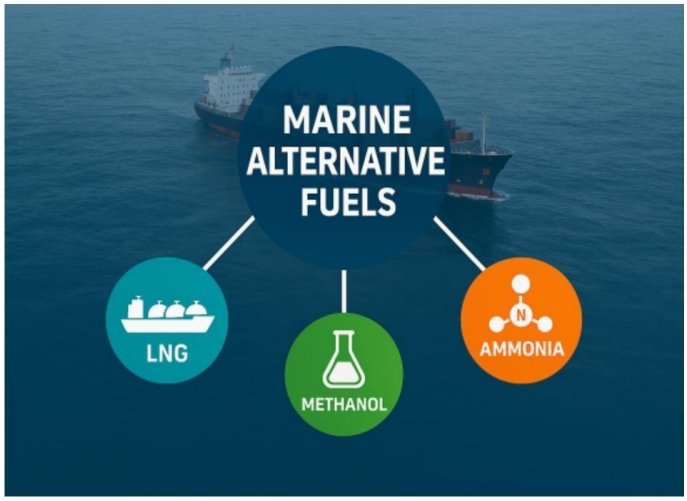
Navigating the Risks Behind Alternative Fuels



The IMO's 2023 GHG Strategy pushes shipping toward net-zero by 2050 through alternative fuels, balancing emissions reductions against safety, operational and commercial challenges.

The 2023 IMO Green House Gas (GHG) strategy has set an ambitious goal of achieving net-zero GHG emissions for the maritime industry by the year 2050, although it should be noted that Member States have recently voted to postpone by one year the formal adoption of the Net Zero Framework, signalling ongoing debate around timelines and implementation.

The strategy remains anchored on three key ambitions:

- By 2030 to reduce the carbon intensity of international shipping by at least 40% compared to 2008.
- Uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources to represent 5-10% of the energy used by 2030.
- GHG emissions from international shipping to reach net zero by or around the year 2050.

To achieve these ambitious decarbonisation targets industry stakeholders are exploring technical and operational measures, the adoption of novel technologies and the use of alternative fuels.

Whilst in the pursuit of decarbonisation pathways, many fuel candidates have emerged, Liquified Natural Gas (LNG), Methanol and Ammonia have been identified as the front-runners. Current data indicates that LNG is leading the in-service vessels and new order book.

Although alternative fuel capabilities are expected primarily on newbuilds, retrofitting on existing assets is also explored, effectively extending their service lifespan. In the initial years of deployment, while these fuels are expected to form the smaller share of the overall fuel-mix in dual-fuel engines alongside conventional fuels, they are projected to be progressively scaled to become mainstream in the maritime fuel landscape.

The deployment of these alternative fuels on board ships introduces a variability in the operational landscape, requiring an understanding of the characteristics of each fuel type in order to accurately assess and manage operational risks. As these are novel fuel technologies, the lack of operational data during initial deployment periods will require an agile Safety Management System (SMS) that can rapidly adapt as new operational learnings become available.

The key takeaways across these alternative fuels are:

1. Elevated Risks

The adoption of alternative fuels introduces a range of additional or elevated risks in the operational environment on board, stemming from some of their unique characteristics including toxicity, flammability, reactivity and low temperatures.

- **Toxicity** introduces potential health hazards for crew members, necessitating strict protocols to prevent accidental exposure or inhalation.
- **Flammability** increases the likelihood of fire-related incidents, requiring enhanced fire prevention and response strategies.
- **Reactivity** with other materials or under specific conditions, may lead to hazardous reactions that must be understood and managed in the design, and through the operational life cycle.
- **Cryogenic** and low temperatures present operational risks such as cold burns.

It is therefore essential that these risks are comprehensively assessed and addressed through system design and tailored operational procedures to ensure the safe deployment of alternative fuels.

2. Risk Profiles

Owing to their specific and sometimes unique characteristics each alternative fuel possesses a distinct risk profile, which requires comprehensive risk assessments. The deployment of these fuels in a dual-fuel or multifuel engines introduces further complexities which arise from interactions of various systems within a multi-fuel operational environment.

Understanding these complexities is critical for effectively managing and mitigating the risks associated with the adoption of alternative fuels on board vessels.

3. Training and Competence

The awareness, training and competencies required by vessel's crew to ensure safe operations will require aligning with the unique risk profile of each fuel, and to a 'hybrid' risk profile in multi-fuel operational environments.

While these alternative fuels have already achieved a high level of technological readiness, their safe deployment is contingent upon the crew competence in managing these operational environments.

4. Endurance

Each of these alternative fuels carries with it a varying degree of commercial 'trade-off' owing to their lower energy density when compared to conventional fuels. For maintaining the same endurance, estimates place the fuel tank capacity required for LNG at 1.89 times larger, Methanol at 2.4 times larger and ammonia at 3.1 times larger when compared with Heavy Fuel Oil (HFO).

These increased storage requirements represent a notable commercial 'trade-off' in terms of vessel design, reduced cargo space/carrying capacity and operational as well as logistical complexities.

Overall, the adoption of alternative fuels necessitates careful consideration of these commercial impacts as part of the broader decision-making process when considering fuel selection and vessel operation.

5. Environmental Aspects

These fuels provide varying levels of Tank to Wake (TtW) GHG emission reduction when compared to conventional fuels. This underscores the varied environmental performance of alternative fuels, presenting key areas for consideration when evaluating their suitability for regulatory compliance over the vessel's life cycle.

6. Fuel Availability

While these fuels offer a reduction in GHG emission levels when compared to conventional fuels, their adoption is closely linked to the availability of robust supply chains to support a well distributed global bunkering infrastructure. The deployment of LNG as a marine fuel has benefited from a well-established supply chain, a key factor in its current dominance in dual-fuel vessels in service and the new build order book.

The design, operational and commercial considerations, regulatory landscape and crew safety for LNG, Methanol and Ammonia have been explored in the attached documents to provide context as to their impact on operations, regulatory compliance and commercial viability.

a. LNG - Design, Operational, Commercial, Regulatory and Safety Considerations
b. Methanol - Design, Operational, Commercial, Regulatory and Safety Considerations
c. Ammonia - Design, Operational, Commercial, Regulatory and Safety Considerations

Supportive Information

For further information on this or other Loss Prevention topics please contact the Loss Prevention Department, Steamship Insurance Management Services Ltd. Tel: +44 20 7247 5490 Email: loss.prevention@simsl.com

Resources

- RA124 Navigating the Risks Behind Alternative Fuels
- LNG Design, Operational, Commercial, Regulatory and Safety Considerations
- Methanol Design, Operational, Commercial, Regulatory and Safety Considerations
- Ammonia Design, Operational, Commercial, Regulatory and Safety Considerations