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## REDUCTION OF GHG EMISSIONS FROM SHIPS

### Proposal for a Market-based Measure (MBM) to incentivize GHG emission reduction and to make equitable transition with an overview of mid- and long-term measures

Submitted by Japan

#### SUMMARY

*Executive summary:* This document proposes to introduce Zero Emission Vessels (ZEVs) Incentive Scheme to provide incentives for stakeholders in the maritime and energy sectors to promote necessary investments to enable effective deployment of zero-emission fuels and necessary support for States, in particular small island developing States (SIDS) and least developed countries (LDCs), to make equitable transition to reduce GHG emissions from international shipping

*Strategic direction, if applicable:* 3

*Output:* 3.2

*Action to be taken:* Paragraph 24

*Related documents:* Resolutions MEPC.304(72) and MEPC.328(76)

#### Introduction

1 MEPC 77 had considered mid-term GHG reduction measures and encouraged Member States to further consider the development of proposals during Phase I of the Work Plan on mid- and long-term GHG reduction measures. This document provides a concrete proposal for mid-term measures with an overview of mid- and long-term measures for further reduction of GHG emissions from international shipping.

#### Overview of mid- and long-term measures

2 Further reductions of GHG emissions from international shipping requires deployment of low- and zero-emission fuels. In particular, introduction of zero-emission fuels should commence as early as possible since replacement and retrofits of global fleet and establishment of fuel infrastructures would take a long period of time. However, zero-carbon fuels are not currently widely available for international shipping and technologies to deliver Zero-Emissions Vessels (ZEVs) are still under development.

3 Introduction and commercialization of ZEVs are expected to take place in the latter half of this decade, but costs for zero-emission fuels and technologies would likely remain high as technical maturity and fuel production capacity would be limited at this stage. It is therefore imperative, especially in the initial phase, to pull demand of zero-carbon fuels by providing incentives for first movers, in order to reduce technical and economic barriers for the introduction of such fuels and technologies. On the contrary, if carbon pricing with stringent price level is introduced at this stage, it would raise the costs for using conventional fuels at punitive levels and would undermine the sustainable development of international shipping.

4 Therefore, as an overview of mid- and long-term measures to further reduce GHG emissions from international shipping, Japan considers it necessary to:

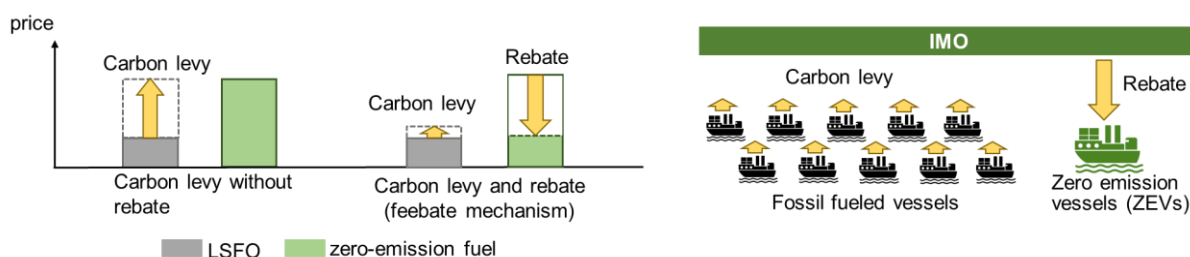
- .1 introduce an incentive scheme based on feebate mechanism as mid-term measure, to provide incentives for first movers adopting zero-carbon fuels, to ensure a reduction pathway consistent with the Paris Agreement temperature goals while ensuring sustainable development of international shipping;
- .2 make adjustments of the scheme, taking into account its effects and impacts, and introduce technical requirements, such as mandating newbuild ships and even existing ships to use zero-emission fuels, as long-term measures to achieve levels of ambition that would be set in the Revised Strategy; and
- .3 use revenues raised by the scheme to make equitable transition.

5 In view of such basket of measures, this document proposes the introduction of ZEVs Incentive Scheme based on feebate mechanism to promote adoption of zero-carbon fuels and to assist maritime GHG reduction efforts in vulnerable States, in particular small island developing States (SIDS) and least developed countries (LDCs), to make equitable transition.

## Main features of the ZEVs Incentive Scheme

### *Providing strong incentives by feebate mechanism*

6 The scheme aims to provide clear incentives for ZEVs by using revenues raised by carbon levy as rebates for zero-emission fuels. Assuming there is large price gaps between zero-emission fuels and fossil fuels and carbon levy is introduced to fill the gap during the initial phase, levy rate would have to be set fairly high. On the other hand, if price gap is compensated by way of providing rebate for zero-emission fuels and levy is introduced to raise sufficient amount of revenues for rebate, levy rate could be set at lower level, when the share of ZEVs is limited (see Figure1). Such a feebate mechanism would ensure necessary incentives to enhance deployment of ZEVs while minimizing negative impacts on fossil fuelled ships.



**Figure 1: Feebate mechanism (carbon levy and rebate)**

### **Price-based approach**

7 The scheme assumes that IMO would fix rates for levy and rebate, which would then be reviewed and adjusted periodically. Such a price-based approach has advantage to ensure higher cost predictability which would enhance investment decisions on technologies to reduce GHG emissions. Although some arguments in economic theory<sup>1</sup> suggest that price-based approach is more efficient than quantity-based approach when there are uncertainties and if curvature of the benefit function is smaller than the curvature of the cost function of emissions, as is clearly the case for climate change. It is also noted that a cap-and-trade scheme, which would fix the quantity of total GHG emissions and leaves the price to be decided by the market, entails price volatility and lower cost predictability. This makes it more difficult for stakeholders to make necessary investment decisions.

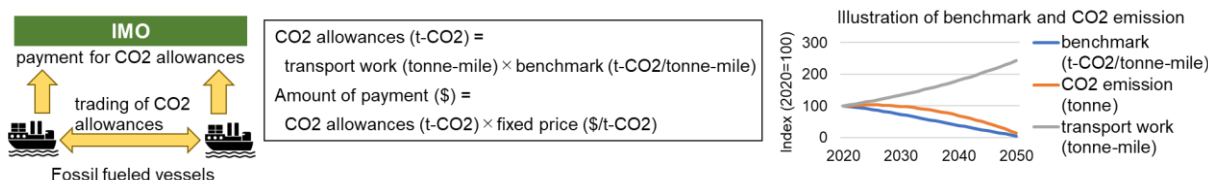
### **Use of revenues for equitable transition**

8 Revenues raised should also be used to assist maritime GHG reduction efforts in vulnerable States, in particular SIDS and LDCs, to make equitable transition.

### **Further concept: fixed price allocation of CO<sub>2</sub> allowances by benchmarking**

9 The scheme should be based on carbon levy to raise revenue since it would be simpler to administer. However, a levy-based scheme or price-based approach has disadvantage when it comes to certainty in reduction levels of GHG emissions. Therefore, as a further concept that could be applied instead of carbon levy, "fixed price allocation of CO<sub>2</sub> allowances by benchmarking", which has the following features, is suggested for consideration.

- .1 Each ship is allocated with CO<sub>2</sub> allowances, which are determined by multiplying actual transport work with the benchmark (carbon intensity standard), by way of making payment for allowances under fixed carbon price (see Figure 2). The fixed carbon price can be determined in the same way as setting the levy rate as described in paragraph 14 of this document.
- .2 Each ship is also required to surrender allowances corresponding to its actual CO<sub>2</sub> emissions. In case the ship does not have enough allowances, it has to purchase them from other ships by trading. Use of carbon credits should also be considered as an alternative method for compliance.
- .3 In contrast with cap-and-trade scheme, the system does not limit transport work and can ensure the sustainable development of international shipping, while achieving higher certainty in CO<sub>2</sub> reduction than a levy-based scheme.



**Figure 2: Fixed price allocation of CO<sub>2</sub> allowances by benchmarking**

<sup>1</sup> Nordhaus, W. D. (2006) *After Kyoto: Alternative Mechanisms to Control Global Warming*. The American Economic Review, Vol. 96, No. 2, pp.31-34.

10 Although allocation of allowances by benchmarking has merit in ensuring higher levels of certainty in reduction of GHG emissions, further considerations on details including the definition of transport work and benchmark are needed, to keep the right balance of simplicity, effectiveness and feasibility in developing and implementing the scheme.

### **Basic elements of the ZEVs Incentive Scheme**

11 The scheme is expected for implementation in 2025 following adoption of MARPOL amendment in 2023. The scope of application would be ships of 5,000 gross tonnage and above engaged in international voyage as covered by the IMO ship fuel oil consumption Data Collection System (DCS). Ships using fossil fuels should pay for the levy and ships using zero-emission fuels can receive rebate via electronic ship account which needs to be developed by the Organization. In case the concept stipulated in paragraph 9 of this document is applied, allocation and trading of CO<sub>2</sub> allowances should also be made via the ship account.

12 Flag States should determine whether ships are in compliance with the requirement by checking if the information provided by the IMO ship account is consistent with the data reported under DCS and should issue a document of compliance for each ship. Port States may verify whether ships calling at their ports have valid documents on board and should take appropriate measures against non-compliant ships to implement the scheme under the "no more favourable treatment" principle. The Organization should manage the ship account and oversee the use of revenues allocated to assist States for equitable transition. In this context, the establishment of the IMRB/F would be useful for the Organization to accumulate knowledge on how to properly manage and oversee the scheme involving monetary payments.

13 The legal framework envisaged for implementation is the MARPOL Annex VI. The proponent suggests that the details of the scheme, including rates for levy and rebate as well as principles and procedures for allocating revenues to assist States should be decided prior to the adoption of MARPOL amendment in 2023. Following its implementation, the scheme would have to be reviewed periodically with [five]-year intervals from [2028] onwards to make necessary adjustments including possible termination of the rebate mechanism.

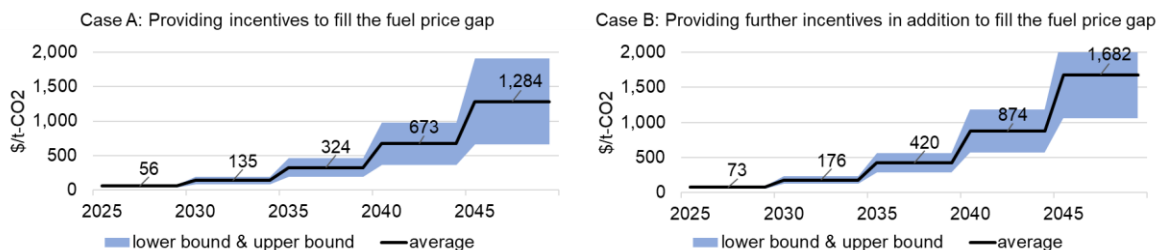
### **Setting rates of levy and rebate**

#### ***Basic idea for setting rates***

14 Rates of levy and rebate should be determined by the Organization in an inclusive and transparent manner, based on considerations on estimated costs and demand of zero-emission fuels. The levy rate should be determined based on the amount of revenues needed for rebate mechanism and assisting States to make equitable transition. The amount of revenues for rebate mechanism should be decided based on rebate rates and estimated demand of zero-emission fuels, considering the replacement of global fleet. Rebate rates should be set to ensure sufficient levels of incentives are provided to ZEVs. Rebates should be provided to ships using fuels with zero tank-to-wake CO<sub>2</sub> emissions, in order to secure as much options as possible for the shipping industry to achieve zero emissions, especially in the initial phase of transition.

#### ***Preliminary analysis on levy rate***

15 Preliminary analysis on the necessary levy rate to secure revenues for rebate has been conducted for two cases; one to provide incentives to fill the fuel price gap and the other to provide further incentives in addition to the fuel price gap (see Figure 3).



Note: Case A assumes providing rebate to fill the price gap between zero-emission fuels and LSFO, while Case B assumes providing further incentives (\$10/GJ for each zero-emission fuel) in addition to the price gap.

**Figure 3: Preliminary analysis on levy rate (carbon price) to provide incentives by rebate**

16 Lower bound, upper bound and average levy rates fixed for five years have been calculated based on the following assumptions for the sake of simplicity of the analysis:

- .1 fuel demand was projected by applying the IEA scenario of Net Zero Emissions by 2050 (NZE)<sup>2</sup> for the shipping sector on estimated energy demand of international shipping in 2020 based on the DCS data;
- .2 price gap between zero-emission fuels and LSFO was calculated based on projections of fuel price by LR and UMAS<sup>3</sup>; and
- .3 demand for both ammonia and hydrogen was assumed as "green fuels" (derived from renewable energy) and "blue fuels" (derived from fossil fuels with application of carbon capturing and storage) comprising half of its shares respectively, demand for synthetic fuel assumed as e-methane and e-methanol comprising half of its share respectively, and demand for biofuels consisting of biodiesel only.

17 The following points can be drawn from the analysis:

- .1 although the levy rate would vary depending on assumptions, a levy rate well below \$100 per tonne of CO<sub>2</sub> would likely ensure revenues to provide sufficient levels of incentives at least in the initial period, as the analysis assumes rapid deployment of zero-emission fuels whose global share reach 17% by 2030 under NZE;
- .2 further incentives to accelerate deployment of ZEVs (Case B) would not necessarily raise the levy rate at significant levels; and
- .3 although prices of zero-emission fuels are expected to decrease, reduction in fossil fuel demand may require higher levy rates, implying the necessity of making adjustments, including possible termination of rebate mechanism, based on considerations on levels of penetration and prices of zero-carbon fuels.

### Use of revenues

18 To further reduce GHG emissions from international shipping, revenues should basically be recycled within the sector. While the larger portion should be used to provide incentives for first movers, sufficient amount of revenues should also be allocated to IMO's

<sup>2</sup> IEA (2021), *Net Zero by 2050. A Roadmap for the Global Energy Sector*. Paris.

<sup>3</sup> Lloyd's Register & UMAS (2020), *Techno-economic assessment of zero-carbon fuels*. London.

Integrated Technical Cooperation Programme (ITCP) to significantly scale up its resources to assist maritime GHG reduction efforts in vulnerable States, in particular SIDS and LDCs, to make equitable transition. Utilization of existing frameworks at IMO would allow provision of technical cooperation in an efficient and transparent manner without distorting the market. Such use of revenues would also help mobilize larger amount of external resources required to implement projects such as those related to the establishment of fuel infrastructures.

19 Use of revenues for carbon credits to offset emissions should also be considered. However, use of credits should be limited and methodologies to ensure credibility of carbon credits should also be considered, if such options are further considered.

### **Emissions reduction potential**

20 Incentives are provided by carbon levy to reduce fossil fuels and rebate mechanism to adopt zero-emission fuels. The potential for emissions reduction by levy may not be large, as fuel demand is considered inelastic in the shipping sector. On the other hand, the potential for reduction by rebate mechanism is expected to be larger, if an analogy is made with land-based power sector achieving growth in renewable energy, which was supported by subsidies such as feed-in-tariffs or contracts-for-differences. Rebate mechanism is expected to deliver similar effects, by providing clear incentives for necessary investments to adopt zero-emission fuels and to significantly reduce GHG emissions by 2050.

21 Uncertainty in the reduction potential may be overcome by applying the concept proposed in paragraph 9, but this would entail detailed considerations on the system including the development of benchmarks for different ship types and sizes.

### **Potential implications on the shipping industry**

22 The rebate mechanism will promote deployment of zero-emission fuels and carbon levy will promote technical and operational measures to improve energy efficiency of ships. Ships, as the regulated entity under MARPOL Annex VI, should pay for the levy and become recipients of rebate. In order to effectively incentivize emissions reduction from ships, costs and benefits borne by the scheme should be appropriately allocated among stakeholders that are responsible for making decisions on specification, maintenance and operation of ships.

### **Initial impact assessment**

23 Although levels of negative impacts by levy would vary depending on various factors including cargo values or shipping routes, overall impacts on trade could be limited as far as levy rate is set at sufficiently low level. For example, according to most previous studies reviewed by Rojon et al.<sup>4</sup>, which assume levy rates as below 25% of the fuel price, impacts of levy on import prices are estimated to be small.

### **Actions requested to the Committee**

24 The Committee is invited to consider the proposal for a Market-Based Measure set out in this document and take action as appropriate.

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<sup>4</sup> Rojon, I., Lazarou, N.-J., Rehmatulla, N., Smith, T. (2021) *The impacts of carbon pricing on maritime transport costs and their implications for developing economies*. Marine Policy 132, 104653. <https://doi.org/10.1016/j.marpol.2021.104653>.