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WORKING GROUP ON REDUCTION OF
GHG EMISSIONS FROM SHIPS
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FURTHER DEVELOPMENT OF THE STRUCTURE AND IDENTIFICATION OF CORE ELEMENTS OF THE DRAFT INITIAL IMO STRATEGY ON REDUCTION OF GHG EMISSIONS FROM SHIPS

GHG emission scenario to reach a temperature target of 1.75°C and candidate short-, mid- and long-term measures

Submitted by OECD

SUMMARY

Executive summary:	This document aims to provide an improved understanding of the level of ambition necessary for the shipping sector to meet the targets set by the Paris Agreement. It does so building on a recent report released by the International Energy Agency, framing the shipping results in the context of an assessment that looks at the changes needed across the whole energy sector. Whereas ISWG-GHG-2/ 2/12 outlines a pathway for reaching a temperature target of 1.5°C, this document focuses on a 1.75°C target. The document also proposes several short-, mid- and long-term measures for consideration to be included in the initial IMO Strategy on reduction of GHG emissions from ships.
Strategic direction:	7.3
High-level action:	7.3.2
Output:	7.3.2.1
Action to be taken:	Paragraphs 24 and 25
Related documents:	MEPC 71/WP.5, MEPC 71/7, MEPC 71/7/12, MEPC 71/INF.35; ISWG-GHG 1/2/3, ISWG-GHG 1/2/4, ISWG-GHG 1/2/10, ISWG-GHG 1/2/11, ISWG-GHG 1/2/12, ISWG-GHG 1/2/13, ISWG-GHG 1/2/14; ISWG-GHG 2/2 and ISWG-GHG 2/2/12

Introduction

1 The ratification of the Paris Agreement and calls to implement the United Nations Sustainable Development Goals show strong global support to address climate change and other environmental concerns. During ISWG-GHG 1 and MEPC 71, many delegations expressed support for the initial Strategy to match the ambition of the Paris Agreement.

2 The 2017 edition of the Energy Technology Perspectives (ETP) report of the International Energy Agency (IEA) analyses the technology and policy implications of the achievement of the Paris Agreement for the global energy sector, outlining decarbonization strategies on a sector-by-sector basis through the development of different scenarios.

3 The Reference Technology Scenario (RTS) of ETP provides a baseline that takes into account existing energy- and climate-related commitments by countries, including Nationally Determined Contributions (NDC) pledged under the Paris Agreement and IMO's EEDI. Despite this, the RTS is not consistent with achieving global climate mitigation objectives of the Paris Agreement.

4 The Beyond 2°C Scenario (B2DS) outlines the developments needed for a rapid decarbonization, compatible with a CO_2 emission budget of 750 gigatonnes (Gt) between 2015 and 2100, and a 50% chance of limiting average global temperature increase to 1.75°C. This requires the global energy sector to reach net-zero GHG emissions by 2060. The B2DS has the closest alignment with ambition of the Paris Agreement amongst all ETP scenarios.

Reaching the target set by the Paris Agreement across the energy system

5 The development of B2DS is built on two main pillars: i. the need to maximize the role of mitigation strategies with the lowest cost; and ii. the need to enable the scale up of solutions that, despite their higher short-term cost, have the capacity to enable the transition to a zero-carbon energy system. In order to account for sustainability constraints, the global availability of biomass for energy use is also limited to a maximum of 150 EJ by 2060.

6 Reaching B2DS targets requires transformations in all sectors at paces beyond anything ever observed today. In the B2DS, power generation takes place with negative CO_2 emissions, thanks to the widespread adoption of zero emission technologies, supplemented by the use of biomass with Carbon Capture and Storage (CCS). By 2060, energy efficiency is fully maximized in all end-use sectors. CCS also becomes widespread in the industry sector, while most buildings are converted to net-zero energy. In transport, two wheelers are entirely electrified, and so are 90% of the cars. In addition to maximum efficiency improvements, aviation is subject to major shifts to high-speed rail and relies largely on the use of biofuels. The challenge is major in every sector, and the consequence of delaying action in shipping would involve the need for even larger reduction efforts in other sectors.

7 On the policy side, the B2DS pathway implies unprecedented action as well as effort and engagement from all stakeholders. The B2DS characterization helps understanding the level of ambition that is necessary for achieving a climate target of 1.75°C, the development of adequate policy levers must follow. A price on carbon is essential. In B2DS, it exceeds 500 real USD 2017 per tonne by 2060. Economic and regulatory instruments fostering energy efficiency therefore need to complement CO_2 pricing. Measures enabling cost reductions through technology learning and to help scale zero emission technologies are also needed. Given the scale of the transition needed, the lack of adequate monitoring systems needs to be swiftly addressed, and it should not be used as an instrument aiming to delay policy action. Due to the need to reduce emission across the whole economy, offset mechanisms such as those adopted in aviation have limited scope for application in the B2DS.

Reaching Paris Agreement targets: technology needs

8 In the B2DS, GHG emissions from international shipping need to stabilize by 2030 compared to 2008, and need to be halved between 2050 and 2060. Achieving this requires swift changes in three areas: i. the optimization of the use of available shipping capacity; ii. the exploitation of all available energy efficiency potential; and iii. the use of zero emission fuels.

9 Figure 1 below provides a visual representation of the solutions identified in the IEA ETP model to reduce GHG emissions in international shipping to reach B2DS targets. The selection of solutions focuses primarily on the improvement of the utilization of available shipping capacity and the maximization of energy savings through improved energy efficiency. It also considers the need to rely on low-carbon fuels, focusing primarily on advanced biofuels. The long-term adoption of biofuels must be limited however, due to the constraints assumed for the availability of sustainable biomass supply. Some emissions are also avoided as demand for international shipping services is lower in the B2DS compared with the RTS.

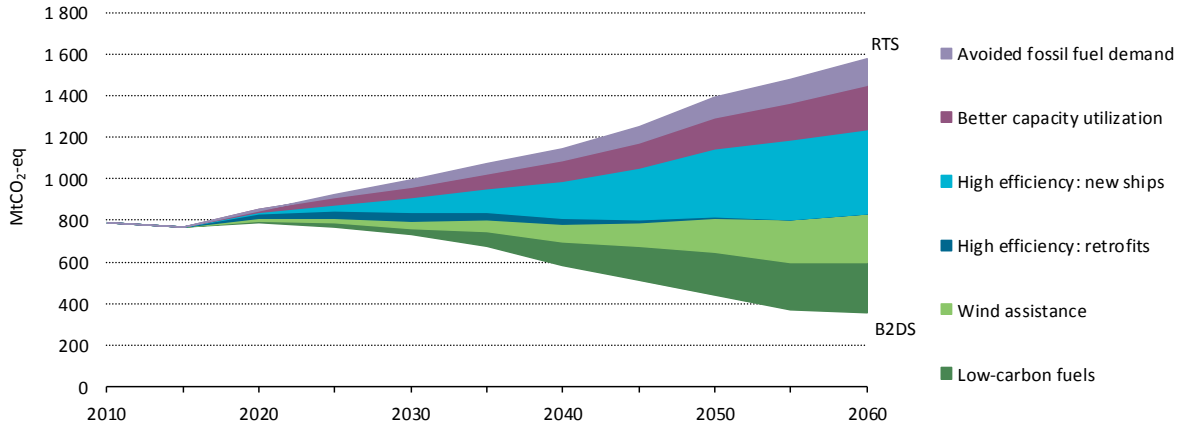

Figure 1: Well-to-wheel GHG emission reduction in international shipping in the B2DS relative to the RTS
Source: IEA Energy Technology Perspectives 2017

10 The reduction in trade considered in B2DS is primarily the result of lower demand for trade in fossil fuels, currently accounting for about one-third of global maritime trade by volume. This decline is consistent with a scenario that sees the demand for fossil fuels falling rapidly and relies heavily on low-carbon electricity. The decline in trade demand accounted for in B2DS is not coupled with assumptions suggesting that maritime trade should overall be reduced to meet the target of the Paris Agreement. All ETP scenarios use projections on the evolution of trade flows developed by the OECD Economic Directorate.

11 Improvements in the capacity utilization reflect a combination of increases in load factors and average ship size. This requires parallel development of port infrastructure and is consistent with the investments already undertaken to adjust canal width and depth, enabling the possibility to accommodate larger ships.

12. Improved efficiency (including wind assistance) accounts for the largest share of GHG abatement in the B2DS, exploiting the full energy saving potential available to the shipping sector. The analysis is based on a list of efficiency improvement technologies that is much in line with those outlined in the annex to document ISWG-GHG 1/2/10. It reflects the assumption that energy efficiency improvements come at a significantly lower cost than changes in the carbon content of fuels, or the reliance on the use of hydrogen as an energy carrier.

.1 By 2030 all new ships entering the fleet must be at least 60% more efficient relative to EEDI baselines (50% for container ships[1]).

.2 Due to the relatively long lifetime of ships, achieving the objectives of the B2DS will also require that part of the fleet will be retrofitted with energy-saving technologies. The contribution of retrofits is especially important in the coming 10-25 years (see figure 1). B2DS results suggest that today's ships that will still be in the fleet by 2030 must be nearly 20% more efficient (about 15% for container ships) compared to EEDI baselines. This means that either all ships in today's fleet set to remain in operation until 2030 need to be retrofitted, or a smaller proportion is retrofitted more ambitiously (i.e. with energy savings exceeding 20%).

13 The carbon intensity of marine fuels declines in the B2DS, primarily because of the introduction of biomass-based low-carbon fuels, such as advanced biofuels.[2]

.1 By 2030, the reduction of the well-to-wheel carbon intensity of the fuel used in international shipping ranges between 5% and 10% in the B2DS.

.2 By 2050, the carbon intensity falls to nearly half of the value of 2015. This reflects the need for a very significant penetration of low-carbon fuels in B2DS.

14 Hydrogen use in shipping and power-to-fuel technologies could provide GHG emissions reductions that are additional to the technologies used in the B2DS. The GHG reductions presented in the B2DS may therefore represent a conservative boundary of the decarbonization potential of international maritime transport. This suggests that the ETP analysis in not conflicting with the level of ambition outlined in document ISWG-GHG 2/2/12.

Liquefied Natural Gas (LNG)

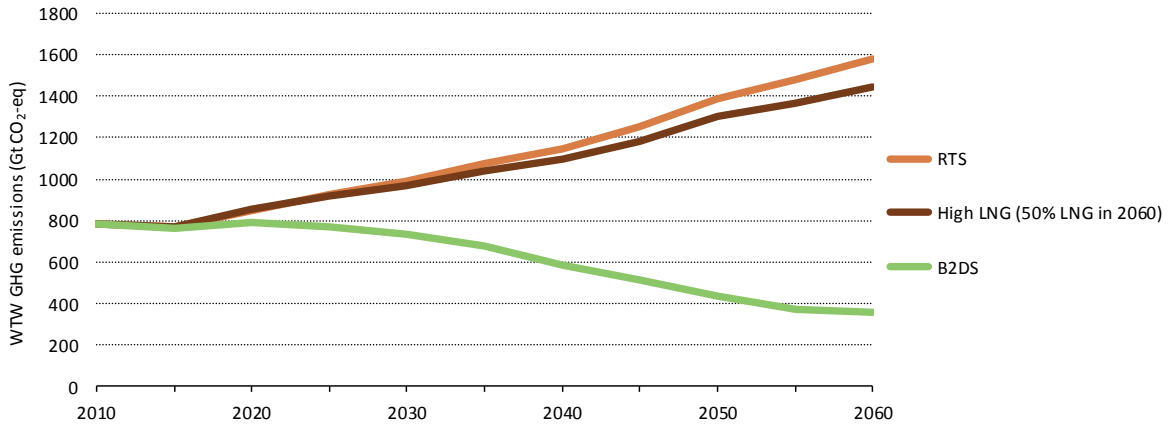

Figure 2: Well-to-wheel GHG emission reduction with a high LNG fuel mix relative to the RTS and B2DS
Source: IEA Energy Technology Perspectives 2017

1 We consider that container ships are unfit to use sails and therefore have a lower efficiency improvement potential.

2 The focus on biomass-based low-carbon fuels adopted in the B2DS is imputable to several factors. First, limitations of electricity use as energy carrier in long distance applications, primarily due to high costs of batteries. Second, uncertainties on costs of technologies requiring the use of hydrogen as energy carrier. Third, expectations for higher barriers for the widespread adoption of hydrogen across the energy system.

15 LNG represents a limited fraction of the shipping fuel mix in the B2DS. The main reasons for this choice are: i. its limited GHG abatement potential (shifting 50% of the global fleet to LNG would reduce emissions only by about 10%, see figure 2); ii. its very limited uptake today, coupled with the need to invest in a costly distribution infrastructure that may soon be stranded; and iii. potential delays in the deployment of fuels having a greater capacity to reduce the carbon intensity of the shipping energy mix.

Reaching Paris Agreement targets: policy needs

16 Stimulating the market to adopt the technology levers outlined in figure 1 would not be possible without substantive policy support from IMO. The following short-, medium- and long-term measures are recommended in support of reaching Paris Agreement targets.

17 Candidate short-term measures (2018-2023):

.1 acknowledge the need for a revision of the ambition of the current EEDI framework and start working towards its implementation, aiming to apply it in the 2023-2030 period;

.2 fast track the development of an operational efficiency standard, stimulating investments for retrofits and the adoption of efficient operational practices, including slow steaming;

.3 develop a mechanism enabling the adoption of a CO_2 price for shipping fuel – including provisions for its revision over time, with the aim to match the ambition of the low carbon pathway for international shipping – and adopt it as soon as possible;

.4 expand port-based incentives and smoother logistics networks (see paragraphs 20 to 23);

.5 develop a policy framework aiming to reduce the overall carbon intensity of shipping fuels over time, e.g. through low-carbon fuel standards or mandates for low-carbon fuels, to stimulate cost reductions through technology learning and scale; and

.6 launch a stakeholder consultation group to identify the most promising pathways for zero carbon shipping, and work towards the definition of policies (such as low-carbon fuel standards or mandates). We commend the proposal made by Japan in document ISWG 1/2/5 in this regard.

18 Candidate medium-term measures (2023-2030):

.1 implement the revision of the EEDI with a level of ambition that matches the values discussed in paragraph 12.1;

.2 implement and strengthen the operational efficiency standard to further encourage retrofits, utilization and improvements, with a level of ambition aligned with the values discussed in paragraph 12.2;

.3 implement policies aiming to reduce the overall carbon intensity of shipping fuels, such as low carbon fuel standards or mandates, reflecting the ambition outlined in paragraph 13; and

.4 fully implement a GHG emission pricing mechanism.

19 Possible long-term measures (>2030):

.1 scale up the ambition of policies outlined in paragraph 18, adjusting to the needs set out in the strategy for the reduction of GHG emissions from ships; and

.2 revise and update the Strategy for the reduction of GHG emissions from ships as needed.

Squaring top-down and bottom-up approaches

20 Although this might not fall under the direct IMO jurisdiction, Member States could adopt bottom-up initiatives at national and regional level, complementing a top-down approach to reducing shipping's GHG emissions, as indicated in document MEPC 71/7. These initiatives could be involving all actors within the maritime logistics supply chain, including shippers, ports and energy providers. Port-based incentives, as highlighted in document ISWG 1/2/11, and national or regional carbon pricing and market-based mechanisms are the most relevant instruments in this group.

21 Port-based incentives typically include port facilities (e.g. shore power, LNG bunkering), environmentally differentiated port fees, green berthing policies. The forthcoming ITF/OECD report *Addressing greenhouse gas emissions from shipping: lessons from port based incentives* shows that, if widely applied, port incentives could affect a large number of ships, delivering large GHG emission reductions. Widening the differences in port fees for ships based on their environmental performance (the gap between best and worse performers is now mostly between 5% to 20% of port fees) would further strengthen this impact. Port-based incentives have so far been voluntary for both shipowners and ports, but could win in effectiveness if made mandatory, harmonized internationally, and linked with mechanisms enabling both shippers and ports to communicate on the extent to which they are using or servicing environmentally friendly ships. A first step towards a less voluntary nature could be agreeing global guidelines.

22 Various countries are already engaged in carbon pricing/market-based mechanisms for shipping. Examples include Norway with its NO_x fund and Shanghai with its inclusion of domestic shipping and ports in their emission trading scheme. A broader application of these schemes could provide incentives to lower emissions in a national or regional context, with revenues raised channelled into deployment of innovative solutions, without necessarily distorting global level playing fields; and could also generate important lessons relevant to the introduction of market-based mechanisms at the global level aimed at reducing GHG emissions from shipping.

23 In addition to port incentives and carbon pricing/market-based mechanisms, smoother transitions within the maritime logistics supply chain could help to reduce emissions. Examples of such transitions include ship waiting time and unproductive terminal moves, which could be considered the result of lack of alignment between the main actors. This underlines the importance of cooperation between actors of the supply chain and a possible role for IMO to stimulate and facilitate such cooperation.

Action requested of the Working Group

24 The Working Group is invited to consider the scenario results and recommendations outlined in this document to set the level of ambition for the initial Strategy.

25 The Working Group is also invited to consider the measures listed in paragraphs 17 to 19 to be included in the "List of candidate short-, mid- and long-term further measures with possible timelines and their impacts on States" in the initial Strategy.