (GBM) would align most closely with Combination Y6 and Category D4 for revenue disbursement. For ease of reference, figure 7 presents a graphic layout of the combinations identified by the IMO Steering Committee.

Figure 7 Possible Combinations Outlined by IMO Steering Committee



Conclusion

39. The Green Balancing Mechanism (GBM) is designed to provide a targeted and economically efficient mechanism to achieve IMO's GHG objectives while incentivising and enabling the use of fuels and technologies that can achieve the net-zero and near-zero GHG reductions critical to the maritime energy transition.

ACTION REQUESTED OF THE COMMITTEE

40. The Working Group is invited to consider the Green Balance Mechanism and other related comments outlined in this paper and to take action as appropriate.