FOIL
FORUM OF INSURANCE LAWYERS

Informing Progress - Shaping the Future

FOIL Update 18th July 2025

Charting a Greener Course for Sustainable Shipping

The shipping industry stands at an important crossroads as it seeks to reconcile its central role in global trade with the introduction of alternative fuels to support efforts to decarbonise. Figures from the International Maritime Organisation (IMO) indicate that approximately 90% of global trade by volume is transported via shipping, making maritime transport a vital component of the worldwide economy.

Among the most energy-efficient modes of transport, shipping remains responsible for approximately 3% of the planet's greenhouse gas (GHG) emissions and 6% of its oil demand. The IMO suggests that the industry should reduce its GHG emissions by at least half of the 2008 levels by 2050; however, current activity levels could result in a 130% increase within a similar time frame. The need for transformation is therefore clear, with the development and adoption of alternative fuels emerging as a key strategy for achieving long-term sustainability targets.

However, the transition is not straightforward or without risk. Several fuel options are currently being explored, each offering unique benefits and presenting distinctive challenges. As this evolution unfolds, the insurance sector must retain agility in its underwriting practices, risk assessment frameworks and product designs to reflect the shifting risk landscape.

Regulatory and Industry Pressures

A combination of regulatory priorities and market dynamics is shaping the drive towards alternative fuels. A pioneering agreement to transition away from the use of fossil fuels was made at the 28th United Nations Climate Change Conference (COP28) in 2023, a deal involving representatives from almost every country on earth. Additionally, the ambitious targets set by the IMO run alongside regional policies, such as the EU's extension of its Emissions Trading System (ETS) to include large ships and the FuelEU Maritime Regulation, which further promotes the use of low-carbon fuels.

In parallel, cargo owners, financiers and consumers are demanding greener supply chains as awareness and understanding of climate change grows. Pressure from Environmental, Social and Governance (ESG) stakeholders is prompting shipping companies to demonstrate progress on sustainability, with access to capital increasingly linked to environmental performance. The volatility in oil prices also impacts operational costs and profitability, both influencing investment in alternative fuel technologies and infrastructure.

Alternative Fuels: Benefits and Challenges

Alternative fuels are replacement energy sources used instead of traditional petrol, diesel or other fossil fuels in transportation with the aim of reducing carbon emissions. These fuels often require different infrastructure and technology, and while offering environmental benefits, they introduce new risks for insurers to address if they are to support the industry's decarbonisation efforts.

Several alternative fuels are currently in development or under consideration, each offering different pathways to decarbonisation. The leading options include liquefied natural gas (LNG), methanol, ammonia, hydrogen, and biofuels, as well as electrification in smaller vessels and for short-sea applications.

Liquefied Natural Gas

LNG is natural gas cooled to a liquid state for easier transportation and storage and is the most established alternative fuel currently in use for long-haul shipping. It offers a 20-30% reduction in CO_2 emissions compared to conventional marine fuels and significantly reduces emissions of sulphur oxides (SOx), nitrogen oxides (NOx), and particulate matter. Infrastructure for bunkering LNG remains behind traditional fuels, but is expanding globally, making it a practical interim solution.

However, LNG is a fossil fuel and emits methane, a potent greenhouse gas, during combustion and potential leakage (methane slip). While it may serve as a transitional fuel, its long-term sustainability is open to question. Insurers must consider the risks associated with using LNG, including cryogenic storage, pressurised fuel systems, and the potential for explosions or leaks in ports and on vessels.

Ammonia

Ammonia is carbon-free at the point of use and has a high energy density, making it a promising alternative fuel for deep-sea shipping. It can also be produced from renewable energy sources (green ammonia), offering a zero-emission solution if full lifecycle emissions are considered.

While it is carbon-free at the point of use, the process of producing ammonia, particularly conventional methods that utilise natural gas, can result in significant greenhouse gas emissions. Ammonia is also highly toxic and corrosive, requiring stringent handling protocols and presenting considerable safety risks for crews and port infrastructure. In turn, insurance coverage needs to be tailored for potential environmental contamination or health-related claims resulting from crew exposure.

Methanol

Methanol virtually eliminates SOx and particulate matter (PM) and reduces NOx by up to 80%. When produced from natural gas, it represents a 10-15% reduction in carbon dioxide emissions compared to traditional marine fuels. It is also biodegradable, making it far less damaging to the environment. When produced from renewable sources (green methanol), it offers emission reductions of up to 90%, making it among the lowest emission fuels for marine engines.

In addition, methanol is globally available and easier to store and handle than LNG or ammonia. It can be used in modified internal combustion engines and does not require cryogenic storage.

Despite the benefits, the current supply of green methanol is limited versus its demand, and its production costs remain higher than those of fossil fuel-based methanol. Further concerns of using methanol are that it has a low flashpoint, is highly flammable and it is very harmful if ingested or inhaled. Insurers must assess liabilities arising from fuel spills, fire hazards, and crew exposure, as well as the capability of fire suppression systems on board.

Hydrogen

Like ammonia, hydrogen can be produced renewably and used in fuel cells to generate electricity or in combustion engines to produce zero emissions at the point of use. It also has a high energy density by weight, meaning it can store large amounts of energy in a relatively small volume. These characteristics make it a particularly attractive option, particularly for short-sea shipping and offshore support vessels.

However, the highly flammable and explosive nature of hydrogen requires strict controls in its storage, handling and bunkering. Storage also requires high pressure or cryogenic temperatures that necessitate specialised tanks and infrastructure, which are currently limited. Insurers must assess the new risk factors associated with hydrogen to inform the

development of new coverage products that address the increased risk of fire or explosion, as well as uncertainty regarding appropriate maintenance protocols.

Biofuels

Biofuels are already compatible with existing engines and infrastructures, reducing the need for investment in modifying or building new vessels or setups. Depending on feedstock and production methods, biofuels can significantly cut lifecycle emissions and make a valuable contribution to decarbonising the shipping industry.

Sustainability concerns exist around feedstock sourcing, with large-scale biofuel production potentially driving land-use changes that impact biodiversity and increasing competition with food production. The variability in the quality and chemical composition of biofuels also raises operational concerns with how they are stored to avoid degradation. From an insurance perspective, there are potential impacts on engine wear, breakdown frequency and fuel contamination-related claims.

Electrification

Electrification using advanced battery technology, specifically Lithium-ion, is emerging as a key alternative fuel strategy for shipping that offers a zero-emission solution when powered by renewable electricity. Currently, due to its limited battery capacity, it is best suited for short voyages and ferries operating in coastal or inland regions. Battery-powered vessels offer a simplified fuel system, eliminating the need for complex fuel processing, which lowers operational costs and reduces environmental impact.

Due to the significant energy demands and energy density limitations, current battery technology is not suitable for larger ships travelling long distances. High battery weight and suitable recharging infrastructure are among the current constraints to the widespread adoption of battery technology.

Battery fires, like those that occur in other modes of transport, raise concerns for insurers, particularly around thermal runaway and the complexity of salvage in the event of marine casualties. The sourcing of battery materials and the end-of-life management of Lithium-ion batteries also need to be addressed responsibly to minimise environmental and social impacts.

Considerations for the Insurance Sector

The shift towards alternative fuels presents marine insurers with several challenges that require a re-evaluation of existing and emerging risks. Each fuel type introduces different operational and environmental risks, meaning traditional insurance models built around heavy fuel oil and marine diesel must evolve.

Considerations such as toxicity, cryogenic containment, fire risk, and system unfamiliarity come to the fore and insurers must collaborate with all stakeholders as new technologies are adopted to understand and price risks accurately.

Alternative fuels dictate new competencies in handling, maintenance and emergency response. Human error often plays a significant role in marine incidents, and the introduction of new fuel systems increases the potential for mishandling or misdiagnosis of system failures; this will need to be factored into risk assessments. The integration of new fuel systems also impacts vessel design, space utilisation and structural integrity, modifications underwriters must assess to determine how these affect insured values, maintenance costs and potential claims.

Ports will play a central role in supporting the transition, and insurers of port facilities will need to reassess their liability exposure related to spills, explosions, or contamination. Investment will not be uniform globally, so the variability in readiness also creates operational risks, with potential for deviation or delay claims under charterparty arrangements and related covers.

Technological innovation is fundamental to driving decarbonisation, meaning the limited performance history of most alternative fuels makes actuarial modelling and premium setting a challenge. Insurers will need to create coverage solutions using prototypes and simulation data, making close industry engagement critical to informed underwriting. Claims experience will mature as adoption increases, which will help shape future product development and risk appetite.

The insurance industry is uniquely positioned to support decarbonisation in shipping by developing new products and endorsements tailored to alternative fuel risks and helping facilitate the financing and adoption of cleaner technologies. Furthermore, rewarding shipowners who invest in fuel monitoring, emissions reporting, and proactive risk management can also encourage transparency and data sharing, measures that support ESG alignment and strengthen the risk profile for all parties involved.

Transitioning to alternative fuels is a complex and evolving journey shaped by regulation, innovation and economic pressures. There is no single solution, but the diversity of fuels being explored reflects a deep commitment to decarbonisation. For their part, insurers must develop technical expertise and collaborate closely with stakeholders to anticipate emerging challenges to safeguard their portfolios and help support a sustainable future.