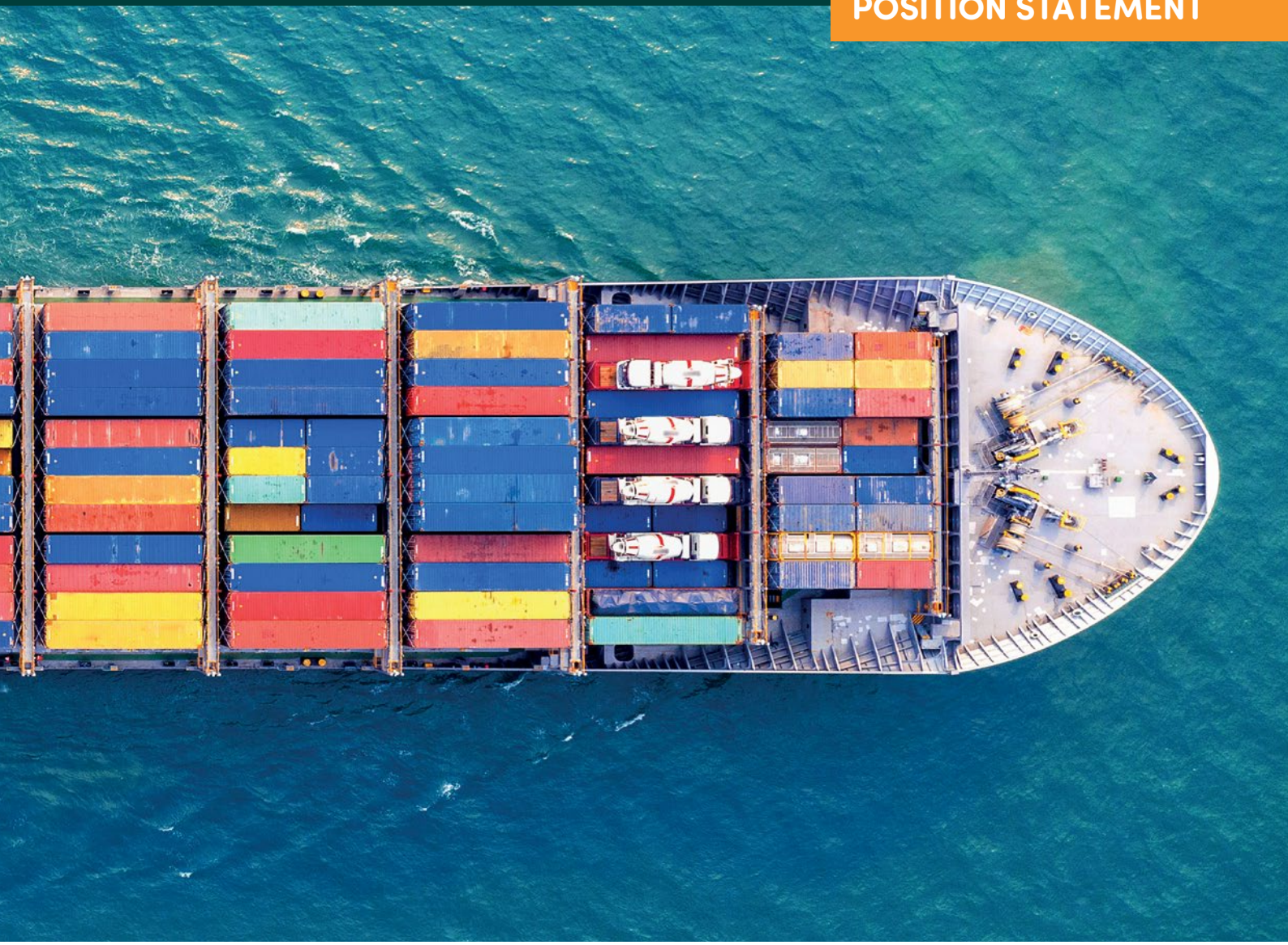
WORLD BIOGAS ASSOCIATION

BIOMETHANE AS A MARITIME FUEL

POSITION STATEMENT



Executive Summary

Biomethane represents a practical, scalable and immediate pathway for some parts of maritime decarbonisation. As a renewable, low-carbon fuel, biomethane can leverage existing liquefied natural gas (LNG) infrastructure and vessels, enabling rapid adoption while aligning with International Maritime Organisation (IMO) climate targets. While biomethane may not cover the entire energy needs of the maritime sector, the World Biogas Association (WBA) supports its integration into maritime fuel strategies as a critical component of the sector's transition to net-zero among the suite of other alternative fuels.

Context & Problem Definition

The maritime sector contributes nearly 3% of global greenhouse gas (GHG) emissions. With IMO 2030 and 2050 decarbonisation targets, shipping faces increasing regulatory and market pressures to reduce its climate footprint.

The objectives are to reduce the total annual GHG emissions by at least 20%, striving for 30%, by 2030, and at least 70%, striving for 80%, by 2050, compared to 2008 levels[i].

The IMO's newly proposed regulatory framework sets the stage for a technology-neutral approach to reducing GHG emissions, ensuring that multiple fuel pathways - including bio-LNG (liquid biomethane), also known as liquefied biomethane (LBM) - can compete on a level playing field.

Conventional fuels offer limited pathways competing for feedstock with Sustainable Aviation Fuel (SAF), and alternative solutions (e.g., ammonia, hydrogen) require significant infrastructure and time to scale. An immediate, transitional solution is needed – bio-LNG[ii].

Statement of Position

WBA advocates for the accelerated deployment of biomethane in maritime applications. Biomethane offers a credible, near-term decarbonisation option for a subset of routes and vessels, while laying the groundwork for deeper integration of renewable fuels in the long term.

Evidence & Justification

Research into bio-LNG costs and availability conducted by the Maritime Energy and Sustainable Development Centre of Excellence at Nanyang Technological University Singapore shows that pure bio-LNG could realistically cover up to 3% of the total energy demand for shipping fuels in 2030, increasing to 13% in 2050. If used as a drop-in fuel blended with fossil LNG, bio-LNG could contribute to up to 16% of the total energy demand in 2030 and 63% in 2050, assuming a 20% blending ratio.

Cost is another important issue for vessel owners and operators. Analysis from the Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping (MMMCZCS) suggests that bio-LNG is the lowest cost green fuel, with significantly lower costs of production compared with bio-methanol and electro-fuels (e-fuels), including e-ammonia and e-methanol[iii].

According to MMMCZCS, the standard commercial process of upgrading and liquefaction to produce LBM is cheaper than synthetic natural gas (SNG) or biomethanol, which are 50–70% more expensive at similar scales. Additionally, when value chains are optimised, LBM production can achieve strongly negative emissions.

Environmental Case

- Biomethane can reduce lifecycle GHG emissions by up to 80% on a well-to-wake compared with conventional marine fuels (depending on feedstock[iv, v].
- When produced from waste streams, biomethane contributes to circular economy goals and reduces methane emissions from agriculture and landfill[vi].
- Using bio-LNG as shipping fuel virtually eliminates SO_x, drastically cuts NO_x, and slashes particulate emissions - delivering immediate local air-quality benefits on top of lifecycle GHG reductions[vii].

Technical Case

- Biomethane is fully compatible with LNG-ready ships and existing bunkering infrastructure. (See Market Dynamics/fig 1). 185 ports worldwide have LNG bunkering facilities, with a further 50 facilities planned in 2025[viii].
- Liquid biomethane can be blended with LNG, enabling gradual decarbonisation without major retrofits. The LNG bunkering coalition SEA LNG believes the market can expect to see 2-4,000 LNG-fuelled ships in operation by 2030, based on the current growth trajectory[ix].

Economic Case

- Leverages existing LNG investment (~$10 billion globally)[x].
- Supports domestic energy production and rural economies through waste valorisation[xi].
- Offers competitive cost trajectories relative to e-fuels in the near and medium term, although still heavily undercut by traditional (fossil) bunker fuel.

Policy Case

- Recognised in the EU's FuelEU Maritime and Renewable Energy Directive (RED III).
- Aligns with IMO greenhouse gas strategy and EU Fit for 55 climate package. Ships running on biomethane can comply with tightening IMO CII (carbon intensity indicator) requirements[xii]. Shipowners can lower EU ETS compliance costs[xiii]. Cargo owners can report lower supply chain CI under ESG disclosure rules[xiv].
- Aligns with the Clydebank Declaration, to establish green shipping corridors – zero-emission maritime routes between 2 (or more) ports[xv]. In supporting the establishment of green corridors, signatories to the Clydebank Declaration recognise that fully decarbonised fuels or propulsion technologies should have the capability to not add additional GHGs to the global system through their lifecycle, including production, transport or consumption[xvi].
- Compatible with the incoming global carbon tax on shipping, scheduled to be introduced in 2027[xvii].

Addressing Challenges and Counter Arguments

- Supply constraints: Global biomethane production must scale; policy and investment support can accelerate capacity expansion.

- Methane slip: Technology solutions (engine improvements, after-treatment systems) are emerging to mitigate leakage[xviii,xix,xx]. Support from programmes such as Methane Abatement in Maritime Innovation Initiative (MAMII)[xxi] and EU-funded GREEN RAY[xxii]will accelerate this change.
- Competing uses: With competing demands for biomethane across multiple sectors, the maritime industry's prospects will depend on a combination of market dynamics, domestic demand and geographical positioning to determine its relative favourability.

Recommendations

Policy Support

- Employ a technology neutral approach aimed at driving the lowest cost of compliance.
- Recognise that biomethane is a materially scalable fuel for decarbonisation with relevance to the 2050 ambitions.
- Establish a certificate mechanism to enforce decarbonisation in shipping, with provisions for free trading of excess certificates to promote efficiency and reward overachievement.
- Develop existing certificates into a single standardised guarantees of origin for biomethane and other alternative fuels.
- Permit "virtual liquefaction" pathways, whereby biomethane tracked with a robust mass balance system through a gas grid can be credibly attributed to sustainable feedstock without requiring physical co-location of liquefaction facilities and biogas production.
- Recognise biomethane's greenhouse gas savings in regulations, using a full life cycle assessment (LCA) of its carbon intensity.
  - Separate emissions into well-to-tank and tank-to-wake stages.
  - Trace waste feedstocks from collection according to best practice.
  - Treat energy crops as products, including all cultivation, processing and shipping emissions.
  - Recognise negative carbon intensity values to maximise the credit for BioLNG.
- Recognise externalities; using bio-LNG as shipping fuel virtually eliminates SO_x, drastically cuts NO_x, and slashes particulate emissions - delivering immediate local air-quality benefits on top of lifecycle GHG reductions.
- Harmonise sustainability criteria across sectors to standardise definitions, metrics, and reporting for carbon emissions reduction, ensuring consistency and comparability.
- Accept mass balance accounting methods, essential to mobilising biomethane for shipping through existing infrastructure.
- Establish a reward mechanism for zero/near-zero fuels (like subsidies, tax breaks, or credits) that incentivises the use of low-carbon fuels (such as biomethane); mechanisms that recognise the difference in characteristics between bio and energy derived fuels.
- Advocate for scaling up sustainable fuel production for the shipping sector via NDCs.

Industry Action

- Invest in LNG dual-fuel ships and bunkering capacity to secure future biomethane adoption.
- Support R&D on methane slip reduction technologies.
- Adopt best practice approaches to biomethane production, aligned to LCA reporting, as enshrined in schemes such as ADCS International[xxiii].

Research & Innovation

- Fund lifecycle analyses of biomethane pathways to ensure transparent carbon accounting, aligned to the development of IMO LCA Framework[xxiv].
- Encourage pilot projects and knowledge-sharing platforms.

Market Dynamics

Cargo

China's Taiwan-based container shipping company Evergreen Marine announced a $3.245 billion order for 11 24,000 TEU liquefied natural gas (LNG/bio-LNG) dual-fuel powered ultra-large container ships[xxv].

German Hapag-Lloyd has commissioned 24 new container ships, 12 with a capacity of 16,800 TEU and 12 with a capacity of 9,200 TEU. All will be equipped with state-of-the-art low emission high pressure liquefied gas dual-fuel engines and can be fuelled by biomethane[xxvi]. In September, Hapag-Lloyd and Shell signed a multi-year agreement for the supply of bio-LNG to fuel cargo ships. Since 2024, Shell has broadened its portfolio to include bio-LNG, now available at 22 sites across its global LNG bunkering network.

France's CMA CGM has invested in 162 dual-fuel vessels ready to use biomethane, biomethanol and hydrogen, that will be in fleet by 2029. Through partnerships with industrial and energy leaders, CMA CGM supports the development of a sustainable supply chain for these new low-carbon fuels[xxvii, xxviii].

The group ordered 12 18,000 TEU dual-fuel LNG boxships in March 2025 with a further six 22,000 TEU dual fuel box ships in September[xxix].

Market Dynamics (cont.)

Singapore based Pacific International Lines have ordered a total of 18 LNG dual-fuel newbuild vessels since 2022, including four 14,000 TEU, four 8,000 TEU, five 13,000 TEU, and five 9,000 TEU vessels[xxx].

Dutch global shipping company Van Oord has completed its first bunkering of bio-LNG onto a dredger on the Elbe River in Germany[xxxi].

Swiss based Axpo Group successfully completes Spain's first ship-to-ship bio-LNG bunkering operation in the large container shipping industry at the Port of Algeciras, building on recent bunkering successes in key ports, including Málaga and Sines[xxxii].

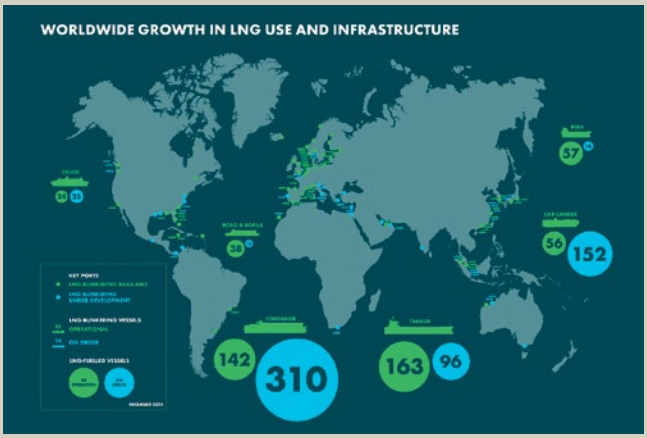
Ferries

Finnish passenger ferry Viking Line will boost its biogas purchasing by sixfold this year and will offer passengers the option of fossil-free maritime transport for the first time on all of its routes[xxxiii].

TUI Cruises has bunkered its first ship-to-ship supplies of ISCC-certified bio-LNG at the port of Barcelona, as the cruise line eyes a full decarbonisation of its operational fleet through diversified biofuels[xxxiv].

Brittany Ferries is progressively incorporating biomethane (bio-LNG) into its operations to reduce emissions, with energy company Repsol supplying the fuel to their LNG-powered vessels, such as the Salamanca and Santoña. Between 2019 and 2025, five new LNG-powered vessels joined the fleet[xxxv].

Ports



Bio-LNG can be transported, stored and bunkered in ports using the established LNG infrastructure. (SEA-LNG)[xxxvi]

St1 and joint venture subsidiary St1 Biokraft complete the first delivery of Swedish-produced liquefied biomethane to the Port of Gothenburg, which also aims to develop a biomethane liquefaction plant to become Scandinavia's primary bunkering hub for alternative maritime fuels[xxxvii].

Conclusion

Biomethane is a viable, scalable and immediate decarbonisation solution for maritime transport. By leveraging existing LNG infrastructure, biomethane can accelerate the shipping industry's transition while supporting circular economy principles and energy security. It is also compatible with pathways for future fuels such as e-methanol, hydrogen and other synthetic gases. With the right policy frameworks and industry investments, biomethane should play a central role in achieving global maritime climate targets.

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