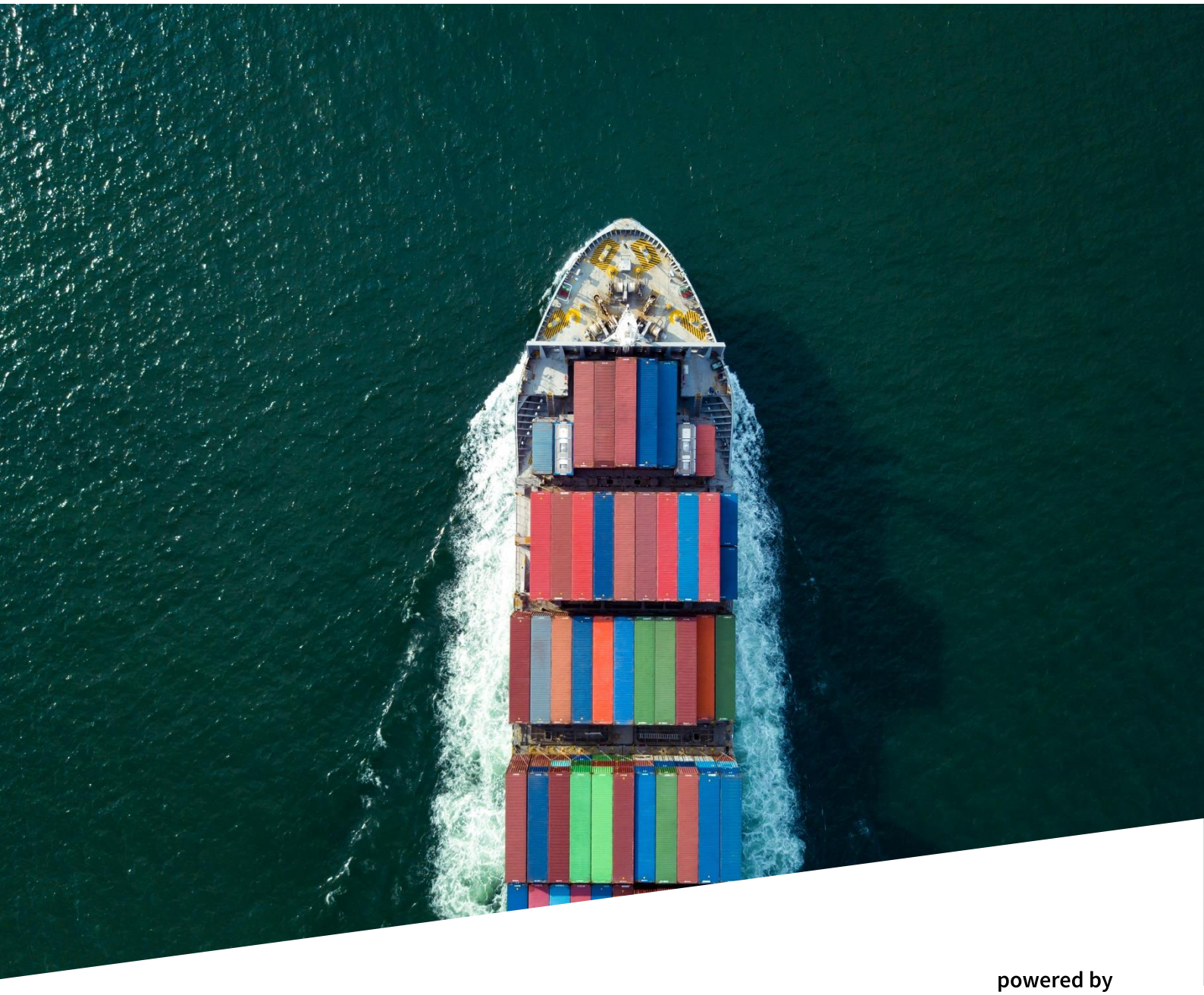
Global Alliance POWERFUELS

Powerfuels in Maritime Transport: Challenges, Measures & Outlook

Insights from the Powerfuels Brief on 10 February, 2022



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Content

Introduction

Powerfuels – green hydrogen and gaseous and liquid fuels from power-to-X processes using renewable electricity – will play an indispensable role in decarbonising maritime transport.

Maritime transport is the backbone of world trade, accounting for around 80 % of global freight transport. With increasing economic growth projections, shipping volumes are expected to continue to increase. Today's energy demand from shipping accounts for 3% of the world's energy demand, causing 2.89% of total anthropogenic emissions in year 2018. If no action is taken, emissions from maritime transport will foreseeably continue to increase.

Several policy actions are underway to address these emissions. The International Maritime Organisation (IMO) published its initial GHG strategy in 2018, which aims at reducing shipping emissions by 50% until 2050, but does not propose specific measures for achieving a fuel switch from fossil to renewable fuels. To put the European Union on track of its climate ambitions, the European Commission published its "Fit for 55" package in July 2021. The package contains a comprehensive set of legislative proposals, and also addresses GHG emissions and the uptake of alternative fuels in maritime transport through the revision of the EU Emissions Trading System (ETS) and the FuelEU Maritime regulation.

However, uncertainty remains for ship owners and ports, which hinders investments in ships with alternative propulsion systems and bunkering infrastructure in ports. As ships are typically in operation for two to three decades, today's decisions have an impact on the fuel mix in 2050.

In order to discuss current challenges and measures for the uptake of powerfuels in maritime transport, the Global Alliance Powerfuels gathered policy and industry experts in a digital event as part of its "Powerfuels Brief" series on February 10, 2022.

In the event, the Alliance's in-house expert and three guest speakers presented their insights. The presentations were followed by a moderated discussion. The following speakers presented their perspectives and participated in the panel discussion:

- **Ricardo Batista**, Policy Officer, Waterborne Transport, Directorate General for Mobility & Transport (DG MOVE), European Commission
- **Cees Boon**, Senior Safety Advisor Harbour Master Policy Department, Port of Rotterdam
- **Dr. Tue Johannessen**, Head of Maritime Application and Viability, Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping
- **Hannes Salomon**, Expert Mobility, German Energy Agency
- **Stefan Siegemund**, Director Mobility, German Energy Agency, moderated the event.

1 Challenges for ship owners, ports and policymakers

To defossilise maritime transport, a major **fuel transition** has to take place, which challenges shipping companies, ports, fuel suppliers and policymakers. As mentioned above, uncertainty about what the future shipping fuel mix will look like is currently still high. What seems to be certain, however, is that renewable electricity-based fuels (powerfuels) will play a major role, complementing fuels of biological origin. Due to factors such as cost and feedstock availability, different powerfuels can have quite diverging final shares in the shipping fuel mix, as Mr. Johannessen illustrated by showing the results of a modelling in two scenarios. Despite their differences, the modelling results show, and the experts present at the event agreed, that powerfuels are the most promising option to decarbonize maritime transport within this century.

As there is not a single most favourable fuel option for the large variety of ship types, ship operators are trapped in a "**wait-and-see attitude**", as Mr. Batista from the EU Commission argued. Clear demand signals would be needed to drive the deployment of production capacities and distribution infrastructure for specific fuels, as well as to reduce the risk of investment in medium-to-long term sustainable energy technologies. A lack of coordination between demand, supply and distribution can be diagnosed for the sector according to Mr. Batista.

Due to the uncertainty of the future shipping fuel mix, **investment risks** for shipping companies and ports to order ships and build up infrastructure for one powerfuel or another are significant. Ships are usually in operation for two to three decades and retrofitting of fuel systems on board is very costly and thus rather unlikely according to Mr. Salomon and Mr. Johannessen. Retrofitting existing vessels for alternative fuel systems would mainly be relevant in a scenario where the alternative growth in alternative fuel production capacity exceeds the amount of fuel capable of being used by growing fleet of new-builds using these fuels from start of their operation, Mr Johannessen elaborated.

Key issues for bunkering alternative fuels at ports are currently the **technical readiness level** of different fuel types and **social acceptance** according to Mr Boon. He pointed out that ammonia and hydrogen in particular were not yet available as commercial applications for shipping and that the public partially had safety concerns about their use, distribution and storage, which is a problem when bunkering these fuels in ports. However, ports already have experience in handling ammonia and methanol to supply these energy carriers to the chemical and fertilizer industries. For substitutes for fossil fuels as renewable Fischer-Tropsch fuels, simply existing infrastructure can be used.

Despite the fact that a lot of progress is currently made to get first projects at demonstration or commercial scale underway, resolve safety issues and receive positive investment decisions for projects, the **cost gap** between powerfuels and fossil fuels remains a challenge. The experts agreed that the production costs of powerfuels could not compete with the production costs of fossil fuels in the short and mid-term, even assuming significant cost reductions through economies of scale. As fuel costs are the main cost component of the total cost of ownership (TCO) of ships, they are a key factor for competitiveness in the global market.

There was general agreement that specific policy support measures and adaptations of the market framework are necessary for the market integration of powerfuels in maritime transport. However, the **regulatory framework for powerfuels** is not yet fully developed and market incentives for their use are currently missing. While the International Maritime Organisation has not taken any action to stimulate their uptake, the European Commission's proposal for the FuelEU Maritime regulation will increase pressure to defossilise the fuel mix.

2 Measures and policy instruments for the market integration of powerfuels

GHG emission reduction targets help to define sector-specific climate mitigation pathways and milestones for the energy transition. These then need to be complemented by concrete measures and policy instruments to achieve the defined pathways and goals. The IMO has set an emissions reduction target for maritime transport of 50% by 2050 compared to 2008 levels in its 2019 GHG strategy. In 2021, the European Commission adopted the Fit for 55 package, which aims to align the EU's legislative framework with the increased climate ambition to reduce emissions by 55% until 2030 and includes specific targets for maritime transport. The ambition of GHG reduction targets must be high enough to reflect the urgency of climate action and at the same time be achievable for affected stakeholders. Mr Salomon argued that the emission reduction targets of the IMO Greenhouse Gas Strategy should be set higher to be consistent with a pathway compatible with the target of the Paris Agreement. Mr. Boon generally agreed, adding, that until technological solutions existed, policymakers must be careful not to move too fast with regulation, as the market needs time to adapt.

Aside from promoting a fuel switch towards renewable and low-carbon energy carriers, energy demand and thereby GHG emissions have to be reduced through **energy efficiency measures**. These include technical and operational measures such as slower steaming, energy efficient design, and others. With regard to powerfuels production capacities, energy efficiency on ships is very important, Mr. Johannessen stated, as the reduced requirement for active propulsion has a major impact on the scale of the powerfuel supply chain. The IMO has already successfully put in place measures to increase energy efficiency, proven by the fact that since 2008, the carbon intensity of maritime transport has decreased. However, energy efficiency and technology transition both have to be incentivised to accelerate the replacement of fossil with renewable fuels to achieve net-zero emissions.

One option to incentivise the switch to alternative fuels are carbon pricing systems – either through price-based instruments such as **carbon taxes** or quantity-based measures, i.e. **emission caps** such as those inherent to the EU Emissions Trading System (ETS). As part of proposal for the revision of the ETS Directive, the European Commission has suggested to gradually include maritime transport in it from 2023 until 2026. To be effective, emission permits must be capped and reduced gradually, so that ship operators are obliged to increasingly use alternative fuels to not exceed the emission allowances. In addition, the **carbon price** for emission allowances must be high enough to constitute a viable market signal. Since, according to Mr Johannessen, powerfuels will likely keep having higher production costs than fossil fuels in 2050, the level of the carbon price will determine which alternative fuels will be price competitive. If the carbon price is set too low, the use of the less expensive but more GHG intensive fossil-based LNG could be favored. Therefore, suitable high carbon prices are needed to put fossil fuels on an equal footing with the fully renewable fuel options with the lowest climate impact. However, the speakers noted that this was difficult to implement, especially on a global scale. Mr. Johannessen included in his presentation a proposed Earmark & Return levy scheme which can enable a high degree cost compensation for the first movers even with a low levy in the first part of the transition.

In addition to carbon pricing, **financial support schemes** can contribute to reducing investment

and operating costs and closing the cost gap to fossil fuels. According to Mr Boon, the current support mechanisms are not sufficient to make powerfuels projects economically viable. Mr Johannessen pointed out that the EU Innovation Fund could be a suitable instrument to support projects aiming to advance the market ramp-up of powerfuels in maritime transport, as it also covers OPEX cost.

Without market-based signals, e.g. via a carbon pricing system at international level creating a level-playing field, or strong financial support schemes capable of closing the cost gap to fossil fuels, **fuel-specific measures** are needed for the uptake of renewable fuels. These could include quotas or demand-side incentives, for example. The IMO has not introduced such measures, thus providing no incentives for ship owners to switch to renewable fuels in this regard.

In this context, and recognizing that the current carbon price in the ETS is not sufficiently high to close the cost gap between fossil and renewable shipping fuels, the EU Commission developed the **FuelEU Maritime Regulation** to act as a catalyst for the introduction of new technologies in maritime transport, Mr Batista explained. The FuelEU Maritime Regulation is intended to provide regulatory predictability within EU legal framework, but also to support policy making at IMO level to develop global measures. It obliges ship operators to gradually reduce the greenhouse gas intensity of energy consumed on board by 6% until 2030 and 75% until 2050. However, as the 2030 target is not very stringent, it could be achieved by switching to fossil-based LNG instead of renewable fuels, which would presumably be cheaper than other compliance options. As a result, important investments into powerfuels could be postponed, Mr Salomon said. He argued that to create a strong incentive for the use of powerfuels in shipping, more ambitious greenhouse gas intensity limits should be introduced, or the use of powerfuels could be made mandatory, e.g. through a gradually increasing dedicated sub-quota. Mr Batista agreed that the target reduction of 2-6% by 2030 seemed modest in the grand scheme of things, but clarified that this target level took into consideration the rate of fleet renewal, the initial lack of access to technology and other factors. Mr Batista stated that the inclusion of quotas for powerfuels in the FuelEU Maritime Regulation would be against the technological neutrality of the FuelEU proposal. However, different stakeholders made proposals in this direction, which are still subject to negotiations with the EU Parliament and Council, he said.

The uptake of powerfuels in shipping requires the establishment of bunkering infrastructure in ports. For safe bunkering, ports implemented **risk mitigation measures** to reduce potential risks of handling these new fuels, Mr Boon explained. Best practices for the different fuel types and the experience gained, for example, in the implementation of LNG bunkering infrastructure, needed to be taken into account in the future to set industry standards, he specified.

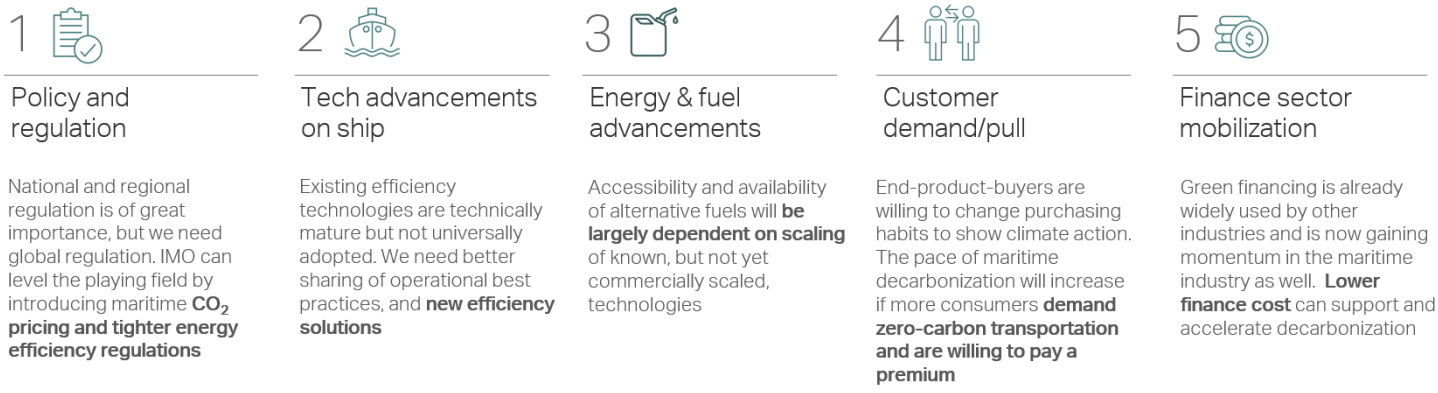

Figure 1 | Levers to reduce emissions from maritime transport, Tue Johannessen, Maersk Mc-Kinney Moeller Center

3 Outlook

All experts agreed that **technology openness** and therefore a technology-neutral market framework seems today important. Companies have a variety of different ships in their fleets and cannot invest in sustainable options for all ships in one go. According to Mr Batista, LNG could play a role as a transitional technology, while renewable fuels will increase in importance and dominate the market in the long-term.

Through the revised Renewable Energy Directive, the EU has introduced an obligation to bring renewable fuels to the market. In this context, consistency with the objectives of the FuelEU Maritime Regulation is important to ensure that there is demand for the fuels available on the market. If costs alone were the decisive factor in decision-making, ammonia could be the most important fuel in 2050, Mr Johannessen projected. Still, other factors will also play a role, such as the **greenhouse gas impact** of different types of fuel. The European Union outlines the methodology for assessing the achieved GHG emission reduction of alternative fuels and defines sustainability criteria in the Renewable Energy Directive II (REDII) and associated delegated acts. The GHG impacts of different fuels must be transparent to reduce the risk of fraud and ensure that physical GHG reductions are achieved. Criteria for RFNBOs, and methodology for the calculation of emission factors is currently under discussion as part of the REDIII negotiation.

In addition o the FuelEU Maritime Regulation the EU is also engaged to promote **global action** in the development of a similar framework of international reach. This is reflected in the EU proposal for an IMO low GHG fuel standard and LCA guidelines for fuels. According to Mr. Batista, the ultimate goal is a global greenhouse gas standard for fuels. If an international, globally agreed greenhouse gas fuel standard was adopted and implemented, the EU framework would fade into the background and global policies could take precedence.

Mr. Batista explained that at the current state, it was important to fill **gaps in legislative proposals** and that policy makers acknowledge insights from industry into which measures work and which ones do not. Initiatives such as the Global Alliance Powerfuels bring together different stakeholders from industry, research and policy, thus enabling a knowledge transfer which is crucial to the development of effective measures and policy instruments.

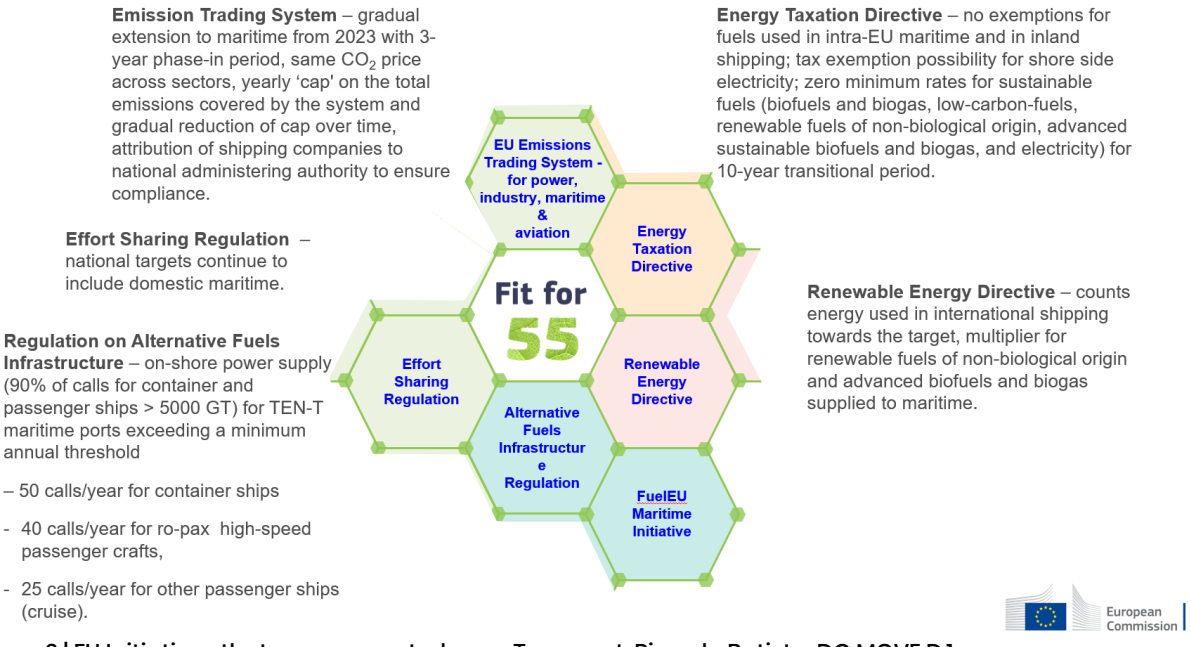

Figure 2 | EU Initiatives that concern waterborne Transport, Ricardo Batista, DG MOVE D.1

About the Global Alliance Powerfuels

The **Global Alliance Powerfuels** was founded in 2018 and is backed by 13 member organisations and an international network of partner institutions. It is coordinated by the German Energy Agency (dena). All members and partners are united by the common goal of advancing the development of sustainable markets for powerfuels.
Further details about the Alliance and its activities can be found at www.powerfuels.org.