



Written Statement of the

World Shipping Council

Before the

House Committee on Natural Resources

on

Ocean Climate Action: Solutions to the Climate Crisis

November 17, 2020

1. Introduction: The World Shipping Council and the Liner Shipping Industry

The World Shipping Council¹ (“WSC” or the “Council”) is a non-profit trade association whose goal is to provide a coordinated voice for the liner shipping industry in its work with policymakers, the public, and other industry groups with an interest in international transportation.

WSC members comprise an industry that has invested hundreds of billions of dollars in the vessels, equipment, and marine terminals that are in worldwide operation today. Approximately 1,200 ocean-going liner vessels, mostly containerships, make more than 28,000 calls at ports in the United States during a given year – almost 80 vessel calls a day. This industry provides American importers and exporters with door-to-door delivery service for almost any commodity to and from roughly 190 countries. Approximately 35 million TEU² of containerized cargo are currently imported into or exported from the United States each year. The container shipping industry is one of the most important facilitators of the nation’s growth and on-going economic

¹ A complete list of WSC members and more information about the Council can be found at www.worldshipping.org.

² A TEU is a twenty-foot equivalent unit. Most containers are 40 feet in length and equal 2 TEUs.

activity. Ocean shipping is also – by far – the most fuel-efficient form of transportation on the planet.

Provided below for the Committee’s awareness and consideration are: a discussion of the industry’s efforts to transition to zero or near-zero emissions fuels; a description of an international research and development proposal to foster that transition; and comments and recommendations on Sections 1401 and 802 of HR 8632. WSC staff would welcome the opportunity to discuss these subjects further with Committee Members or staff.

2. Reducing Greenhouse Gas (GHG) Emissions and the Technological Challenge of Transforming the International Fleet

The bill on which today’s hearing is focused – the Ocean-based Climate Solutions Act (HR 8632) -- contains several provisions designed to increase the understanding of and take steps to reduce GHG emissions from the shipping industry. While we will provide later in this paper specific comments and recommendations on the bill’s monitoring, reporting and verification and other proposals, the bill cosponsors’ interest in reducing GHG emissions shipping is indeed timely. The issue of reducing GHG emissions is today the single largest issue under consideration by the International Maritime Organization (IMO), a specialized United Nations body, in which the U.S. plays an active role, that regulates international shipping.

International ocean shipping, including all sectors (container, bulk, tanker, etc.), carries over 80% of the world’s international trade and generates between 2-3% of global CO₂ emissions. In 2018, the IMO adopted a resolution that set two goals for GHG reductions from shipping. The first goal is a 40% increase in overall fleet efficiency by 2030. The second goal is a 50% reduction in absolute emissions by 2050 (versus a 2008 baseline), with emissions to be reduced to zero or near zero as soon as possible after 2050.

It will likely be possible to meet the 2030 goal through a combination of the mandatory ‘Energy Efficiency Design Index’ requirements for new ships that became effective in 2013 and new efficiency regulations covering the existing fleet that are expected to be adopted by the IMO in 2020. The existence of a highly competitive liner shipping market, the fact that fuel is the biggest variable cost for vessel operators, and increasing societal and customer requirements to reduce emissions provide vessel operators with powerful incentives to make their operations as efficient as possible and will help reach that goal.

Although the IMO’s 2030 GHG goal can be met by operational and design measures applicable to a fleet that remains fossil-fuel based, the 2050 reduction goal and the move thereafter to a zero or near-zero GHG emission status for ocean shipping cannot be met by an industry that uses fossil fuels as its propulsion base.

In order to meet these ambitious global goals, it is imperative that new fuels and related propulsion, fuel storage, and fuel infrastructure are engineered and deployed. Moreover, that transformation in the fuels used by ocean-going vessels must begin in the near future in order

for the change-over to occur in time to meet the IMO's deadlines. Ocean vessels have a commercial lifespan of 20-25 years, which means that investment decisions made today will be with us for a generation. This means that we must act now to develop new fuels and related technologies if we are to avoid locking in fossil-fuel based vessels for a period that extends beyond the 2050 target date for the most drastic GHG reductions.

The challenge the industry faces is that, although there are promising possibilities for the fuels of the future, none of the candidate fuels are available today to be used to power large ships serving trans-oceanic routes. Hydrogen, ammonia, and other fuels have been identified as possible replacements for fossil fuels in marine applications, but these fuels present storage, handling, and production challenges that must be overcome before they are practically and safely available for widespread use. There may also be additional options which have not yet received the same level of examination.

Vessels that sail across oceans must obviously carry their fuel with them, and that means fuels must be safe to handle and carry, must be energy-dense so that they do not displace too much cargo space, and must be widely available. All of these critical criteria represent technical challenges that will require substantial effort and engineering expertise to resolve. The solutions will not simply appear by themselves.

To address this challenge, WSC and seven other shipping organizations recently submitted to the IMO a comprehensive proposal, which the IMO is considering this week, to establish a \$5-6 billion research and development (R&D) effort over a 10 to 12 year period to identify the fuels and related technologies of the future that will be necessary for the maritime industry to meet the IMO's aggressive decarbonization goals. This R&D program would be organized under the IMO and paid for by industry through a fee on each ton of marine fuel burned. The R&D proposal is discussed in further detail below and a copy of the complete proposal to the IMO is attached as Exhibit A. WSC would welcome the inclusion in HR 8632 of a statement supporting this proposal.

3. The Proposal for an International Maritime Research and Development Board

As mentioned in the introduction above, the baseline facts that the international shipping industry faces with respect to GHG reduction may be summarized as follows:

- The 174 member countries that participate in the IMO have already set ambitious goals and deadlines for reductions in GHGs from shipping.
- The most ambitious of the IMO's GHG reduction targets cannot be met by a global vessel fleet that relies primarily or even substantially on fossil fuels.
- Although there are promising fuels and related technologies that may be practically applicable to trans-oceanic vessels at some point in the future, there are no low-

carbon or zero-carbon fuel/propulsion systems available today that can be used by large trans-oceanic vessels.

- Because ocean-going vessels are long-lived assets (20-25 years), we must move as quickly as possible to develop and deploy low-carbon and zero-carbon propulsion systems and fuels to avoid stranded assets and delays in implementing next generation technologies.

As the industry evaluated this set of facts, it became clear that an essential component in meeting the IMO's deadlines for reducing GHGs from international shipping is to create and support a dedicated research and development effort to identify and develop practical application technologies that can replace fossil fuel propulsion for large ships. It also became apparent that, although there are a number of R&D efforts underway around the world, many of these are focused on short-sea applications or are not of a size and scale to be able to develop global solutions within the required timeline. Our focus therefore turned to the question of how the IMO could be used as the organizing body to create and sustain an R&D effort that could deliver the required solutions.

The IMO is the only body in the world that is capable of bringing together the elements that are necessary for the successful creation and maintenance of an R&D effort of the size necessary to produce results within the time required. This is the case for several reasons:

- The IMO is the only existing body with the reach to coordinate a global R&D effort focused on commercial maritime transport.
- Any global R&D effort must have a mandatory industry financial contribution mechanism in order to generate necessary funding, avoid free riders, and maintain a level commercial playing field.
- In order to implement a sustainable funding mechanism, any effective industry-wide R&D program will need to have access to the IMO's fuel consumption database, as well as a defined communication procedure with flag states, both of which the IMO already has in place.

Once we determined that the magnitude of the challenge and the need for quick action required a substantial and sustained R&D effort to find and develop the propulsion systems of the future, and we determined that the IMO was the right body to organize that effort, we began crafting a proposal to the IMO that describes how this critical R&D work can be undertaken and funded. After a period of over two years during which we consulted with IMO member states, environmental groups, technical experts, academics, and other industry groups, on December 18, 2019, the World Shipping Council and seven other international shipping organizations submitted to the IMO a proposal to create the International Maritime Research and Development Board (IMRB).

A copy of the comprehensive submission that we made to the IMO on the IMRB proposal is attached to this testimony as Exhibit A. Boiled down to its essence, the decarbonization R&D effort would be a global, targeted grant program funded by a mandatory contribution based on each ton of fuel burned. This is a detailed proposal that addresses a number of issues regarding the purposes and management of the IMRB that will have to be considered in order for the proposed R&D structure and effort to yield the necessary results. Among the issues addressed by the proposal are:

- 1) R&D objectives of the IMRB.
- 2) Funding of the IMRB, including a structure that ensures that all funds are delivered directly to the IMRB, with no involvement of member country tax authorities.
- 3) Governance of the IMRB, balancing high-level IMO oversight with the need for an independent, knowledgeable board of directors and professional staff that is nimble and adaptable in deploying the assets of the IMRB to obtain effective R&D results.
- 4) Management of grants and contracts.
- 5) Provisions on conflict of interest.
- 6) Treatment of intellectual property generated through research efforts, balancing the need to incentivize participation by qualified experts, companies and institutions with the need for the results of IMRB-funded research to be made broadly available in order to encourage competition in developing next-generation fuels and supporting technologies.
- 7) Dissolution of the IMRB upon completion of its work.

The IMRB proposal, if adopted by the IMO, would substantially accelerate and increase the scope of R&D work that is essential to decarbonizing shipping. That research is not occurring today on a schedule or on a scale that will yield results in time to meet the schedule set by the IMO, or at the speed increasingly demanded by society at large, and there is no indication that any one company or any one country would be willing or able to undertake such a research effort on its own. Luckily, we have in the IMO an existing international organization with global participation that is already deeply involved in the issue of decarbonizing shipping. All that is required in order to bring this powerful R&D tool into being is the political will to consider and adopt the IMRB proposal.

We are optimistic that, as more IMO member states understand the IMRB proposal, the more they will support it. In addition to the fact that this is the only proposal currently before the IMO that seeks to directly implement decarbonization through research and engineering solutions, making this industry-funded investment in R&D makes business and policy sense. The alternatives to finding technological solutions that allow the ocean transportation industry to

reduce and ultimately eliminate its carbon emissions are to either reduce the transportation services that support world trade or to continue on a path of increasingly burdensome and low-yielding regulations of a fossil-fuel powered industry. Neither of those outcomes – artificially constraining trade or chasing ineffective regulation – is desirable. Finding non-fossil-fuel solutions will allow international ocean shipping to continue to grow to serve growing world trade, thus providing a sustainable path for both climate and economy. It is possible to de-couple trade and GHG emissions, and for the former to grow while the latter decline.

International shipping is by far the most efficient means of cargo transportation on the planet, and advances in ship design, size, and operational strategies have allowed container ships, for example, to increase their efficiency by as much as 50% over the past decade. These are impressive advances, but the fact is that over time these advances will be overtaken by trade growth, and it is not possible in the long run to reach the world's decarbonization goals for shipping by continuing to burn fossil fuels.

Because we do not yet know what specific fuels and related technologies will replace fossil fuels, the logical next step is to do the research to answer that question and to make the next generation of fuels available for commercial deployment in the world's fleet. The IMRB proposal to the IMO provides the funding and the structure to make that essential R&D work happen, and we look forward to working with the IMO member states to bring the IMRB into existence. We would welcome the active support of the United States in that work.

4. WSC Comments and Recommendations on Provisions in HR 8632

A. Proposal to Establish a U.S. Monitoring, Reporting and Verification Regime (Title XIV, Section 1401)

Section 1401 would direct NOAA to establish a mandatory carbon dioxide monitoring, reporting and verification (MRV) regime for vessels greater than 5,000 gross tons. WSC and its member companies have substantial concerns with the U.S. establishing a unilateral MRV regime. First, while the European Union (EU) several years ago developed an MRV proposal, the EU did so with the overt objective of pushing the IMO, which is best suited to establish a global system for collection and sharing of emissions data for commercial ships, to establish a data system. As a result, the IMO has established a "Data Collection System" (DCS) to which vessels must report carbon dioxide emissions data. The IMO DCS system collects and makes available to IMO member states, including the United States, the same data that would be collected from HR 8632's proposed MRV program. Since the U.S. can obtain the data that it needs from the IMO DCS, it would be patently unnecessary for the U.S. to invest the time and tax dollars to establish its own data collection system.

Second, U.S. establishment of a carbon dioxide MRV regime would send a signal to other maritime states that unilateral action to collect data from shipping is acceptable. Such action would not only undermine the IMO DCS program, but it would place an unnecessary burden on the ships carrying U.S. import and export cargo in U.S. – international services. Such ships would

be subjected to duplicative reporting requirements to the IMO, the U.S. and any other countries that decided to establish their own carbon dioxide data collection systems.

Finally, U.S. development of an MRV regime would require the expertise of the U.S. Coast Guard (USCG) and the U.S. Environmental Protection Agency (EPA), which have the necessary expertise in shipping and emissions measurement to properly implement and manage such a system. Furthermore, establishment of such a regime pursuant to HR 8632 would require lengthy negotiations on how to fairly and appropriately define “transport work” for the various types of vessels subject to the requirements.

WSC respectfully urges the cosponsors of HR 8632 to strike Section 1401 from the bill and to instead direct the USCG and EPA to use the data collected in the IMO DCS to monitor and report on the shipping sector’s carbon dioxide emissions in the United States.

B. Proposal to Designate Areas of Importance to Marine Mammals in Which 10 Knot Speed Restrictions Would Apply (Title VIII, Section 802)

Section 802 would direct NOAA to work with the USCG to establish marine mammal “areas of importance” in: all areas designated as critical habitats; important “feeding, breeding, calving, rearing, or migratory habitat” areas; and areas where there is high whale mortality, injury or harassment, including areas where there is disruption of vocalization patterns through underwater vessel noise. Nationally-designated sanctuaries, parks, refuges and monuments as well as areas of high marine mammal productivity would also be considered for designation as “areas of importance”. The bill would then require NOAA to establish seasonal or year-round 10 knot or lower speed restrictions in all designated “areas of importance.”

WSC and its members have collaborated for years with NOAA, the USCG and various state and local groups to reduce the risk of whale ship-strikes. Needless to say, no ship owner or operator ever wants to hit a whale. Our industry worked closely with NOAA to analyze ship AIS data against migratory patterns of North Atlantic Right Whales and to model ship-strike simulations at various vessel speeds. NOAA has implemented two main approaches for reducing the risk of ship strikes.

NOAA implemented dynamic management areas (DMAs) in which locations of sighted whales are transmitted to vessels so the areas can be avoided. The use of DMAs is the most reliable way to reduce whale ship strikes because it keeps the ships away from known locations where whales have been spotted or are migrating. While DMAs require assets and technology, such as aircraft and remote tracking devices, to sight and/or monitor whales so their locations can be reported to ships, DMAs have proven effective at protecting the whales by keeping ships away from them. The presence of AIS and other real-time communication and collision avoidance systems onboard most commercial ships has helped make the use of DMAs a practicable and effective solution.

NOAA also implemented seasonal management areas (SMAs) extending out 20 nautical miles from most major U.S. East Coast ports during North Atlantic Right Whale migratory periods for each area. When the SMAs are seasonally active, vessels are required to operate at 10 knots or less within the designated areas. While industry compliance with these restrictions is high, as shown is vessel AIS track data, the extent to which the SMAs have been successful is not clear, in part due to limited ship strike data.

While we appreciate the desire to include whale protection provisions in this bill, we have concerns with the proposed approach in Section 802 as it focuses exclusively on one policy approach - 10 knot speed restrictions - to address whale risk. As already mentioned, DMAs work because they ensure that ships are alerted to and can avoid known whale locations. NOAA possesses and has already used its ample authority in many instances to address risks to whales through mandatory and voluntary measures. WSC believes that it makes the most sense for NOAA to use a science-based approach, which evaluates the efficacy, safety, and costs and benefits of particular approaches, before implementing protection measures rather than using a single tool (speed restrictions) to address all whale interaction and underwater noise issues.

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MARINE ENVIRONMENT PROTECTION
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REDUCTION OF GHG EMISSIONS FROM SHIPS

Proposal to establish an International Maritime Research and Development Board (IMRB)

Submitted by ICS, BIMCO, CLIA, INTERCARGO, INTERFERRY,
INTERTANKO, IPTA, and WSC

SUMMARY

Executive summary: This document proposes the establishment of an IMO GHG reduction research and development programme to accelerate the introduction of low-carbon and zero-carbon technologies and fuels as identified in paragraph 4.7.9 of the *IMO Initial Strategy on the Reduction of GHG Emissions from Ships*. The proposed action is considered critical to achieving the levels of ambition for 2050 and beyond set forth in the IMO Initial GHG Strategy. The co-sponsors propose that core funding would be provided via a mandatory R&D contribution per tonne of fuel oil purchased for consumption, which will be necessary to maintain an appropriate level of funding and to maintain fair competition between shipping companies. The co-sponsors propose that core funding of approximately five billion US dollars over the life of the programme would fundamentally alter the current level of investment in maritime R&D focused on the development of low-carbon and zero-carbon technologies. An effort of this scale is expected to be successful in identifying one or more technical pathways that can lead to the introduction of zero-emission ships across the maritime sector by 2030 and beyond.

*Strategic direction,
if applicable:* 3

Output: 3.2

Action to be taken: Paragraph 67

Related documents: Resolution MEPC.304(72); ISWG-GHG 5/4/4; MEPC.1/Circ.885 and MEPC 71/7/4

Introduction

1 This proposal is intended to serve as one component of an integrated IMO strategy to phase-out greenhouse gas (GHG) emissions, consistent with the Initial Strategy on the Reduction of GHG Emissions from Ships (hereafter referred to as the IMO Strategy) that was adopted by IMO in 2018 (resolution MEPC.304(72)). The IMO Strategy establishes ambitious targets, including the phase-out of GHG emissions '*as soon as possible this century*' and reducing annual GHG emissions from international shipping by at least 50% by 2050 compared to 2008.

2 To reach the 2050 ambition and to realize the full vision of the IMO Strategy, it will be necessary to develop a suite of low-carbon and zero-carbon technologies and fuels that will be the basis of the next maritime technology transition. The technologies necessary to achieve these ambitious goals do not yet exist in a form or scale which is commercially viable for widespread use by international shipping, especially for transoceanic voyages. But the co-sponsors are confident that these ambitions can be realized if the necessary research and development investments in developing low-carbon and zero-carbon propulsion systems and technologies are incorporated as part of an integrated IMO strategy.

3 The IMO Strategy calls, inter alia, for consideration of '*research and development activities addressing marine propulsion, alternative low-carbon and zero-carbon fuels, and innovative technologies [with] an International Maritime Research Board to coordinate and oversee these R&D efforts*' as one of the candidate short-term measures (see paragraph 4.7.9 of the IMO Strategy) to be considered by the Committee. Note that the above mentioned International Maritime Research Board in the IMO Strategy is the same as the International Maritime Research and Development Board (IMRB) proposed in this document.

4 The development, scaling and application of new technologies are probably the most important steps needed to deliver the levels of ambition set by the IMO Strategy. The IMRB and its coordinated R&D programmes would help accelerate the development of low-carbon and zero-carbon emission technologies and fuel systems that are specifically tailored for maritime application, especially larger transoceanic ships. The IMRB and the specific R&D programmes it could support would be expected to help deliver substantial GHG reductions in the mid to long term, but discussions to establish the IMRB will need to occur in the short term if the expected benefits are to be achieved in the time period consistent with the IMO Strategy.

5 The co-sponsors recommend that one of the specific research items to be undertaken through the IMRB (in addition to its work on low-carbon and zero-carbon technologies) would be work to identify technical and operational innovations that may be undertaken to address and reduce the high transportation costs that exist for many Small Island Developing States (SIDS) and other remote locations.

6 This document has been developed by the co-sponsors as a follow-up to document ISWG-GHG 5/4/4. The ideas proposed in this document are intended to facilitate discussion about the IMRB concept which, if adopted, would allow the maritime sector to take collective responsibility for decarbonising international shipping. The concept outlined in this document is intended to provide the necessary structure, direction and funding for successful development of low-carbon and zero-carbon technologies and fuels that may be used across the world fleet to achieve the vision and objectives of the IMO Strategy. The amount of funding to be applied is specifically intended to help accelerate the necessary research and development work that will be critical to delivering this. Notwithstanding the concept outlined in this document, it is emphasized that responsibility for decarbonisation of the sector as a whole is not the sole responsibility of shipping companies, and must ultimately be driven by a broad set of stakeholders.

Proposed IMRB Concept

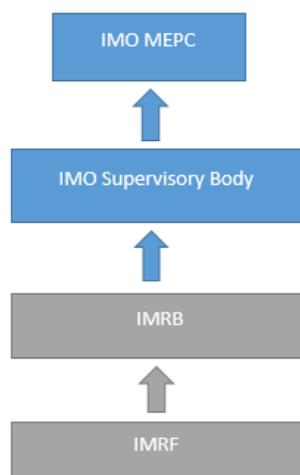
7 The IMRB would play a critical role in accelerating the development of low-carbon and zero-carbon emission CO₂ fuel systems and technologies for international shipping, with a negligible impact upon trade or the economic interests of IMO Member States.

8 With the support of the industry, the IMRB could be established by IMO relatively quickly, as a non-governmental research and development organisation which would report to IMO, together with a mechanism for providing the necessary core funding from *shipping companies* via a mandatory system of R&D contributions per tonne of marine fuel oil purchased for consumption by ships. To facilitate the involvement and active participation of other important stakeholders, the co-sponsors invite Member States to encourage and/or require other relevant stakeholders to participate and contribute to the International Maritime Research Board and its work. The IMRB may also require some grant recipients to contribute a defined percentage of funds (e.g. co-funding of a specific proposal) as a condition of grant approval, thereby expanding the pool of total resources available.

9 The IMRB would report to a body of representative IMO Member States established by the MEPC in order to provide oversight of its activities, including approval of the IMRB's budget. The supervisory body would report to the MEPC.

10 The IMRB concept would include three functional components:

- .1 International Maritime Research and Development Board (IMRB);
- .2 IMO 'supervisory body' (reporting to the MEPC) to provide oversight and approve the IMRB budget; and
- .3 International Maritime Research Fund (IMRF) that would provide industry financing for the IMRB and the research and development programmes it would undertake.



11 The IMRB would consist of two main elements, both financed from the budget set for the IMRB:

- .1 an IMRB Board of Directors that would oversee the work of the IMRB; and
- .2 a Secretariat, led by an Executive Director, that would include both professional and administrative staff to manage the substantive work of the IMRB, implementing its strategy and R&D programmes, and providing financial oversight and administration of the IMRF and the R&D contribution system.

12 It is envisaged that the IMRB and the IMRF might have a life of between 10 and 15 years. Once the MEPC has concluded that the IMRB has fulfilled its objectives, the IMRB and IMRF would be formally dissolved.

13 The co-sponsors do not consider the proposed IMRB concept to be a market-based measure (MBM). Neither is this proposal intended to frustrate or delay the development of an MBM should there be consensus for this among Member States. The intention is simply to accelerate development of low-carbon and zero carbon technologies and fuels for use in the commercial maritime sector. However, if this IMRB concept is taken forward by the Organization, it could potentially provide some of the architecture for the possible future development of a levy-based MBM for shipping, in a manner that would reduce the possibility of market distortion.

14 Most importantly, this proposal is considered an essential step in developing the necessary fuels and technologies that are critical to achieving the introduction of zero-carbon vessels (ZEVs) across the commercial maritime fleet, especially with regard to large transoceanic ships. If the IMRB concept is taken forward, the Committee would subsequently need to consider what regulatory measures or economic instruments may be appropriate to facilitate the transition from the carbon-based fuels and ships in today's fleet to a fleet made up of low-carbon and zero-carbon ships.

15 It is emphasized that a mandatory contribution system for shipping companies, established via amendments to MARPOL or another appropriate mechanism, will be vital for this concept to work. This is to ensure a level playing field and the maintenance of the necessary funding for the IMRB and its programmes. Without a mandatory mechanism, there would be no guarantee that every shipping company worldwide would contribute on a fair and equal basis.

16 Should the Committee choose to further consider and develop this proposal, the Committee would need to carefully consider what legal mechanism would prove most practical to establish and finance the IMRB. The co-sponsors believe that the IMRB may be established by adopting a new Chapter 5 outlining regulations for greenhouse gas reduction research and development under MARPOL Annex VI, but we also recognize that the Committee will want to carefully consider what mechanism is most appropriate.

International Maritime Research and Development Board

17 The objective of the IMRB would be to accelerate the research, development and deployment of low-carbon and zero-carbon fuels, energy sources, propulsion systems and other new GHG reduction technologies that will be necessary to achieve the levels of ambition for 2050 and beyond set by the IMO Strategy. The IMRB would perform the necessary management responsibilities involved with directing an international research and development programme of this scale.

18 The IMRB would operate under a Charter approved by the MEPC that would set out the primary research and development objectives to be pursued and achieved, as well as critical principles, operating parameters and expectations for the IMRB. The Charter would also include the procedures for selecting the members of the IMRB Board of Directors and the Secretariat. Annex 1 of this document sets forth a possible draft Charter to provide an indication of what such a document may include, recognizing that the Charter would subsequently need to be further developed should Member States decide that this IMRB concept should be taken forward.

19 Consistent with the agreed Charter, the IMRB would undertake a broad spectrum of activities and management functions. Specific responsibilities would include:

- .1 development, direction, management and administration of an international maritime research and development strategy designed to promote the development of low-carbon and zero-carbon technologies and fuels for use across the maritime sector, including propulsion systems and fuels suitable for application in transoceanic commercial shipping;
- .2 identification, definition and ongoing refinement of the specific research priorities consistent with the mandate and Charter of the IMRB;
- .3 development of specific R&D programmes and request for proposals, review of proposals received, and decisions concerning specific project approval and funding;
- .4 consideration of changes and modifications to specific research and development objectives in light of project results, technology developments, and experience gained;
- .5 preparing a detailed budget and report each year for review and approval by IMO;
- .6 administering the collection of R&D contributions to the IMRF and the issuance of evidence of contributions having been made by shipping companies, both annually and immediately via an automated payments system;
- .7 management and administration of the IMRF including all relevant fiduciary responsibilities associated with the management, accounting, and investment of IMRF funds; and
- .8 providing regular progress reports, assessments, and recommendations to the new IMO supervisory body (reporting to the MEPC) that might be established for this purpose.

20 The IMRB would direct and manage research and development projects consistent with its mandate. Actual research projects would be undertaken through qualified third-party research institutions and other qualified entities. The research and development work would be subject to specific deliverables and constraints as per contract or specific binding grant conditions. In particular, these would require recipients of any funding to comply with appropriate intellectual property principles that would be developed as a guide for work undertaken as part of IMRB programmes or grants.

21 For the purpose of the proposal, "development" is intended to mean 'applied research' only. Although this work would include the development of working prototypes or, for example, addressing technical and safety issues associated with the bunkering, use and storage of new fuels, this would not include commercial development of relevant technologies and fuels, or taking new technologies to market. Commercial development of relevant technologies, fuels, and related infrastructure would be the responsibility of other stakeholders such as energy producers, ports, engine manufacturers and shipbuilders.

22 The composition of the IMRB Board of Directors will have to be agreed by the MEPC, with specific procedures to prevent potential conflicts of interest. It is envisaged that the IMRB Board of Directors would include non-governmental professionals with experience, inter alia, in research and development, shipping, shipbuilding, zero-carbon fuels, environmental energy policy, and other expertise relevant to the mandate of the IMRB.

IMO supervisory body

23 IMO oversight of the IMRB and its work would be achieved through the establishment of a new IMO supervisory body composed of an appropriate number of IMO Member State representatives with support from the IMO secretariat.

24 The details concerning the composition of this IMO supervisory body and its relationship with the MEPC would be determined by IMO Member States. While the IMO supervisory body may be composed of a defined number of IMO Member State representatives, it could be open to participation by any Party to MARPOL Annex VI that wishes to contribute views and information relevant to the work of the IMRB.

25 The IMO supervisory body would meet on a periodic basis to perform its functions and provide oversight and advice to the IMRB.

26 Specific responsibilities of the IMO supervisory body would include:

- .1 general oversight and advice to the IMRB and its Board of Directors on the strategic direction and annual budget of the IMRB;
- .2 ensuring that the IMRB performs its duties and responsibilities consistent with the objectives set forth in the IMRB Charter;
- .3 approval of the overall annual operating budget for the IMRB after considering recommendations and other relevant information provided by the IMRB and its Board of Directors;
- .4 reviewing, or if necessary undertaking, independent financial audits of the IMRB concerning the management and administration of the IMRF and related investments to ensure that the IMRB fully meets its fiduciary responsibilities in managing the IMRF, including the accounting of funds expended for specific research and development programmes, grants, and other funding provided by the IMRB using IMRF funds; and
- .5 advising upon recommendations made by the IMRB to modify and adjust the IMRB research strategy and budget as appropriate in light of technological, scientific, and research developments.

27 While the IMO supervisory body would approve the annual operating budget of the IMRB and provide advice on its overall strategy, decisions on the funding of individual R&D projects should be the sole responsibility of the IMRB and its Board of Directors. This provision is intended to avoid potential politicization of project specific funding decisions, and to allow the IMRB to focus on achieving the specific technical objectives as defined by its Charter. The suggested draft Charter set out in annex 1 further elaborates on the role of the IMO supervisory body.

Funding the IMRB

28 The funding of the IMRB would need to be sustainable with recurring income on an annual basis until the objectives of the IMRB have been met. This would be achieved through the establishment of an International Maritime Research Fund (IMRF) under the auspices of the IMRB.

29 The core funding of the IMRF would be provided via mandatory R&D contributions per tonne of fuel oil purchased for consumption. As noted in paragraph 8 of this document, the co-sponsors also invite Member States to encourage and/or require other relevant stakeholders to participate and contribute to the International Maritime Research Board and its work. Relevant stakeholders may include energy suppliers, marine engine companies, specialized research and development institutions, foundations, and other entities with substantial expertise relevant to the development of low-carbon and zero-carbon fuels and technologies in the commercial maritime sector.

30 Member State efforts to encourage or require other relevant stakeholders to participate in the formal work of the IMRB and to contribute to the financing of the IMRF would be expected to significantly expand the substantive expertise and financial resources available to the IMRB. Member State actions taken to expand involvement of key stakeholders can be expected to accelerate the ability of the IMRB to reach the goals set forth in the IMO Strategy and the objectives set forth in the draft Charter (see annex 1, Article 3 of this document).

31 All funds received would be held 'in trust' by the IMRF in order to conduct maritime R&D projects and would no longer belong to the individual companies or entities that had made the R&D contributions. As noted in paragraph 8, the IMRB may also require some grant recipients to contribute a defined percentage of funds (e.g. co-funding of a specific proposal) as a condition of grant approval, thereby expanding the pool of total resources available.

32 In order to expedite establishment of the IMRB and IMRF, the co-sponsors would be willing to help develop a fully automated system, allowing ships to make R&D contributions directly to IMRF accounts established for each ship (matching their IMO number).

33 There would need to be a brief trial period following the official establishment of the IMRF and before evidence of shipping companies having made R&D contributions became mandatory, in which monies were not actually transmitted, in order to identify and address any potential problems with the functioning of the system.

34 It is also anticipated that the IMRF would accrue interest which would be used to support the work of the IMRB.

35 To achieve the goals established by the IMO Strategy, the IMRB would require significant funding capable of supporting numerous research and development projects to be undertaken by multiple research institutions and other qualified entities around the world. While a substantial sum of money would be necessary to support the R&D projects of the IMRB, the quantum of the R&D contribution per tonne of fuel oil required could be relatively

modest and would be approved by the MEPC. This should ensure that any impacts on trade and the economic interests of Member States are negligible. Annex 2 of this document provides an initial impact assessment on States for this proposal consistent with the guidance contained in MEPC.1/Circ.885.

36 The co-sponsors estimate that roughly five billion US dollars in core funding is needed over the life of the IMRB and IMRF to fund the necessary research and development work supported by the IMRB. The five billion US dollar figure is based on a preliminary analysis of what research and development work activities could be undertaken at this level of funding. See document MEPC 75/INF.5 for a copy of the relevant study. Over a 10-year period, this means that approximately five hundred million US dollars per year would be needed to fund the IMRB.

37 Based on the assumption that the total fuel consumption of international shipping, before the introduction of zero-carbon fuels, will continue to be at least 250 million tonnes per annum, the co-sponsors propose that the quantum of the R&D contribution would be set by the MEPC at two US dollars per tonne of marine fuel purchased for consumption.

38 As a matter of principle, a lower R&D contribution per tonne would be set for alternative low-carbon fuels and energy sources, or those with lower GHG emissions than conventional fuel oil.

39 Figure 1 provides a short graphic illustration of how the IMRB and IMRF contribution system would work. Further detail is provided in paragraphs 40 – 64 of this document.

How the mandatory R&D contribution system would work

40 Mandatory statutory certification would be used to demonstrate compliance. A ship would be required to demonstrate that the necessary R&D contributions had been made to the IMRF, commensurate with the ship's annual fuel purchased for consumption, as verified by the flag State. The existing IMO Fuel Oil Data Collection System (DCS) could be used to verify the amount of this contribution. The co-sponsors recognize, however, that ships below 5,000 GT are not currently required to report data to the IMO DCS and it may therefore be necessary to consider how to verify contributions from ships below 5,000 GT.

41 Each shipping company would be required to make the necessary contribution directly to the IMRF for each ship it has assumed responsibility for under the International Safety Management (ISM) Code, regardless of the flag State. In the case of ships registered with non-Parties, the principle of 'No More Favourable Treatment' would need to apply, with flag State certificates of all visiting ships checked by port State control authorities.

42 Each shipping company would be responsible for transmitting the R&D contributions to the IMRF for its ships on a mandatory basis as required by an amendment to Annex VI of MARPOL or other legal mechanism deemed appropriate by the Committee. The co-sponsors emphasize that the R&D contribution per tonne of fuel oil must be regarded as an integral part of the cost of any fuel purchased for consumption. This is to ensure that if an entity other than the shipping company (such as a charterer) is responsible under commercial contract or charter party for paying or reimbursing the cost of fuel this entity shall also be responsible for the cost of the contribution to the IMRF. In order for the IMRB concept to be taken forward, the importance of addressing this issue is strongly emphasized.

48 The IMRF Account Statement would show the R&D contributions against the amount of fuel purchased, corresponding to the Bunker Delivery Note (BDN) for the fuel purchased. This would also serve as evidence of transmission of the R&D contribution to the IMRF by the shipping company if it needs to be recovered from another commercial entity such as a charterer.

49 R&D contributions would need to be transmitted by the shipping company directly to the IMRF either:

- .1 on a 'contribute as you go' basis (i.e. within three months of the bunker fuel purchased for consumption as shown on the BDN), or
- .2 on an annual basis.

The main benefit of contributing on an 'as you go' basis is that this will facilitate reimbursement to the shipping company from third parties, such as charterers, that might ultimately be contractually responsible for paying for the cost of the fuel and the required R&D contribution.

50 Direct R&D contributions by the shipping company to the IMRF are essential for the concept to work and to minimize inefficiencies within the system for transmitting all of the R&D contributions to the IMRF for use by the IMRB. R&D contributions cannot be made via bunker suppliers or with the involvement of non-maritime authorities, as this would lead to significant complications and difficulties in enforcement and administration of the system. It could also lead to market distortion in the case of bunker suppliers located within countries which were not Parties to the new IMO regulation. Requiring R&D contributions to be made to the IMRF via flag States would also be too complex and could potentially lead to taxation and hypothecation issues with national administrations. For these reasons, the proposed funding mechanism is premised on R&D contributions being transmitted directly by shipping companies to the IMRF.

Verification of R&D contributions

51 Ships would be required by a new regulation to hold a flag State certificate confirming that the necessary R&D contributions had been made. In addition, the IMRF itself would verify that required contributions had been made, using data within the IMO DCS.¹ This should simplify the necessary regulations by building on the existing responsibilities of flag States with regard to the IMO DCS.

52 The IMRF would prepare an Annual IMRF R&D Contribution Confirmation Statement which would be sent directly to the shipping company for each of its ships. This would confirm that the R&D contributions made by the shipping company during the previous calendar year correspond with the verified fuel oil consumption data submitted to the IMO DCS by the flag Administration. The Annual Statement would only be issued after the IMRF has confirmed that the contributions are commensurate with the data recorded by the IMO DCS.

53 In the event of any discrepancy with the IMO DCS, the IMRF would either issue a rebate or invoice the shipping company for any shortfall and collect the outstanding amount before issuing the Annual IMRF R&D Contribution Confirmation Statement.

¹ The IMO Fuel Oil Data Collection System allows Bunker Delivery Notes, received at the time of purchase, to serve as a proxy for recording consumption, although other methods can also be used.

54 Allowing time for the resolution of any discrepancies, the Annual IMRF R&D Contribution Confirmation Statement could be issued to the shipping company for each of its ships within an agreed period (e.g., before 1 June each year) and presented by the shipping company to the flag State. However, most of these statements could be issued earlier in the year to facilitate issuance of flag State certificates and avoid logjams.

55 The flag Administration (or delegated Recognized Organization) would then issue an official International Maritime Research Certificate to the ship, confirming that required R&D contributions had been made during the previous calendar year. Allowing time for the verification process by the IMRF, this flag State certificate might normally be valid for the same 12-month period (e.g. 1 September to 30 August).

56 The flag State International Maritime Research Certificate would form part of the ship's statutory certification.

57 To ensure uniform global implementation and compliance, the system would need to be overseen by flag State administrations, supported by port State control (PSC) authorities when carrying out inspections. PSC authorities could then check that the ship has an up-to-date International Maritime Research Certificate issued by the flag State confirming that required contributions have been made during the previous calendar year.

58 PSC authorities would be entitled to check that R&D contributions have been made regardless of whether the ship is registered with a flag State Party to MARPOL Annex VI, consistent with the principle of 'No More Favourable Treatment'.

59 Applicable guidance for the new regulations would need to include appropriate provisions for instances where ships change flag State or company during the annual verification period.

Ships registered with Non-Parties

60 Shipping companies with ships registered with a non-Party would need to be able to transmit the necessary contributions to the IMRF. In the case of ships registered with flag States that are not Parties to MARPOL Annex VI, IMO has agreed that Recognized Organizations can verify and submit fuel oil data to IMO for inclusion in the DCS on behalf of such ships.

61 Such ships should be allocated an IMRF Account and be issued by the IMRF with 'contribute as you go' statements of receipt, and an Annual IMRF R&D Contribution Confirmation Statement in the same way as other ships. The status of the IMRF as a non-governmental research and development fund should help to facilitate the participation of all ships in the system regardless of the flag State.

62 It should be noted that IMO Member States which have ratified the IMO liability Conventions have been willing to issue certificates to ships registered with flag States that have not ratified these Conventions. This should also be possible with respect to issuing the International Maritime Research Certificate.

Implementation of the IMRB

63 Implementation of this proposal would be done through amendments to MARPOL Annex VI or another legal mechanism as deemed appropriate by the Committee. The Committee would also develop accompanying resolutions and/or guidelines that are deemed necessary. These instruments would need to address the following:

- .1 establishment of the IMRB and the IMRF and their relationship with IMO;
- .2 the quantum of the *mandatory* R&D contribution by ships per tonne of fuel oil purchased for consumption;
- .3 the expectation that contributions would be made by other stakeholders and ensuring a means for facilitating such contributions to the IMRB;
- .4 arrangements for approval by IMO of the budget for the IMRB, based on data for total fuel consumption by the world fleet provided by the IMO DCS² and additional contributions by other stakeholders;
- .5 a mandatory requirement for ships to carry a valid International Maritime Research Certificate, issued by, or on behalf of, the flag State, confirming that required R&D contributions have been made to the IMRF during the previous calendar year;
- .6 provisions for ships entering or leaving service part way through the year;
- .7 a mechanism for IMO to transfer individual ships' annual fuel oil consumption data to the IMRF, as recorded in the IMO DCS, whilst preserving the confidentiality of such data;
- .8 a stipulation that although the shipping Company (as defined by the ISM Code) would be legally responsible for transmitting the R&D contribution to the IMRF, the R&D contribution per tonne of fuel oil must be regarded as an integral part of the cost of any fuel purchased for consumption and that it is the commercial entity responsible for paying for the fuel which is responsible for the cost of the R&D contribution;
- .9 port State control measures and provisions regarding application of the 'No More Favourable Treatment' principle to ships registered to non-Parties to the new regulation;
- .10 treatment of ships of under 5,000 GT (depending on the nature of the provisions which may need to be developed for smaller ships); and
- .11 provisions that enable the IMRB and IMRF to be phased down and dissolved once the MEPC has concluded that the IMRB has fulfilled the objectives set forth in its Charter.

64 Those elements listed above which are not included in the IMO legal text should be addressed in an MEPC resolution or guidelines, as may be appropriate.

Conclusion and proposed way forward

65 This proposal is intended to facilitate discussion among governments and other stakeholders about the development of a measure that could prove to be one of the most critical actions in the IMO GHG strategy, enabling the IMO and industry to meet the 2050 GHG reduction target established in the IMO Strategy and to move as soon as possible to low-carbon and zero-carbon fuels and technologies. This proposal outlines a possible

² This would need to take account of what might be decided regarding the treatment of ships below 5,000 GT which are currently not covered by the IMO DCS.

framework for how an *International Maritime Research and Development Board* (IMRB) could work to achieve that objective, recognizing that the details would inevitably require further development should these ideas be taken forward by the Committee.

66 In order to ensure that essential research and prototype development of low-carbon and zero-carbon fuels and technologies commences as soon as possible, the co-sponsors are of the view that this programme would need to be in place by 2023. Therefore, to achieve this objective, the co-sponsors suggest that the International Maritime Research and Development Board proposed in this document be discussed at MEPC 75 with a view toward providing comments and views on the general acceptability of the concept of the IMRB/IMRF. The co-sponsors fully recognize that MEPC 75 will appropriately devote considerable attention to agreement on appropriate measures to reduce emissions in the existing fleet. Recognizing the critical need to accelerate the development of low-carbon and zero-carbon technologies and fuels, the co-sponsors also believe that the Committee should provide time for an initial, general discussion of this proposal at MEPC 75 with a view to more detailed, substantive discussions at MEPC 76.

Action requested of the Committee

67 The Committee is invited to consider this document, in particular, the conclusion and the proposed way forward in paragraphs 65 and 66, and take action as appropriate.

ANNEX 1

Possible draft Charter

Applicable to the International Maritime Research and Development Board (IMRB) and the International Maritime Research Fund (IMRF)

Introduction/Preamble

Whereas:

- The *Initial International Maritime Organization (IMO) Strategy on Reduction of Greenhouse Gas (GHG) Emissions from Ships* calls for GHG emissions from international shipping to peak as soon as possible and to reduce the total annual GHG emissions from shipping by at least 50% by 2050 when compared to 2008 levels, while phasing out GHG emissions as soon as possible in this century on a pathway consistent with the Paris Agreement temperature goals.
- The *Initial IMO Strategy on Reduction of GHG Emissions from Ships* explicitly recognizes the need for new research and development activities addressing marine propulsion, alternative low-carbon and zero-carbon fuels, and innovative technologies to further enhance the energy efficiency of ships, and recognizes the concurrent need to establish an *International Maritime Research and Development Board* to coordinate and oversee these R&D efforts.
- These ambitious goals will require the accelerated development and deployment of low-carbon and zero-carbon fuels, propulsion systems, and related technologies specifically to meet the unique power demands that make up the broad spectrum of shipping activity in the commercial maritime sector.
- Consequently, this document sets forth the mandate, responsibilities, and associated provisions necessary to establish an *International Maritime Research and Development Board (IMRB)* whose purpose is to establish an international maritime research and development programme specifically devoted to research and development of low-carbon and zero-carbon technologies suitable for application in the commercial maritime sector as well as proper administration of all available funds. It is emphasized that responsibility for decarbonisation of the maritime sector as a whole is not the sole responsibility of shipping companies and must ultimately be shared by other stakeholders.

Article 1

Establishment

1. The *International Maritime Research and Development Board* is established in [*insert relevant geographic location*] and is registered as ... consistent with the [*insert relevant legal authorities governing the establishment of a non-profit organization in the relevant jurisdiction*].
2. An International Maritime Research Fund (IMRF), specifically created for the collection of funds for the IMRB, and to be overseen by and subordinate to the IMRB, shall be established.

3. The IMRB and the IMRF are established pursuant to regulations ..., as amended and adopted. [*This particular provision will be dependent on what specific legal mechanism the Committee deems appropriate to establish the IMRB and IMRF.*]

Article 2 **Mandate**

1. The mandate and purpose of the *International Maritime Research and Development Board* (IMRB) is to establish, oversee, and fund an international research and development programme designed to identify low-carbon and zero-carbon fuels, propulsion systems, and related technologies for use in commercial maritime service.

2. The IMRB and its programme shall support research and development projects that accelerate the development and deployment of low-carbon and zero-carbon fuels, marine propulsion systems, and related technology and design advancements. Low-carbon and zero-carbon fuels and technologies are non-fossil-based fuels and technologies that produce near-zero or zero-carbon emissions when evaluating the full life cycle production of a given fuel or technology.

3. The IMRB and its programme shall develop a portfolio of research and development projects that pursue low-carbon and zero-carbon fuels and technologies that reflect the differing demands that are inherent to a broad spectrum of shipping activity including large transoceanic ships, smaller short-sea ships, passenger ships, and the major ship types that constitute commercial maritime trades. This portfolio shall include research, development, and demonstration projects that seek to identify and develop low-carbon and zero-carbon fuels and technologies which are not yet available for commercial deployment on most ship types.

4. While the primary mandate of the IMRB is focused on identifying low-carbon and zero-carbon fuels and technologies, the IMRB shall also consider co-benefits. Consequently, the IMRB will consider and encourage development of fuels and technologies that also minimize harmful emissions such as oxides of nitrogen, SO_x, particulate matter, black carbon, and other emissions and discharges considered harmful to the environment.

5. The IMRB may exercise its discretion to also pursue mixed-fuel (e.g., hybrid fossil and non-fossil fuel) projects if such projects are considered to be important pathways in facilitating the transition to low-carbon and zero-carbon fuels and technologies.

6. The IMRB's research and development efforts may include field demonstrations of promising technologies, fuels, and marine propulsion systems with the aim of catalyzing the conditions that will lead to low-carbon and zero-carbon systems that are commercially available and economically and technically viable for use across a wide range of ship types used in the commercial maritime sector.

7. When the IMRB determines and IMO agrees that low-carbon and zero-carbon fuels, propulsion systems, and technologies can be made available across the maritime sector, the mandate shall be considered to have been met.

Article 3
Objectives

1. The primary objective of the IMRB is to meet the above mandate through the funding and management of research and development projects that support development of low-carbon and zero-carbon fuels, marine propulsion systems, and related technologies for use in the commercial maritime sector.
2. The IMRB shall pursue the most cost-effective low-carbon and zero-carbon fuels and technologies.
3. The IMRB shall also seek to foster international cooperation and collaboration among the recipients of its grants and contracts and other interested parties to maximize the productivity and progress of research and development projects. In this context, the IMRB shall work to disseminate knowledge gained from funded projects to assist global efforts to decarbonize shipping and help support the transition from fossil fuel use in shipping in both developed and developing countries, particularly SIDS and LDCs.
4. The IMRB shall promote, fund, and evaluate low-carbon and zero-carbon fuels and technologies that can be applied in different ship types to ensure that research and development investments are made in those areas of commercial maritime shipping that are critical to achieving the objectives outlined in the IMO GHG Strategy. In this context, the IMRB work programme needs to give appropriate priority to identifying low-carbon and zero-carbon fuels and technologies that are workable for transoceanic ships.
5. The IMRB shall include a research work stream that will explore technical and operational innovations that could contribute to reducing transport costs to Small Island Developing States and other remote locations.
6. Among its research and development initiatives, the IMRB shall include funding to develop and construct fully functioning prototypes. The IMRB may also fund projects to develop prototype ship-to-shore infrastructure designs to facilitate practical and economical fueling of ships. Such projects will be limited to prototype development and shall not be expanded to include commercial infrastructure construction and shipbuilding.
7. The IMRB shall achieve these objectives in a manner that is transparent, credible, and trusted, while remaining aligned with the Objectives of the IMO GHG Strategy.

Article 4
Management and Organization of the IMRB and IMRF

1. The IMRB shall be composed of the IMRB Board of Directors, an Executive Director, Chief Financial Officer, Technical Research Officer, General Counsel, and other professional and administrative staff to perform the managerial functions and responsibilities necessary to the successful operation of the IMRB and the IMRF (see figure 1 which is appended to this document).
2. The IMRF will provide the financial resources necessary to support the programmatic work of the IMRB including grants and contracts to qualified research and development institutions and other qualified parties performing work as directed and authorized by the IMRB. The IMRF will also provide the necessary financial resources to support the IMRB Secretariat including salaries, office space, and all other related expenses. The management of the IMRF and related fiduciary responsibilities will be conducted by the Chief Financial Officer (CFO). The CFO and financial staff managing the IMRF, as well as the IMRF itself will be an integral component of the IMRB Secretariat.

3. The Board of Directors shall consist of [11] individuals, including a Chairperson, who are non-governmental professionals with extensive experience and recognized expertise in one or more of the following fields: research and development, shipping, shipbuilding, low and zero-carbon fuels and technologies, environmental policy, energy policy and other expertise relevant to the mandate of the IMRB.

4. The term lengths for the Board of Directors shall be initially staggered, with four members serving one-year terms, four members serving two-year terms, and three members serving three-year terms. The standard term length after each initial term shall be three years, and Board Members will be able to serve a maximum of two terms. To serve a second term a Board Member must again be nominated and selected via the same process that a new nominee would face. Using this process, each year, approximately one-third of the Board's seats shall rotate to new nominees, or in some cases, will be retained for a Board Member's second term. Consequently, the Board of Directors will always have members with sufficient IMRB-specific experience.

5. The initial Chairperson of the Board will be selected by the IMO Secretary General from a list of candidates provided by the IMRB Nominating Committee. The remaining [10] initial IMRB Board Members will then be selected by the Chairperson from a list of candidates named by the IMRB Nominating Committee.

6. The IMRB Nominating Committee shall be composed of [13] members. Of these [13] members, [7] shall be from the shipping industry, [3] shall be government representatives, and [3] shall be from academia and environmental NGOs. The IMRB Nominating Committee may utilize professional assistance for nominating prospective Board Members consistent with paragraph 7 below. Once the IMRB Board of Directors has been established, subsequent nominations to ensure continuity of the Board (consistent with the term lengths outlined in paragraph 4) shall be made by the IMRB Nominating Committee with the approval of the IMRB Board of Directors. Interviews and other evaluations may be performed as the IMRB Nominating Committee, Executive Director, and IMRB Board of Directors deem appropriate.

7. The IMRB Nominating Committee shall ensure that nominees for the IMRB Board of Directors are non-governmental professionals with experience, inter alia, in: research and development, shipping, shipbuilding, low-carbon and zero-carbon fuels and technologies, environmental policy, energy policy and other expertise relevant to the mandate of the IMRB. Specific criteria and guidance outlining expertise and experience are set forth in Appendix [*to be developed*].

8. The Board of Directors shall be responsible for making high-level decisions concerning strategy and management of the IMRB. These responsibilities shall include: development of specific R&D needs, providing guidance to the Executive Director, and identification, definition, and ongoing refinement of the specific research priorities consistent with the mandate of the IMRB.

9. The IMRB Board of Directors shall have the authority to set its own processes and procedures for reviewing and evaluating proposals on an individual and/or group basis, and shall have the final say on approval of grants and contracts that have been recommended to it by the IMRB staff.

10. The Board of Directors may, if appropriate, recommend an increase or decrease in the funding of the IMRB should the Board of Directors conclude that the amount of funding currently authorized warrants adjustment.

11. The Chairman of the Board shall rotate every [2-4] years. The initial term of the inaugural Chairman should be [...] years.
12. The Chairman of the Board's responsibilities shall include convening and leading meetings of the IMRB Board of Directors and assisting the Executive Director in communications with the IMO Oversight Body and other parties as appropriate.
13. With respect to the initial establishment of the IMRB, the Board of Directors shall select an IMRB Executive Director and Chief Financial Officer from a list of candidates provided by the IMRB Nominating Committee. Following a rigorous interview process, the Board of Directors shall select the most qualified person for the respective positions. Subsequent Executive Directors and Chief Financial Officers will be chosen by the IMRB Board of Directors.
14. The responsibilities of the IMRB Executive Director shall include overall management and direction of the IMRB and the IMRF. The Executive Director and Chairman of the Board of Directors shall be responsible for presenting the annual operating budget to the IMO Oversight Body and reporting on the IMRB's work and progress to the IMO Oversight Body, MEPC, and other bodies, as appropriate.
15. The Chief Financial Officer (CFO) shall oversee the management of the IMRF, the operating budget of the IMRB, and financial management of the programmatic contracts and grants, and all related fiduciary obligations consistent with the budget approved by the IMRB Board of Directors and the IMO Oversight Body. The CFO reports to the IMRB Executive Director and shall regularly advise on the management of the IMRF, contributions to the IMRF, and other aspects of the IMRF and IMRB as the Board of Directors sees fit.
16. The IMRB Executive Director shall hire a Technical Research Director to administer and oversee the strategic research initiatives of the IMRB and provide technical advice to the Executive Director and the IMRB Board of Directors. The Technical Research Director shall report to the Executive Director.
17. The IMRB Executive Director, with the approval of the Board of Directors, shall consider qualified candidates and make a selection for the position of General Counsel. The General Counsel will provide legal counsel to the Executive Director, Technical Research Director, and the IMRB Board of Directors. In addition, the General Counsel will be responsible and have authority to oversee all matters where a conflict of interest may arise. In this context, the General Counsel shall review and have access to all administrative and managerial reports regarding the IMRF, funding awards, hiring procedures, hiring decisions, nominations and appointments to the IMRB Board of Directors, and other areas of the IMRB as necessary to ensure that there are no conflicts of interest. Any conflicts of interest identified shall be reported to the Board of Directors by the General Counsel in a timely manner.
18. The IMRB Chairman of the Board of Directors, Executive Director, Technical Research Director, and Chief Financial Officer, as appropriate, shall present regular reports on the management and status of the research and development programme, the IMRF, and related matters to the IMO Oversight Body.
19. The IMRB Executive Director [with the approval of the Board of Directors] shall have the authority to hire professional and administrative staff as is necessary to ensure the smooth and efficient operation of the IMRB and IMRF. The Executive Director shall also have the authority to delegate specific managerial authorities as he or she deems necessary.

Article 5
Conflict of Interest Provisions

1. The selection of the IMRB Board of Directors, Executive Director, Chief Financial Officer, the Technical Research Director, and the General Counsel (hereafter referred to as the IMRB Officers) shall be subject to strict conflict of interest provisions to ensure that the management, direction and decision-making within the IMRB and IMRF are undertaken in a manner that is free of political and commercial conflicts of interest or the appearance of such conflicts. It is critical that nominees for IMRB Officers are free from notable conflicts of interest, both commercial and political. Therefore, any nominee should be vetted in light of specific criteria identified in Appendix [], and subject to review and approval of the IMRB General Counsel.
2. The IMRB Officers and the performance of their responsibilities shall be subject to a defined set of conflict of interest provisions as set out in Appendix [] of this document.

Article 6
Acquisition and Management of Resources

1. The International Maritime Research Fund (IMRF) shall be financed via mandatory contributions, on the basis of fuel oil purchased for consumption by each ship subject to the regulation[s] as approved by IMO. The fee per tonne of fuel oil purchased for consumption shall be established in consideration of the needs of the IMRB, while taking into account the total fuel consumption of the world fleet as determined by the IMO Data Collection System (DCS). The specific fee shall be subject to IMO approval.
2. A process for submitting both required and voluntary contributions as well as a detailed accounting system shall be created and maintained by the staff of the IMRB.
3. IMRF accounts shall be created for individual ships subject to the regulation, identified by the ship's IMO number. Contributions shall be paid to their respective accounts directly via an automated system for increased efficiency.
4. The IMRB staff shall use the existing IMO Fuel Oil Data Collection System to verify that the contributions have been made as required.
5. The IMRB shall issue documentary evidence in the form of quarterly and annual IMRF contribution statements to Flag states, with a copy sent to each respective shipowner, as evidence that the required contributions have been made for every ship. Upon receipt of this statement, Flag states can then issue the required *International Maritime Research Certificate*, valid for the next year.
6. Issuance of the certificate for each year shall be subject to a ship fully meeting its required contributions for the previous year.
7. The contributions to the IMRF should be treated as a component of the cost of marine fuel, and thus the commercial entity ultimately paying for the fuel should also pay for the cost of the contribution, although the responsibility of transmitting payment to the Fund itself and maintaining compliance so as to receive an annual certificate rests with the shipowner.
8. Ships registered with non-parties will also have an IMRF Account linked to their IMO number, and will be required to contribute along with all others, per the principle of 'No More Favourable Treatment'. Non-party ships shall carry a statement of compliance by their Administration/RO that they have contributed full and final for the previous year.

9. Payment may be made on a 'contribute as you go' basis (submitted within three months of purchasing fuel) or through a single annual payment for the preceding year.
10. Interest gained from the IMRF being held in trust shall be used to support the work of the IMRB.
11. The IMRF shall be managed by the Chief Financial Officer.
12. Consistent with the budget approved by the IMRB Board of Directors and the IMO Oversight Body, the IMRB Executive Director shall possess the authority to approve contracts, purchases, and other actions necessary for the effective operation of the IMRB and IMRF. Contracts and grants relating to specific research and development projects require approval of the IMRB Board of Directors and are subject to the provisions specified under Article 7.

Article 7

Administration of Grants and Contracts

1. A system shall be established and put in place by the IMRB, in which qualified applicants may submit proposals for research and development projects as requested by the IMRB through a "*Request for Proposal*" (*RFP*), solicitation of contract proposals, or through other mechanisms as deemed appropriate by the IMRB Executive Director. The IMRB will also develop a process and criteria for reviewing unsolicited proposals consistent with *Article 3* of this document.
2. The IMRB professional staff shall review proposals based on their merit, feasibility, proposed cost, and scientific and technical potential.
3. In reviewing proposals, as well as research and development work performed or currently in progress, the IMRB staff may utilize appropriate peer review measures and engage external consultants with appropriate technical expertise to determine the scientific merit and feasibility of proposals, and to assess progress made in the case of existing work projects.
4. Those proposals considered to have the most merit shall be recommended to the IMRB Board of Directors for final review and determination of whether to approve the work, the duration of the work project, and the specific level of funding to be approved. Decisions concerning grants and contracts made by the IMRB Board of Directors shall require the affirmative support of a majority of the Board Members that are eligible and participating when voting on a given motion. If a given Board Member or Members have been determined to have a potential conflict of interest on a specific proposal, that Board Member(s) will be excluded from voting or otherwise participating in the Board's discussion of the specific proposal under consideration.
5. The IMRB and its Board of Directors shall consider, inter alia, the following criteria during its evaluation and assessment of specific project proposals:
 - potential to meet the low-carbon and zero-carbon objectives identified in Article 3 of this Charter;
 - energy density, feasibility, and potential to be applied in specific maritime ship types and trades, including the spatial and energy demands of transoceanic voyages;
 - safety considerations that examine risks to the ships' crew, shore-side personnel, and relevant risks to the general public;

- co-benefits with respect to other important air emissions such as NO_x, SO_x, PM, BC, VOCs, etc.;
- can the specific fuel or technology be used with existing internal combustion two-stroke, slow speed engines? If not, does the project provide an appropriate evaluation of the relevant considerations for ship design, materials science, and the overall engineering of relevant systems as applicable to one or more ship types;
- potential to be used in conjunction with existing bunkering infrastructure;
- impacts on competition and maintenance of a level playing field, in particular, avoidance of grants being made directly to shipowners, shipyards, energy producers, or other parties that might cause market distortion; and
- specific project proposal criteria as specified by the IMRB.

6. All research and development grants and contracts shall be subject to the grantee's acceptance of specific terms to be established by the IMRB, including, but not limited to:

- a. The intellectual property policy for all grants and contracts shall be as follows: All research and development grants and contracts shall be subject to the grantee's acceptance of specific terms concerning intellectual property rights associated with inventions arising from the grant or contract. These terms, which shall be determined by the IMRB, shall be designed to further two equally important purposes:
 - to encourage broad participation in the work funded and directed by the IMRB by providing grantees an opportunity to obtain intellectual property rights in the results of work funded by the IMRB, and
 - to ensure that the intellectual property associated with discoveries and knowledge created by work funded by the IMRB is available for incorporation into inventions and derivative works created by parties other than the grantees performing the work leading to such discoveries and knowledge.
- b. The objectives specified in 6a shall be fulfilled by the IMRB through grant conditions that may include, inter alia, a requirement that all utility patents and utility patent applications claiming inventions made pursuant to an IMRB grant or contract shall be licensable to anyone in the world on Fair, Reasonable, and Non-Discriminatory (FRAND) terms, so that such inventions can be widely adopted by the international community.
- c. Grantees or contractors shall provide regular updates on substantive progress made and use of funds provided to date.
- d. Grantees or contractors shall return unused funds (if any remain) at the completion of the proposed project to the IMRB, which shall then deposit such remaining funds back into the IMRF, and

- e. The IMRB shall be authorized to terminate a given work project and its funding if in the judgement of the IMRB Board of Directors the recipient has failed to satisfactorily perform the stipulated work in a timely manner or has failed to properly account for or manage IMRB funds. The IMRB will hold the sole authority to terminate funding of a given work project.

7. Contracts and other payments (e.g. salaries, office space, and other expenses) that are primarily related to internal management and administrative responsibilities of the IMRB may be approved by the Executive Director. The Executive Director may also delegate such approvals to the Chief Financial Officer.

Article 8

Supervision and Oversight by IMO

1. IMO shall have oversight authority, via a specific entity to be created for such a purpose, over the IMRB.

2. The oversight body shall meet on a periodic basis to perform its functions and provide supervision and direction to the IMRB. Its responsibilities shall include:

- a. providing general oversight and advice to the IMRB and its Board of Directors on the strategic direction and budget of the IMRB;
- b. ensuring that the IMRB performs its duties and responsibilities consistent with the objectives and mandate set forth in this Charter;
- c. advising upon recommendations made by the IMRB to modify and adjust the IMRB research strategy and budget as appropriate in light of technological, scientific and research developments;
- d. reviewing and approving the IMRB's annual operating budget after considering recommendations and other relevant reports and information provided by the IMRB and its Board of Directors. In the event that the IMO Oversight Body does not approve the proposed annual operating budget, the IMRB shall prepare a modified budget within 45 days of the initial decision; and
- e. reviewing, and, if necessary, undertaking independent financial audits of the IMRB concerning the management and administration of the IMRF and related investments to ensure that the IMRB fully meets its fiduciary duties in managing the IMRF, including the accounting of funds expended for specific research and development programmes, grants, contracts and other funding provided by the IMRB using IMRF funds.

3. The IMO Oversight Body shall receive regular reports on project progress and updates, as well as reports on the IMRF and its stability, performance, and any other related issues.

4. The IMO Oversight Body shall not have the authority to make decisions on the funding of individual R&D projects; rather, these decisions will be the sole responsibility of the IMRB and its Board of Directors.

Article 9
Dissolution

1. As stipulated in regulation [], and after an operational period of twelve years, beginning on the date that this [Chapter] enters into force, mandatory contributions to the IMRF shall cease. Once mandatory contributions cease, the IMRB shall continue to oversee all planned and approved projects through completion, and may plan and approve new projects, subject to availability of funds. All new and ongoing work projects shall be completed in a period of five years once mandatory contributions have ceased.

2. Upon completion of the IMRB's work programme and with the approval of the MEPC, the IMRB and IMRF shall cease operations. Upon such a determination, the IMRB and IMRF and its requirements shall be dissolved, unless the parties determine otherwise.

Appendix

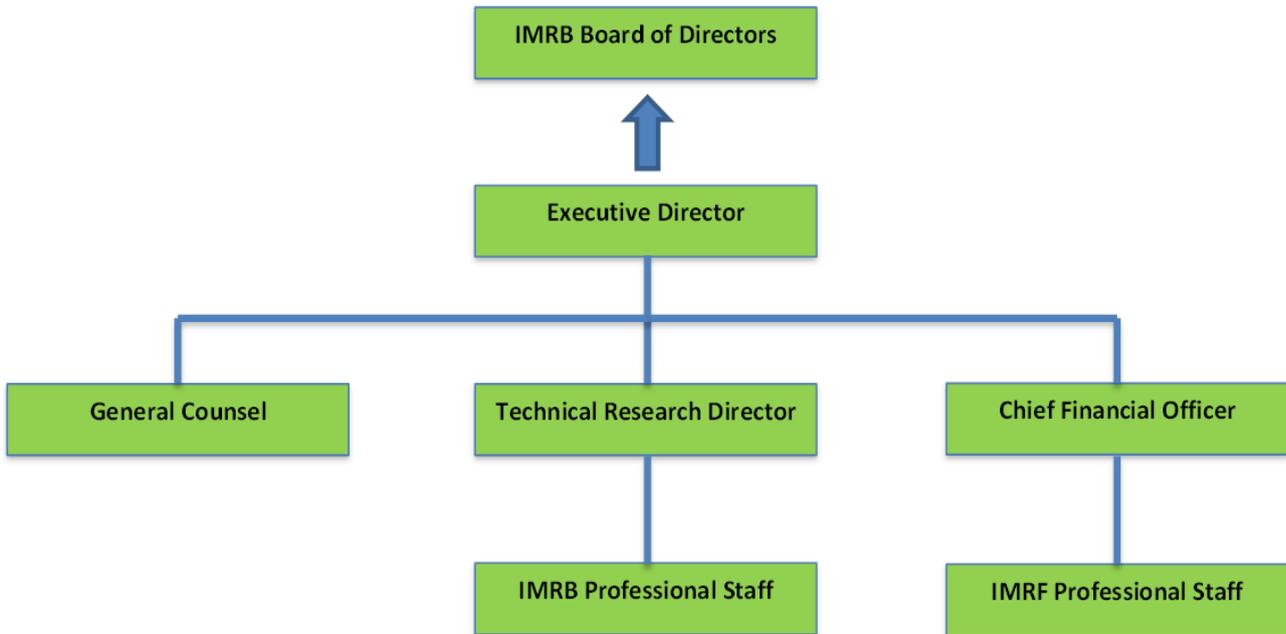


Figure 1 Management and Organization of the IMRB and IMRF

ANNEX 2

INITIAL IMPACT ASSESSMENT ON STATES

1 Measure:

Establishment of an International Maritime Research and Development Board (IMRB) to accelerate the development of low-carbon and zero-carbon emission ships

1.1 Proposals

.1 To establish an International Maritime Research and Development Board (IMRB) to accelerate the development of low-carbon and zero-carbon emission ships in order to achieve the 2050 levels of ambition of the Initial IMO strategy on reduction of GHG emissions from ships (MEPC.304(72)) (the Initial Strategy). The objectives and activities of the IMRB would be governed by a Charter that would be approved by the Organization and overseen by a 'supervisory body' reporting to the MEPC.

.2 The research and development programmes of the IMRB would be funded by an International Maritime Research Fund (IMRF), which would itself be funded by the shipping industry in the form of direct mandatory contributions, via an automated payment system into the IMRF, for each tonne of fuel oil purchased for consumption on board ship. This mandatory contribution would be fixed at two US dollars per tonne of fuel oil, sufficient to raise around five billion US dollars over a 10-year period. Member States may also require or encourage other stakeholders to contribute into the IMRF.

.3 Ships would be required to carry an International Maritime Research Certificate demonstrating compliance with required contributions to the IMRF, verified using the existing IMO Fuel Oil Data Collection System. This would be a statutory certificate issued by the ship's flag Administration and subject to examination by port State control. This would provide an effective means of enforcing mandatory contributions that will minimize the administrative burden on Administrations which would not have any direct role in the collection of contributions from shipping companies.

.4 The IMRB and its coordinated R&D programmes would accelerate the development of low-carbon and zero-carbon emission technologies and fuel systems that are specifically tailored for maritime application, especially for larger transoceanic ships. The IMRB and the specific R&D programmes it would support are expected to help deliver substantial GHG reductions from international shipping in the mid to long-term.

1.2 Assessment of impacts on Member States

.1 Geographic remoteness of and connectivity to main markets

The proposed contribution level of two US dollars per tonne of fuel oil is within the daily variability of fuel oil bunker prices and would be a marginal component of marine fuel oil cost (less than 1%). The proposal includes specific research aimed at identifying technical and operational innovations to reduce the transport cost to Small Island Developing States and other remote locations. Consequently, the proposal can be expected to undertake work that may lead to the reduction of transport costs to SIDS and other remote locations.

.2 Cargo value and type

As the proposals would apply to all ships (at least 5,000GT and above) it would not discriminate between different cargoes. As the additional cost of fuel would be marginal and within the daily variability of marine fuel costs, it would not impact the shipping costs of low value cargoes.

.3 Transport dependency

The proposals will not disproportionately impact Member States which are dependent on maritime transport.

.4 Transport costs

The proposal is not expected to adversely impact transport costs beyond any impacts which might already result from daily volatility of fuel oil prices. The work undertaken in the IMRB is designed to identify potential mechanisms for reducing the cost of transportation to Small Island Developing States and other remote locations.

.5 Food security

The proposals will have no adverse impact on food security.

.6 Disaster response

The proposals will have no adverse impact on disaster response.

.7 Cost-effectiveness

The proposals would impose a marginal cost on individual ships whilst creating a multi-billion-dollar fund to accelerate research and development of low-carbon and zero-carbon fuels and technologies. Therefore, the proposed IMRB is considered to be an extremely cost-effective measure which will facilitate successful delivery of the 2050 levels of ambition of the initial strategy.

.8 Socio-economic progress and development

The proposal is expected to have no adverse impact on socio-economic progress and development.

1.3 Justification

.1 Delivery of the initial strategy, in particular providing a pathway to deliver the 2050 level of ambition of the initial strategy and the introduction of low-carbon and zero-carbon fuels and technologies. Specific development of one of the candidate short-term measures identified in the Initial IMO Strategy on Reduction of GHG Emissions from Ships. See paragraph 4.7.9 of the Initial IMO GHG Strategy.

.2 Accelerating the development of low-carbon and zero-carbon fuels and technologies suitable for maritime application to mitigate climate change.

.3 Low-carbon and zero-carbon fuels and technologies are expected to offer significant co-benefits in terms of reducing or eliminating emissions of local pollutants such as particulate matter, with positive impacts for local eco-systems and public health.

.4 The proposals will ensure that the shipping industry collectively provide the core funding which will be required to undertake the necessary research and development effort.

1.4 Number of ships affected and impact on GHG emissions

.1 All ships subject to MARPOL Annex VI (at least 5,000GT and above).

.2 Successful delivery of the 2050 levels of ambition of the initial strategy.

1.5 Impact on seafarers

.1 The proposals will have no impacts for seafarers.

1.6 Positive Impacts

.1 Accelerated development of low-carbon and zero-carbon fuels and technologies, facilitating reduced GHG emissions from ships and successful delivery of the 2050 levels of ambition of the initial strategy.

.2 Timely identification of low emission pathways which will mitigate the risk that resources are wasted developing measures which are later found to be ineffective whilst giving industry confidence to invest in measures which are identified as having a high emissions reduction potential.

.3 Provision of a multi-billion-dollar fund which would be available to support a wide range of research and development projects, many of which are expected to provide significant co-benefits such as improved public health and reduced local pollution.

.4 The proposals will be cost effective and will minimize the financial burden on individual shipowners, with no anticipated adverse consequences for trade or the economic interests of member states. No other potential proposals are considered able to match the effectiveness of this proposal for decarbonising shipping or this proposal's negligible negative impacts.

.5 Accelerated development of commercially viable low-carbon and zero-carbon emission ships, including ships engaged in transoceanic voyages.

.6 Positive cost reductions are anticipated in association with a specific research work stream focused on technical and operational innovations to lower the cost of transportation to Small Island Developing States (SIDs) and other remote locations.

1.7 Negative Impacts

.1 There would be a marginal increase in the cost of purchasing fuel oil for ships. The proposed mandatory contribution of two US dollars per tonne of fuel oil purchased for consumption is within the daily variability of marine fuel prices and would not significantly affect fuel cost. Therefore, the proposal will not impact the cost of maritime transport beyond existing exposure to daily fuel price variability.

.2 The IMRB has been designed to minimize administrative burden for both industry and member states, therefore the costs of establishing and maintaining the IMRB and IMRF, and costs of enforcement will have no negative impacts for member states.

1.8 Quantification of Impacts

- .1 GHG reductions at least in line with the 2050 level of ambition of the initial strategy.
- .2 Shipping transport cost impacts are expected to be within normal levels of commercial variability.
- .3 There is expected to be no significant adverse impact on trade with significant positive impacts on maritime transportation as a result of the work undertaken through the IMRB.
- .4 Potential benefits through reduction of transport costs to SIDs and remote locations as a result of specific research work stream.

1.9 Will the measure result in any disproportionately negative impacts?

- .1 No.

1.10 Expected workload for IMO

- .1 Development of an amendment to the MARPOL Convention or an alternative legal mechanism deemed appropriate by the Committee.
 - .2 Establishment of the necessary IMO oversight function to oversee the IMRB.
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