Gas: CUTTING EMISSIONS AND POLLUTION IN MARITIME TRANSPORT

Introduction

- LNG, bioLNG, eLNG, hydrogen and ammonia[1] have a crucial role to play in the EU transport sector, including maritime transport.
- LNG is readily available and delivers important air quality benefits, with deep reductions in sulfur oxides (SO_x), nitrogen oxides (NO_x) and particular matter (PM).
- Alongside bioLNG and eLNG, LNG allows significant reduction in CO_2 and GHG emissions of vessels on a TTW (Tank-to-Wake) and WTW (Well-to-Wake) basis[2].

2.3 MILLION JOBS
created in the EU

Our DNV pathways study has shown how optimising the role of gas in the transitions can increase EU employment by 2050.

Eurogas key policy recommendations

- The EU should increase focus on promoting LNG, bioLNG and eLNG to reduce emissions from maritime transport.
- Eurogas believes the following elements are crucial to boosting the use of these fuels:
  - All EU policies should ensure a level playing field and assess solutions objectively along the complete value chain, including refuelling and distribution infrastructure.
  - The EU framework needs to recognise the Well-to-Wake emissions, to fully account for the contribution of fuels, as well as local emissions, performances of fuels, and the time needed for their deployment.
  - An economically efficient and well-planned approach that maximizes the value of existing assets to incorporate increasing shares of renewable and low carbon gases.
  - The Alternative Fuels Infrastructure Directive (AFID) for LNG, bioLNG, eLNG and hydrogen uptake should be fully implemented. In the upcoming AFID revision, natural gas – liquified and gaseous – must remain an alternative fuel source.
  - Taxation which fully recognises fuels' contribution to decarbonisation and environmental performance in the transport sector.
  - The NO_x, SO_x and Particulate Matter (PM) Emission Control Areas (ECAs) must be extended to the whole European coastline[3].
  - Small-Scale LNG infrastructure projects should be classified as sustainable within the European Commission's Sustainable Finance Programme.

1 There is ongoing work to certify as ammonia ready certain LNG tanks, allowing synergy between the two fuels - Bureau Veritas/GTT – 'NH_3 ready' Membrane Tanks (February 2021)
2 Sphera – The definitive study on lifecycle analysis for LNG as a marine fuel – Sphera's 2nd lifecycle GHG emission study on the use of LNG as a marine fuel (April 2021)
3 To complement the North and Baltic Seas as NO_x Emission Control Area (NECA) since 1 Jan. 2021. In practice, all new vessels built as of 2021 will be required to reduce their NO_x emissions by 80% compared to the present emission levels when sailing in these areas.
4 DNV estimates based on the volumes projected in DNV study for Eurogas: European Carbon Neutrality: The Importance of Gas. Includes jobs for all types of gases, their supply, their transmission, distribution and trade for all end-uses.

Climate and air quality benefits

- Compared to conventional maritime fuel oils, LNG significantly reduces emissions from local pollutants[5,6,7]:
  - SO_x emissions are reduced to near zero due to the very low sulphur content of LNG.
  - NO_x and PM can be reduced by more than 90%.
- Compared to very low sulphur fuel oils, LNG significantly reduces GHG emissions, while accounting for methane slips[8]:
  - From the Well-to-Wake perspective, GHG emissions are reduced by 14-23% for 2-stroke slow speed engines, and by 6-14% for 4-stroke medium speed engines.
  - From the Tank-to-Wake perspective, GHG emissions are reduced by 20-30% for 2-stroke slow speed engines, and by 11-21% for 4-stroke medium speed engines.

If today's global marine transport completely switched to LNG, its GHG emissions would decrease by 15%[2] compared with the fleet powered by fuel oils.

Taking into account improvements in reducing methane emissions in the LNG supply chain, this benefit could rise to **20% by 2030**[2,10].

Blending with 20% of bioLNG could further reduce CO_2 emissions by up to 34%[9]. Higher blending rate, use of innovative technology – such as fuel cells – and synergy with eLNG and the potential re-use of the (biogenic) CO_2, could unlock even deeper decarbonisation.

Infrastructure and vessels global deployment

There are 206 LNG ships in operation and **295 on order (98 to be delivered in 2021)**. There are **142 LNG-ready vessels**, either in operation or on order[10]. Currently, LNG-fuelled vessels constitute approx. 13% of the newbuild orderbook. LNG has penetrated nearly all ship segments – estimates for 2021 and beyond show continuing growth in many classes of vessels.

At the end 2020, there were **124 ports with LNG bunkering facilities**. In 2022, that number will **grow to at least 170**.[12].

1/3 Member States have set targets for LNG bunkering. By 2026, the EU will have to establish an adequate number of LNG refuelling points in ports to ensure the circulation of inland waterway or seagoing vessels[13].

---

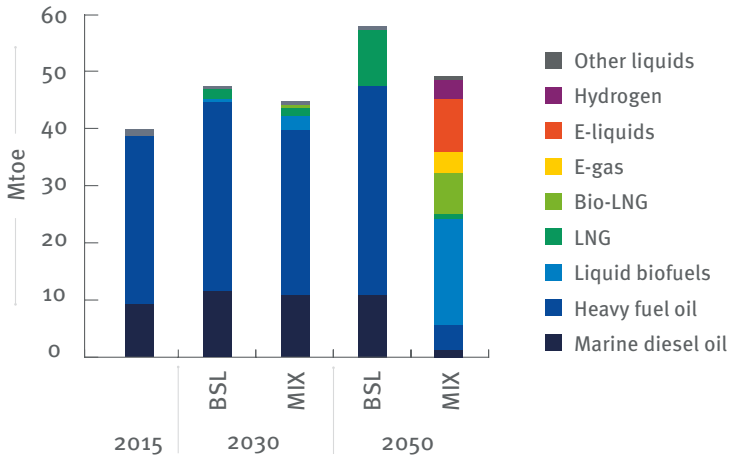
5 Conventional maritime fuels oils i.e. Heavy Fuel Oil (HFO), Very Low Sulphur Fuel Oil (VLSFO) & Maritime Gas Oil (MGO)
6 LNG Protocol – Declaration for the Use of LNG as the Go-To Fuel of the Future (Oct 2019)
7 P. Gilbert, C. Walsh, M. Traut, U. Kesieme, K. Pazouki, A. Murphy – Assessment of full life-cycle air emissions of alternative shipping fuels, Journal of Cleaner Production, (Jan 2018)
8 Regarding methane slips in use, according to2:
- High-pressure 2-stroke slow speed diesel cycle engines already have virtually no methane slip
- Low-pressure 2-stroke slow speed Otto cycle engines ordered today offer a 50% reduction in methane slip
- For 4-stroke medium speed engines, methane reduction technologies such as oxidation catalysts or the implementation of high-pressure gas injection could reduce methane emissions by 70 %/90 % respectively. It has to be noted however that both technologies are currently in R&D and not commercially implemented yet.

For methane emissions in the LNG supply chain: they account today for 6% of the total WTW emissions but could be reduced in average by 15 % by 2025 and by 35 % by 2030.
9 EBA, GIE, NGVA, SEA LNG – BioLNG makes carbon neutrality a reality for EU transport (November 2020)
10 DNV GL – Alternative Fuels Insight Platform (Consulted in May 2021)
11 The Maritime Executive – The Outlook for LNG as a Marine Fuel (February 2021)
12 Clarksons Research - Clarksons: 27% of the order book to run on alternative fuels (December 2020)
13 Throughout the TEN-T Core Network

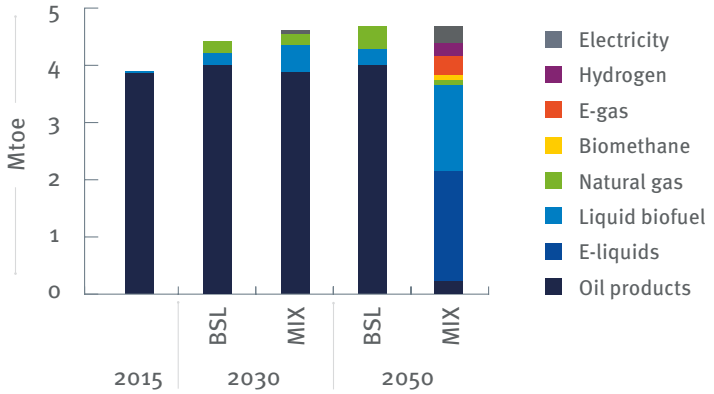
Gases will play an increasing role in all maritime applications

› **Europe:** According to EC projections the consumption of LNG, bioLNG and eLNG in maritime transport is expected to soar in the coming decades.

International maritime fuels mix in 2030/2050[14] according to European Commission projections



Inland waterways and national maritime fuels mix in 2030/2050[14] according to European Commission projections



BUNKER FUELS:

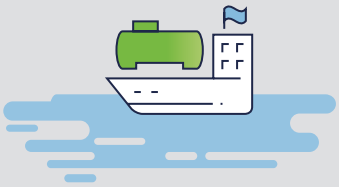
LNG would provide about 4.3% of maritime bunker fuels by 2030.*

INLAND NAVIGATION:

share of LNG use for inland navigation increases to 3.7% by 2030.*

*European Commission projections

› **Global:** The consumption of LNG is expected to strongly increase in the coming decades. According to IEA *Net Zero by 2050* scenario, consumption of gas for maritime shipping (which includes both domestic and international operations) is expected to increase 7 times in 2030 and about 8 times by 2040[15].



Consumption of gas for maritime shipping is expected to increase globally[15].

7x in 2030

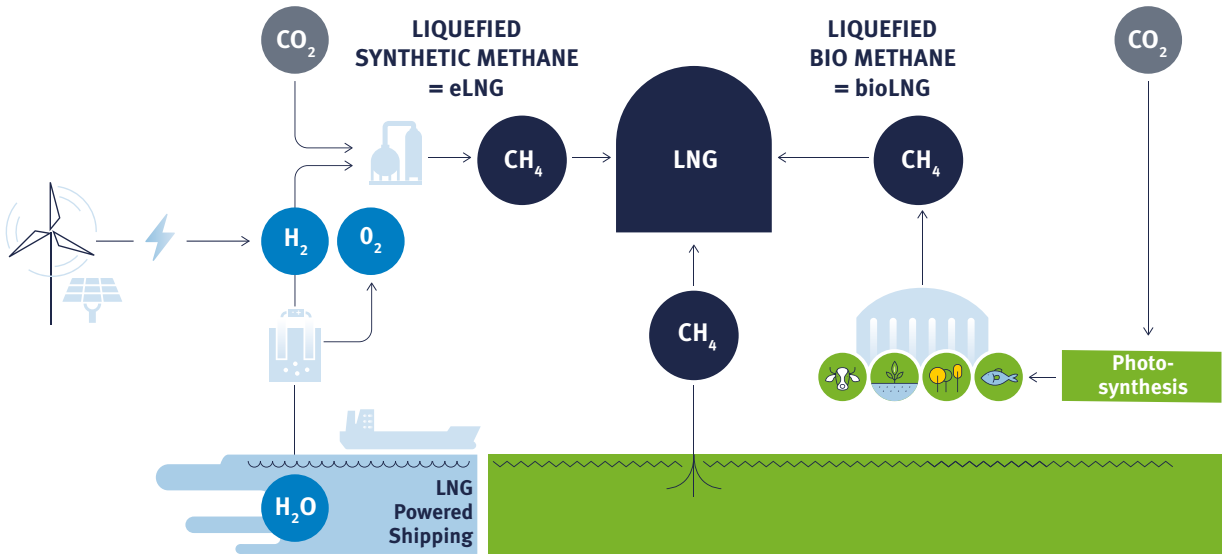
8x in 2040

Energy consumption in shipping by fuel in Exajoules (EJ)

SHIPPING	2020	2030	2040	2050
Oil	10.80	8.95	4.21	1.53
Gas	0.06	0.39	0.47	0.10
Bioenergy	0.01	0.82	1.71	2.05
Hydrogen	0.00	0.22	0.84	1.62
Ammonia	0.00	0.88	2.93	4.55
Electricity	0.00	0.00	0.00	0.01
Synthetic fuel	0.00	0.00	0.01	0.05
Total EJ	**10.87**	**11.25**	**10.18**	**9.91**

14 EC – Smart and Sustainable Mobility Strategy Staff Working Document (December 2020)
15 IEA – Net Zero by 2050 scenario (May 2021)

How to produce LNG, bioLNG, eLNG



eurogas@eurogas.org | +32 2 894 48 48 | www.eurogas.org | Rue d'Arlon 80, 1040 Brussels

Eurogas is a European gas industry association representing 64 companies and associations engaged in gas wholesale, retail and distribution in Europe.