IN RECENT YEARS DECARBONISATION HAS PROBABLY BECOME ONE OF THE MOST COMMON WORDS IN THE SHIPPING NEWS MEDIA. THE UNITED NATIONS' PARIS AGREEMENT ON CLIMATE CHANGE IN 2015 MADE A COMMITMENT TO KEEP THE GLOBAL MEAN TEMPERATURE INCREASE AT BELOW 2°C OF PRE-INDUSTRIAL LEVELS BY 2100, WHILE MAKING EFFORTS TO LIMIT WARMING TO 1.5°C.

DECARBONISATION

PROGRESS SO FAR AND FUTURE DEVELOPMENTS

IN APRIL 2018, THE INTERNATIONAL MARITIME ORGANISATION (IMO) ADOPTED ITS INITIAL STRATEGY ON THE REDUCTION OF GREENHOUSE GAS (GHG) EMISSIONS FROM SHIPS, WHICH SETS OUT THE AMBITION TO REDUCE CARBON INTENSITY BY AT LEAST 40% BY 2030, MOVING TOWARDS 70% BY 2050, AND TO REDUCE GHG EMISSIONS BY AT LEAST 50% BY 2050. THERE IS ALSO A STRONG DESIRE FROM MANY COUNTRIES AND WITHIN THE SHIPPING INDUSTRY TO REDUCE EMISSIONS BY 100% BY 2050.

It has become clear to the industry that the goal is to end the use of fossil fuels, requiring commercially-viable zero-emission vessels to enter into service in the near future. With the majority of the world's merchant fleet burning fossil fuels, consideration will need to be given to how ships, which are currently being financed, designed and built, would be able to operate or switch to an alternative non-fossil fuel later in their operational life.

ALTERNATIVE FUELS

As a result of these changes, the market for alternative non-fossil fuels has seen a rapid increase in recent years, and a number of alternative fuels are now being tested as possible solutions to to help decarbonise the shipping industry. At the moment it is hard to identify which fuels will be the most realistic alternatives to fossil fuel as this will depend on the results of the large scale testing currently taking place, as well as other factors such as being able to secure a global supply of any new fuels.

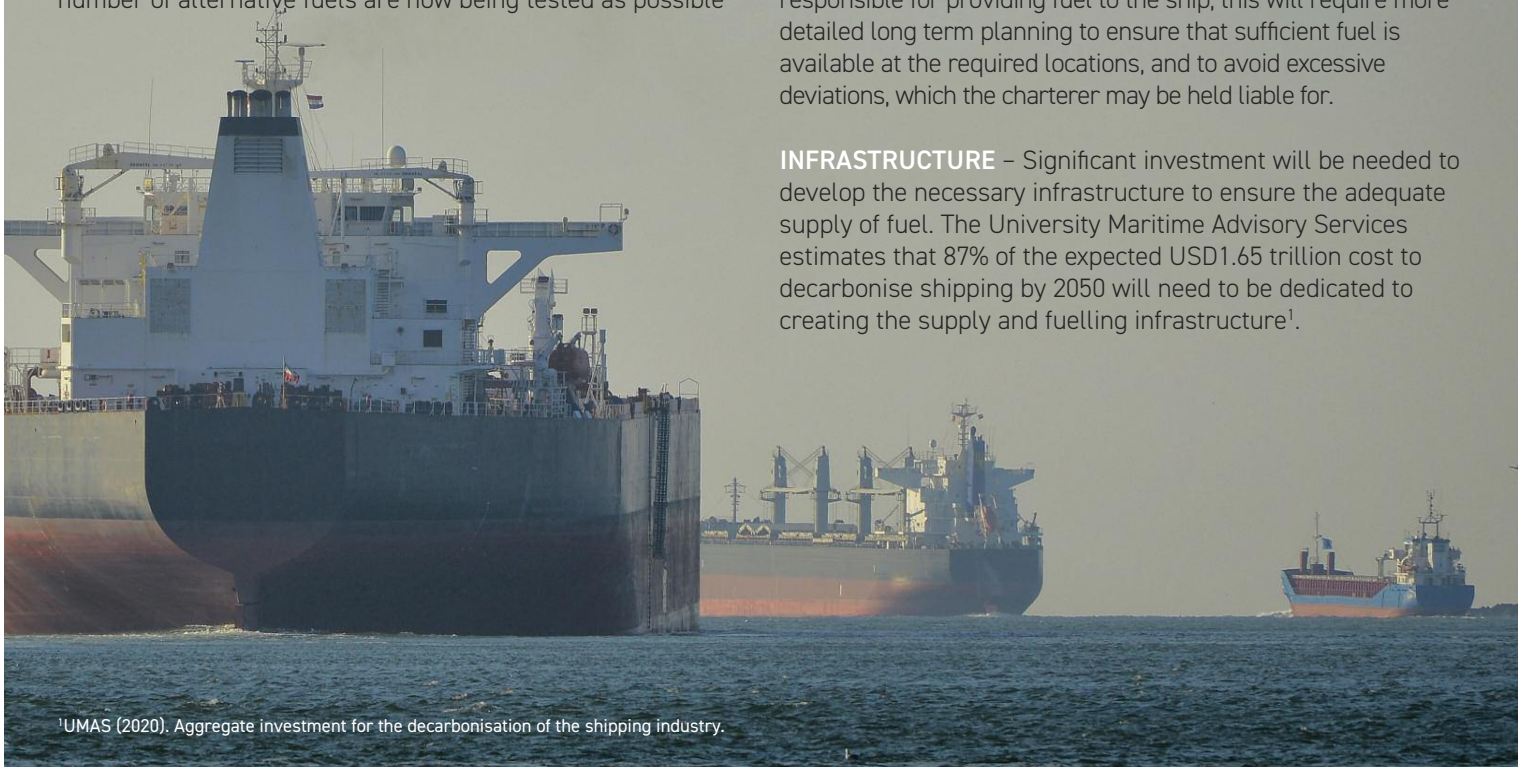
POSSIBLE P&I RISKS RELATING TO THE USE OF ALTERNATIVE FUELS

The introduction of alternative fuels does introduce new or increased risks compared to those associated with using fossil fuels. From a P&I perspective, the following factors are likely to impose potential liabilities on Members, always bearing in mind that these risks are likely to evolve and change as the technology develops:

AVAILABILITY – Lack of availability could result in operational disruption, and in the worst cases, lead to a ship becoming inoperative if it is unable to use other available fuel types. For ships on charter, this could result in disputes as a ship may be unable to fulfil its charter party obligations.

For chartered tonnage, where a Member as charterer is responsible for providing fuel to the ship, this will require more detailed long term planning to ensure that sufficient fuel is available at the required locations, and to avoid excessive deviations, which the charterer may be held liable for.

INFRASTRUCTURE – Significant investment will be needed to develop the necessary infrastructure to ensure the adequate supply of fuel. The University Maritime Advisory Services estimates that 87% of the expected USD1.65 trillion cost to decarbonise shipping by 2050 will need to be dedicated to creating the supply and fuelling infrastructure[1].



[1]UMAS (2020). Aggregate investment for the decarbonisation of the shipping industry.

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The biggest challenge will be in the tramp trade, where ships do not operate according to a predetermined schedule. Obviously the most popular alternative fuels will become more readily available around the world but, if the infrastructure is not in place, Members will need to plan ahead carefully to ensure that sufficient fuel can be provided to their ships. Failure to do this may result in off hire disputes as the ship would need to deviate to a suitable fuelling location or lie idle while waiting for fuel to become available.

QUALITY – There is a lack of international standardisation for most alternative fuels, for example, regulations such as the ISO 8217 standard which covers fossil fuels. This could lead to an increased risk of fuel disputes, as it may become difficult for Members to claim that the alternative fuel was not within the required specifications.

Members will need to provide a clear and detailed fuel specification to their fuel providers to ensure that only fuel suitable for use on board is delivered. Members should also establish suitable test parameters to determine the quality of the alternative fuel delivered to them, and the specifications must also be agreed with the charterer.

FUEL MANAGEMENT – The use of alternative fuels will require Members to identify any operational risks associated with the use of such fuels properly. They should provide the crew with the proper practical training and understanding to sufficiently mitigate these risks sufficiently to prevent off hire charter party disputes due to engine failure.

HEALTH, SAFETY AND ENVIRONMENT – Potential health concerns relating to the use of alternative fuels vary considerably depending on the fuel type. All fuel supplied should be accompanied by a Material Safety Data Sheet (MSDS), which should form the basis of a thorough risk assessment to ensure that appropriate safety barriers are in place to mitigate against any identified risks to the crew. For example, Ammonia is known to be very toxic and therefore any leakage could be lethal for an exposed crew member.

Another notable safety concern relates to the flash point temperature of certain fuels, which may be below the current SOLAS requirement of 60°C. The use of such fuels will require a rigorous approval process, including Flag State consultation, as well as increased robust safety means to ensure that the fuel is handled safely on board.

FUEL PRICING – Another factor which may become a commercial risk for Members is the pricing of alternative fuels compared to fossil fuels. Currently, alternative fuels tend to be more expensive than fossil fuels, and there are also local and regional variations in price and availability. However, as the market for alternative fuels grows, there is potential for cost reduction, as technology improves and more fuel is produced.

CONCLUSION

It is still too early to say which will be the preferred alternatives to fossil fuels as this will depend on a number of factors. One is the obvious environmental benefits of each alternative fuel, but the greatest challenges will relate to the availability, supporting infrastructure and price of the alternative fuels. All these elements need to be in place before these fuels are likely to become realistic industry-wide alternatives.

Also, there needs to be an increase in large-scale testing in order to determine and confirm the operational suitability and reliability of alternative fuels. In choosing the right fuel, Members will need to conduct a thorough operational assessment, including consulting various stakeholders to determine which alternative fuel best suits the requirements of their operation.

From an insurance liability perspective, the greatest concerns are about the possible lack of availability and infrastructure which could lead to supply issues. Members would need to make detailed plans to make sure that their ships could be sufficiently and efficiently supplied. In addition, the variation between the different types of alternative fuel together with the lack of standardisation may lead to an increased likelihood of fuel disputes.

Members will need to review their safety management system (SMS) thoroughly and implement robust procedures, as well as provide training to key personnel, to ensure that these risks are properly managed.

This table looks at a number of the most common alternative fuels and points out the various advantages and disadvantages of each fuel.

ALTERNATIVE FUEL	DETAILS	PROS	CONS
LIQUEFIED NATURAL GAS (LNG)	Requires an LNG capable engine with different fuel handling system and increased fuel storage space	Safe to use / proven technology / bunkering network evolving / very low in Nitrous Oxide (NOx), Sulphur Oxide (SOx) and Particulate Matter (PM) / >20% less CO_2 / LNG carriers can use waste boil-off gas	Methane slip / LNG is still a fossil fuel / regional variation in bunkering availability / future LNG pricing uncertain / high capital expenditure – especially retrofit / potential loss of cargo capacity
LIQUIFIED PETROLEUM GAS (LPG)	Requires LPG capable engine with different fuel handling system	Low NOx, SOx and PM / c.10-20% lower CO_2 / LPG carriers can use cargo as fuel / extensive terminal infrastructure	Limited uptake as marine fuel to date outside of LPG carriers / still a fossil fuel / economic incentive depends on pricing.
METHANOL	Primarily produced from natural gas / can be used in dual-fuel oil/methanol engines	Fuel handling and risk management simpler than LNG / zero CO_2 emissions for 'green methanol' / reduced NOx and SOx / existing terminal infrastructure	Retrofit can be complex / low energy density / likely to be costly in the short-term / toxic and flammable / global production still limited
BIOFUELS	While many engines are compatible, some ships require modification to the fuel system and engine	Some types of biodiesel already widely available at competitive prices and can use existing waste products / requires limited changes to engines and fuel handling systems	Typically no CO_2 reduction from vessel itself / emissions vary according to supply chain / sustainability issues (e.g. land usage for palm oil production)
HYDROGEN	Development focussed on zero-emissions fuel cells / can also be used in specialist combustion engines	Potentially both clean and abundant attracting significant investment in technology / fuel cells more efficient than combustion engines	Fuel production is still energy-intensive / large-scale production expensive / undeveloped bunkering infrastructure / expensive to store at -253˚C
AMMONIA	Can be produced from catalytic reaction of nitrogen from air and hydrogen from water and used in combustion engines or fuel cells	Already produced and traded at scale / zero emissions from vessel itself / 'green ammonia' could be fully GHG emissions free	Current production process (Haber-Bosch) is highly energy intensive / much less energy dense than oil-based fuels / extremely toxic and corrosive / significant NOx emissions / possible difficulty maintaining combustion / additional safety systems will need to be fitted to manage the toxicity risk
BATTERIES	Batteries can store electrical energy for propulsion by charging the ship using a High Voltage Shore Connection (HVSC)	Ship itself does not generate emissions / could be carbon-free if on-land power source is also green / already in use for small ferries / expanding network of HVSC facilities at ports	Impractical for larger vessels or those on long voyages due to size of batteries needed / upstream emissions still possible / potential loss of cargo space / unsuitable for many locations / safety concerns with some types of battery
SYNTHETIC METHANE	Fuel produced by combining hydrogen produced using excess energy from renewables and waste CO_2	Fuel could use LNG capable engines / potential to extend LNG beyond 'bridging fuel' / good method of carbon capture and re-use	Production process is still energy inefficient and costly / limited availability at present

Original source: Clarksons Research