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CONSIDERATION OF CONCRETE PROPOSALS FOR MID AND LONG-TERM MEASURES AND ASSOCIATED IMPACT ASSESSMENTS IN THE CONTEXT OF PHASE I OF THE WORK PLAN AS WELL AS THE PROPOSAL TO ESTABLISH AN INTERNATIONAL MARITIME RESEARCH BOARD

Integrating a Low GHG Fuel Standard with IMO's GHG Strategy

Submitted by the World Shipping Council

SUMMARY

Executive summary:	Development of a Low GHG Fuel Standard has the potential to be a central component in IMO's GHG Strategy. This paper offers views on a set of issues critical to consideration of this important regulatory measure.
Strategic direction, if applicable:	3
Output:	3.2
Action to be taken:	Paragraph 8
Related documents:	MEPC 78/7, ISWG-GHG 11/2/2, ISWG-GHG 11/2/5, ISWG-GHG 10/5/3, ISWG-GHG 10/5/6, MEPC 77/WP.7, MEPC 44/11

Introduction

1 The Organization is currently embarking on an effort to identify mid and long-term measures that will be critical to implementing IMO's GHG Strategy. These discussions include consideration of regulations that may prescribe standards and phase-in of low GHG fuels. A Low GHG Fuel Standard (LGFS) may stand alone or it may serve to complement a market-based measure (MBM).

2 We identify five functions that we believe should be considered as the Working Group and Committee discusses how a LGFS can serve as an integral component of the IMO GHG Strategy. The paper describes how efforts to develop an effective LGFS need to consider the six critical elements presented in MEPC 78/7. We also outline three specific issues we

believe are important policy issues with practical import as we consider how an LGFS may serve as a central component of the IMO GHG Strategy (Paragraphs 5 through 7).

Necessary functions of a Low GHG Fuel Standard

3 Design and implementation of a LGFS should achieve the following functions that contribute to the IMO GHG Strategy next phases. A Low GHG Fuel Standard or LGFS:

.1 needs to reduce overall emissions of GHGs, i.e., decarbonization, not simply relative reductions in GHG per unit transport work or indexed (relative) GHG intensity.

.2 should apply technologically neutral standards applicable to energy transition pathways to promote innovation without energy transition pathway bias.

.3 should follow internationally accepted science-based methods and align with guidelines updated through UNFCCC/IPCC Assessment Reports so that the IMO GHG Strategy conforms with the Organisation's mandate from the UNFCCC in Article 2.2 of the Kyoto Protocol and applicable guidance under Decision 2/CP.3 (Reference MEPC 44/11).

.4 needs to define performance expectations for future fuels and technologies that are informed by life cycle assessment methods/guidelines related to GHG performance, production energy costs, and fuel handling and storage costs.

.5 should accommodate fleet pooling, recognising that that fuel production and distribution clusters rely upon collective fleet demand. Pooling across fleets offers a critical advantage for the energy transition incentivized by a LGFS, and can help implement a LGFS phase-in schedule.

Critical Considerations

4 An effective LGFS will consider and align with the six critical elements presented in MEPC 78/7, namely: i) Fuel Life Cycle Analysis; ii) New Ship Designs; iii) Integrated Production and Supply; iv) Research and Innovation Investment; v) Green Corridors; and vi) Global GHG (Carbon) Pricing.

.1 **Fuel Life Cycle** quantification is intrinsic to a LGFS concept. Fuels to be included in LGFS need to achieve GHG reductions that can be certified. LGFS certification will depend upon quantitative life cycle analytical methods, describing both the upstream (Well-to-tank or WtT) and downstream (Tank-to-Wake or TtW) GHG emissions.

.2 **New Build Standards** may be necessary to consider whole-ship design for energy efficiency and matched with LGFS future fuels. Fuels transition can be conceived to varying degrees as:

.1 Compatible with existing shipboard power system technologies (at the most simple, drop-in fuels for existing ships). Existing (i.e., market-ready/proven) vessel and engine designs may achieve near-term (but potentially limited) GHG reductions using drop-in or near drop-in LGFS fuels.

.2 Requiring advances in shipboard system design integrating power systems and other technologies (at the most simple, new ship designs). New build standards for vessel designs may require advanced (i.e., not yet market-ready) LGFS fuels produced using nearly 100% renewable energy production (or certified zero).

.3 **Integrated Production and Supply** of fuels that meet LGFS performance criteria will need to serve a complex marine fuel supply market. LGFS phase in needs to develop stable and predictable demand for low and zero-GHG fuels. Production and supply must be:

.1 Sufficient to make production of these fuels economically worthwhile either in the maritime sector itself or in combination with other sectors' demand for LGFS fuel production; and/or

.2 Augmented through national government commitments through regulatory mandates or incentives.

.4 **R&D Investment** to ensure LGFS performance, to address shore infrastructure safety and reliability, and to develop commercially ready onboard designs, requires research and innovation of both shoreside infrastructure and shipboard systems. Note recent proposal in MEPC 78/7/3.

.5 **Green Corridor** provisions along with pooled fleet reporting can help to define LGFS implementation phases. The challenge of a global phase-in of a LGFS requires consideration of geographic:

.1 Opportunities that can serve as catalysts to accelerate transition to LGFS fuels; and/or

.2 Conditions or barriers delaying successful implementation of an LGFS.

Specific elements to include in a Low GHG Fuel Standard

5 LGFS performance requirements and phase-in schedules should not exceed life cycle GHG reduction potential(s) for an inclusive set of candidate marine fuels informed by technology and engineering insights; e.g., LGFS requirements cannot be arbitrarily set, either globally or within geographic regions (e.g., Green Corridors). Currently, life cycle models for renewably derived fuels define GHG reductions for future fuels to be non-zero (i.e., greater than zero GHGs). Relative GHG reductions compared with current fuels range between 85% and 96%, suggesting best-case LGFS performance requirements that may be "near-zero". Moreover, the pace at which nations can produce renewably derived marine fuels will determine how quickly fuels meeting "near-zero" LGFS performance can be made available

(regionally and eventually globally). Therefore, LGFS phase-in setpoints informed by the state of science and engineering for life cycle assessment, and milestones should be defined by the pace of progress in renewable energy production of LGFS fuels.

.1 An illustration is provided here to illustrate how this applies to renewably derived fuels such as e-Hydrogen (H_2), e-Ammonia (NH_3), e-Diesel, e-Methanol (CH_3OH), e-LNG (CH_4) using the MARIN ESSF model. Figure 1 and Figure 2 compare four e-fuels under differing shares of renewable electricity production. Note that current life cycle models identify fuels produced with 100% renewable energy to be "near-zero", i.e., around 85% to 90% reduction in GHGs compared with current marine fuels. (Note: graphs use MARIN ESSF data for GHG equivalent ($CO_{2\text{-}e}$) based on GWP100; relevant discussion in paragraphs 4.3 and 9.)

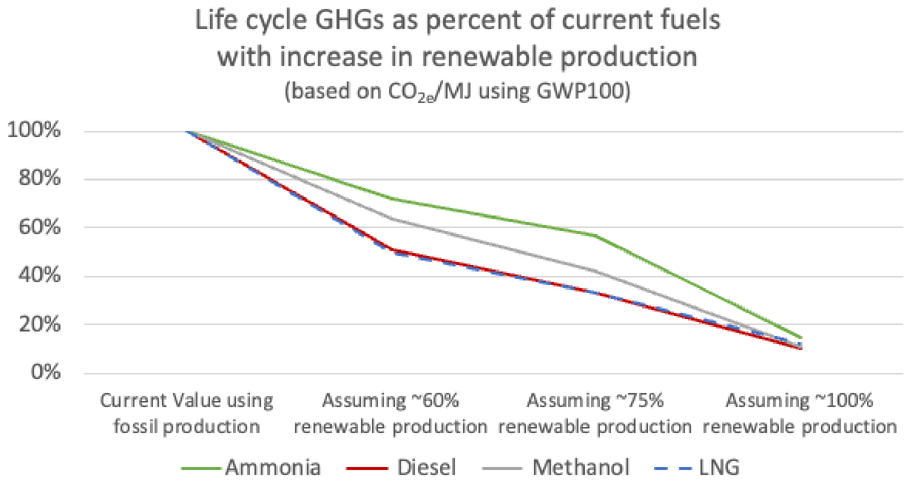

Figure 1. Life cycle GHGs as percent of current fuels (y-axis) with increased renewable e-fuels production (x-axis)

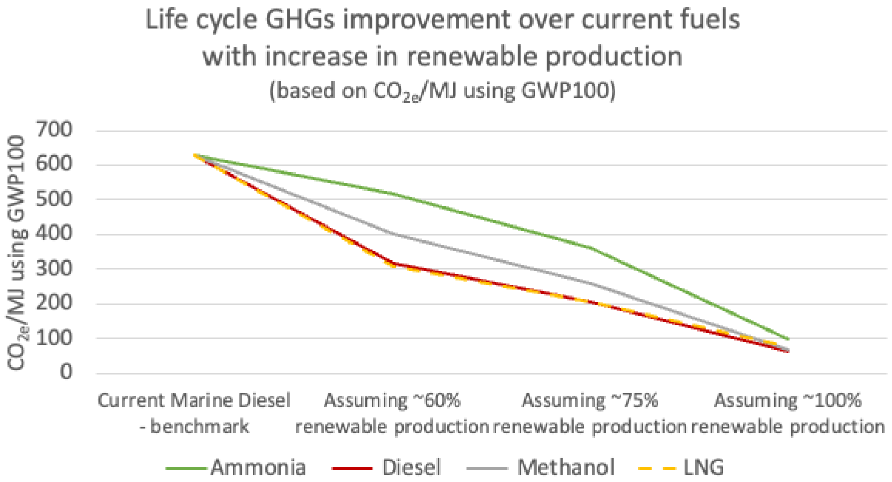

Figure 2. Life cycle GHGs performance (y-axis) across current and renewable e-fuels production (x-axis)

.2 To be clear, Figure 1 and Figure 2 DO NOT indicate which fuels are "best", firstly because such a determination requires economic information not represented in life cycle GHG data. For example, production of one fuel could be more (or less) economic and high performing as a LGFS fuel, more cost-effectively achieving a near-zero target. Secondly, a determination using both technical and economic criteria can be expected to vary by vessel type, by geographic region, etc.

.3 LGFS targets need to: i) raise the ambition of renewable production and supply; and ii) set phase-in milestones informed by availability of LGFS fuels. While averaging of high-GHG and emerging LGFS fuels can help inform the setpoints of LGFS standards, an LGFS phase-in needs to be tied to progress in renewable production of fuels.

.1 For example, a phase-in milestone reducing GHGs by some ~25% could be achieved by Ammonia produced by an electricity grid using 60% renewable shares. EU Green Deal ambition is to have 60% renewable energy by 2030 and the rest of world has not committed to that goal.

.2 Timing an LGFS phase-in goal of ~25% GHG reduction, therefore, may depend upon global pace of transition or be defined for a region (corridor) where conditions favor synergistic progress.

6 Pooling offers a critical advantage for the energy transition incentivized by a LGFS. Fuel markets are not ship-specific, and the uptake of LGFS fuels must consider how fuel production and distribution clusters rely upon collective fleet demand. Introduction of LGFS fuels is unlikely to occur uniformly, presenting challenges for a uniform global phase-in schedule. Supply development depends first upon economic and policy conditions that influence locations of production and demand. Fleet pooling of LGFS uptake can significantly help the implementation of an LGFS phase-in schedule for at least three reasons.

.1 Pooling can accelerate global average phase-in across fleets where vessels operating on routes with greater access to LGFS fuels can adopt their use in greater quantities (blends) and share fleet compliance where other vessels in the pool have delayed access.

.2 Pooling facilitates information sharing necessary for technology diffusion among vessels, which advances commercial readiness levels for fleet uptake of LGFS fuels.

.3 Pooling offers a regulatory signal that can incentivize the necessary and timely co-investments among governments and public-private partnerships to develop integrated production and supply of LGFS fuels.

7 LGFS needs to align with the science-based metrics established and updated through the IPCC Assessment Reports. Life cycle assessment consideration of upstream (WtT) inputs to certify LGFS fuels should rely upon the same suite of GHGs, and use common GWP conversion values, with state-of-science accepted in science decision support for the UNFCCC.

.1 The IMO GHG Strategy should conform with the Organisation's mandate from the UNFCCC in Article 2.2 of the Kyoto Protocol and applicable guidance under Decision 2/CP.3 (Reference MEPC 44/11). Other metrics can be included for information and investment decision support, but these should remain outside of the regulatory phase unless and not until UNFCCC updates its direction to the Organisation and relevant decision guidance if modified.

.2 This is reinforced by recent studies on sustainability criteria and life cycle assessment methods. "Most methods recommend (or require) the use of a 100-year time horizon to establish the CO_{2e} characterisation factors for all GHG emission flows, and this is by far the most prevalent time horizon used in the scientific literature … when considering longer term climate impacts, the use of a 100-year timeframe is more scientifically appropriate" (Ricardo Energy & Environment, Report for the Study on Sustainability Criteria and Life Cycle GHG Emission Assessment Methods and Standards for Alternative Marine Fuels, Final Report, Report for: IMO Low Carbon GIA, report ED14897, Issue: 1A, 06 December 2021). As stated in ISWG-GHG 11/2/2, WSC also considers it appropriate to examine GWP20 estimates as supplementary information.

Action Requested of the Working Group

8 The Committee is invited to note the above information and take action as appropriate.