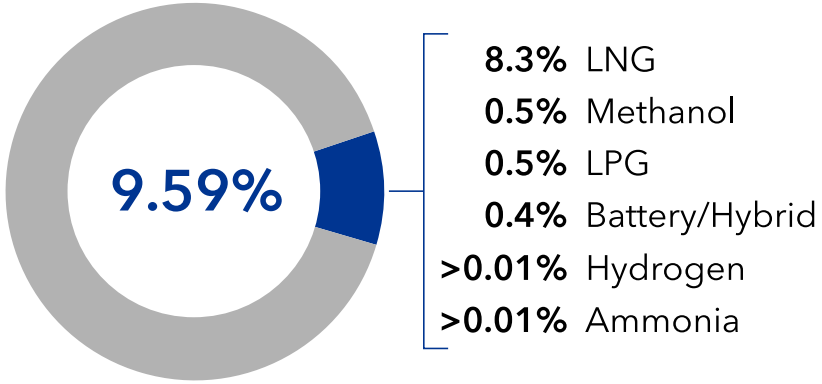
WHEN TRUST MATTERS

Alternative fuels supply and production

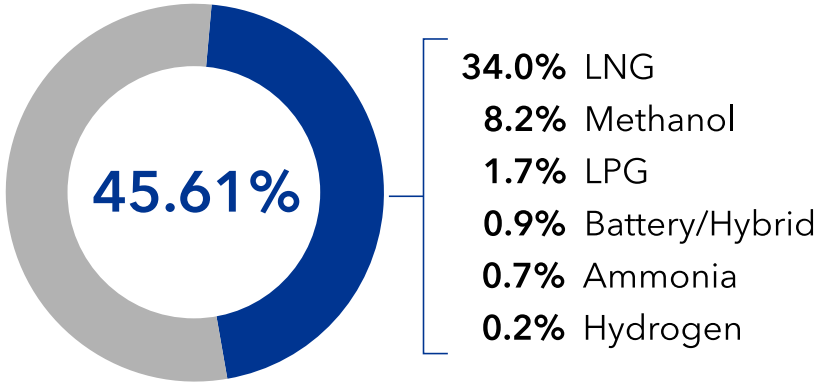
5th IENE Energy & Shipping Seminar

George Teriakidis, Regional manager, Region Southeast Europe

GROSS TONNAGE IN OPERATION

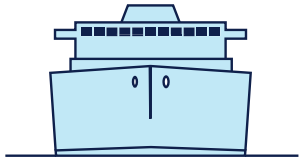


GROSS TONNAGE ON ORDER



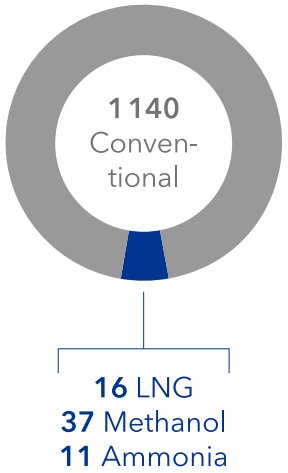
Percent of fleet using conventional vs. alternative fuels (including LNG carriers)

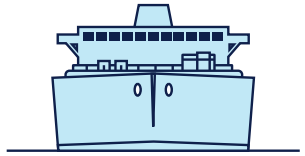
Uptake of alternative fuel technologies for large bulkers, tankers and containerships, excluding LNG carriers



BULKERS
40 000 DWT and above

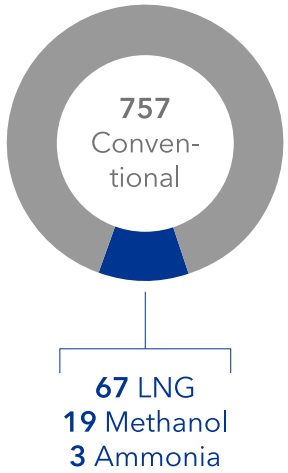
Share of order book
Number of ships

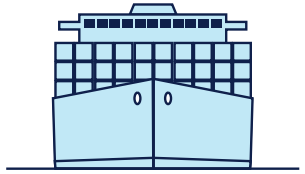




TANKERS
45 000 DWT and above

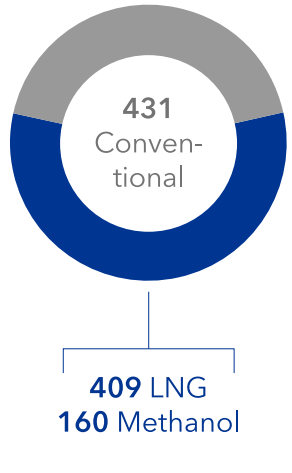
Share of order book
Number of ships





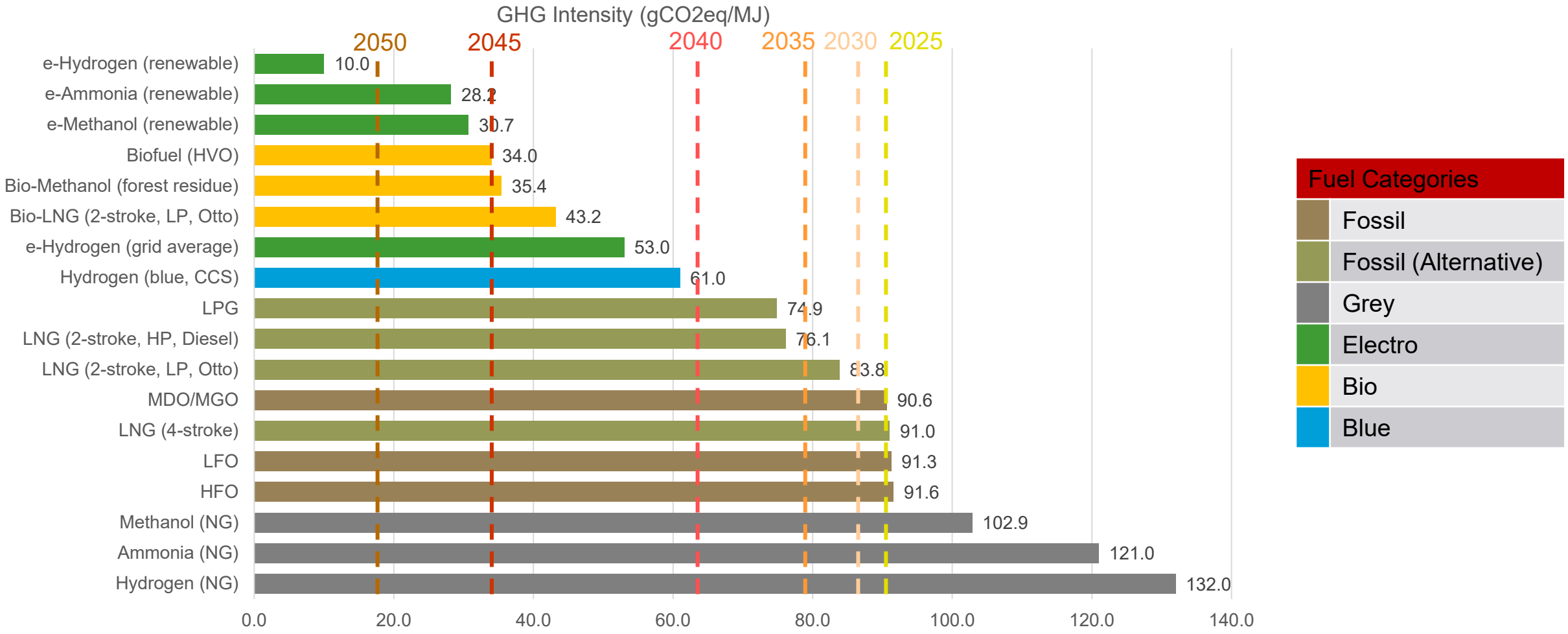
CONTAINERSHIPS
2 000 TEU and above

Share of order book
Number of ships



Sources: S&P Global, Alternative Fuels Insight (AFI) – afi.dnv.com; as of 31 January 2026

GHG Intensity limit – Fuel EU



- *Values are based on assumption and may vary once LCA is finalized.*
- *LNG (with high pressure 2-stroke engine) and LPG are the two fossil fuels compliant options until 2040.*
- *Sources: FuelEU regulation, MEPC documents, JRC default values for transport fuels*

Marine fuel comparison - the picture for the short-term

		Technology and safety			Economic		Availability		GHG
Fuel substance		**Volumetric energy density***	**Maturity indicator (ICE)**	**Safety regulations (IMO)**	**Onboard CAPEX**	**Fuel cost*** **	**Fuel production** (Mtoe per year)**	**Bunkering infrastructure**	**WtW GHG intensity**** (gCO_2-eq./MJ)**
1. Biofuels	Fossil	~36 GJ/m^3	Mature	Mature	No additional cost	B100 biodiesel: ~1500 USD/tonne VLSFO-eq.	Sustainable biodiesel: ~9	Well-established	~91
	Low GHG intensity		Mature, but bio-based diesel compatibility should be checked on a case-by-case basis						<34
2. LNG / RNG	Fossil	~21 GJ/m^3 (~58% of fuel oil)	Mature	Mature	~15-30% additional cost	LNG: ~500 USD/tonne VLSFO-eq.		>80 ports 55 bunkering vessels (13 on order)	~76-91
	Low GHG intensity					High	Bio-methane: ~6 Biogas: ~40		<51
3. Methanol	Fossil	~16 GJ/m^3 (~44% of fuel oil)	Limited engine models available, boilers under development	Alternative design approval process required, but interim IMO guidelines in place	~10-20% additional cost	~700 USD/tonne VLSFO-eq.		1 bunkering vessel (3 on order)	~101
	Low GHG intensity					~2200 USD/tonne VLSFO-eq.	Bio/e-methanol: <1 (announced projects: ~10)		<35
Ammonia	Fossil	~12 GJ/m^3 (~33% of fuel oil)	Engines and boilers under development	Alternative design approval process required	~15-25% additional cost	~1000 USD/tonne VLSFO-eq.		No dedicated bunkering infrastructure	~124
	Low GHG intensity					~2800 USD/tonne VLSFO-eq.	Blue/e-ammonia: <1 (announced projects: ~109)		<36
Hydrogen (liquefied)	Fossil	~9 GJ/m^3 (~25% of fuel oil)	Engines under development	Alternative design approval process required	>30% additional cost	High		Infrastructure for marine transport and bunkering to be developed	~133
	Low GHG intensity					Very high	<1 (liquefied) ~3 (H_2 gas)		<34

*not including fuel storage system
**based on current annual production capacity (by en of 2023) from DNV's Alternative Fuels Insights platform
***based on estimated recent prices, 2024-04, in Rotterdam by Argus Media (if available)
****for all low GHG intensity fuels, we assume production with GHG saving of at least 65%

High score | Medium score | Low score | Very low score

Mtoe: Million tonne oil equivalents ICE: Internal Combustion Engine WtW: Well-to-wake

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	Low GHG intensity								<35
4. Ammonia	Fossil	~12 GJ/m³ (~33% of fuel oil)	Engines and boilers under development	Alternative design approval process required	~15-25% additional cost	~2800 USD/tonne VLSFO-eq.	Blue/e-ammonia: <1 (announced projects: ~109)	No dedicated bunkering infrastructure	~124
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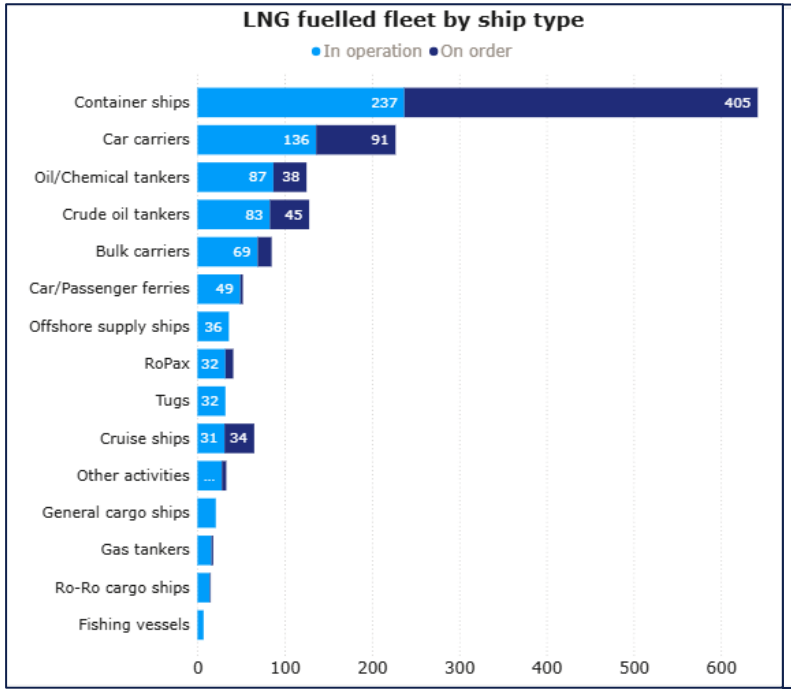
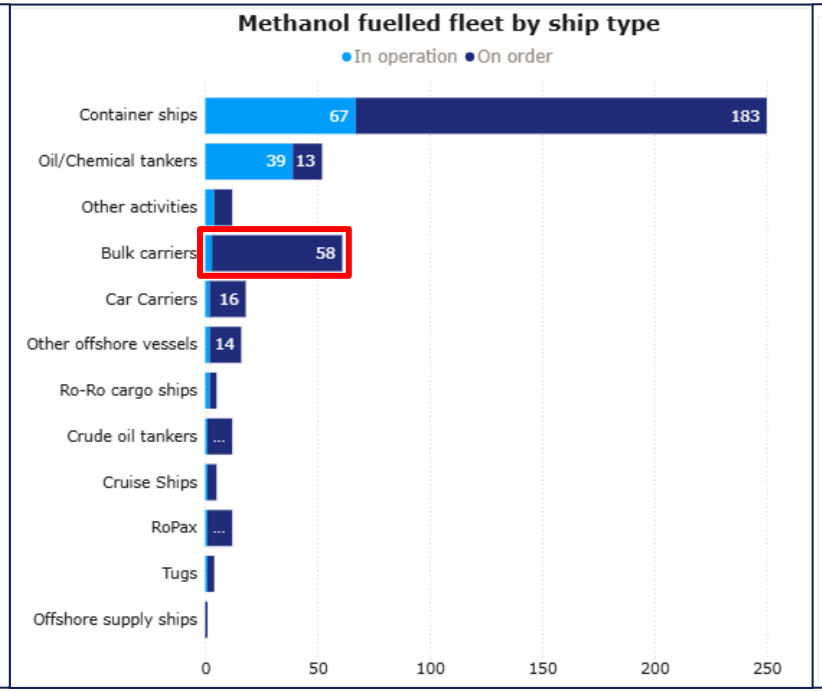
Alternative fuels uptake

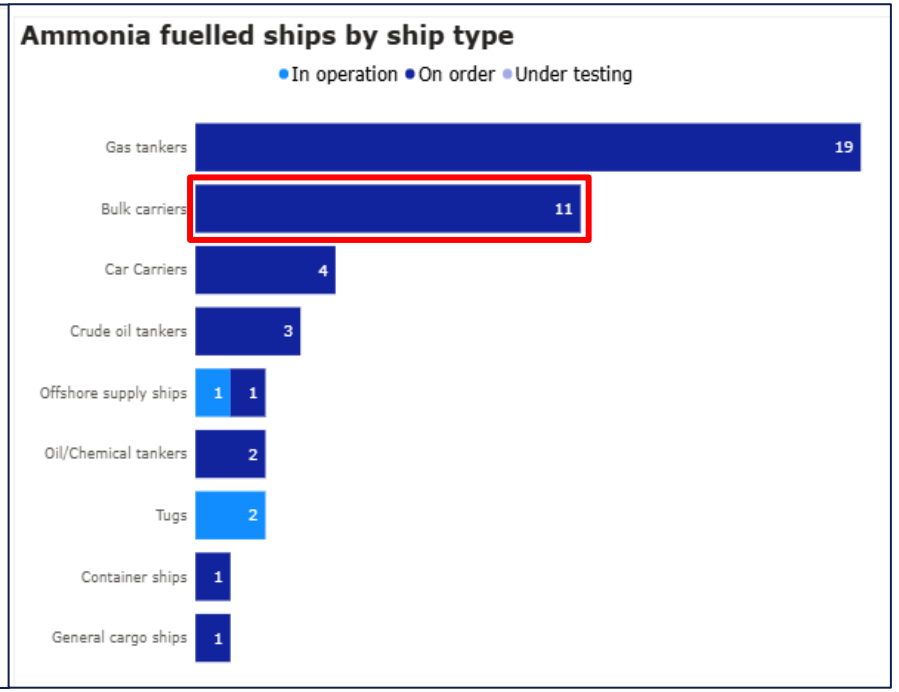
2. LNG / RNG



3. Methanol



4. Ammonia

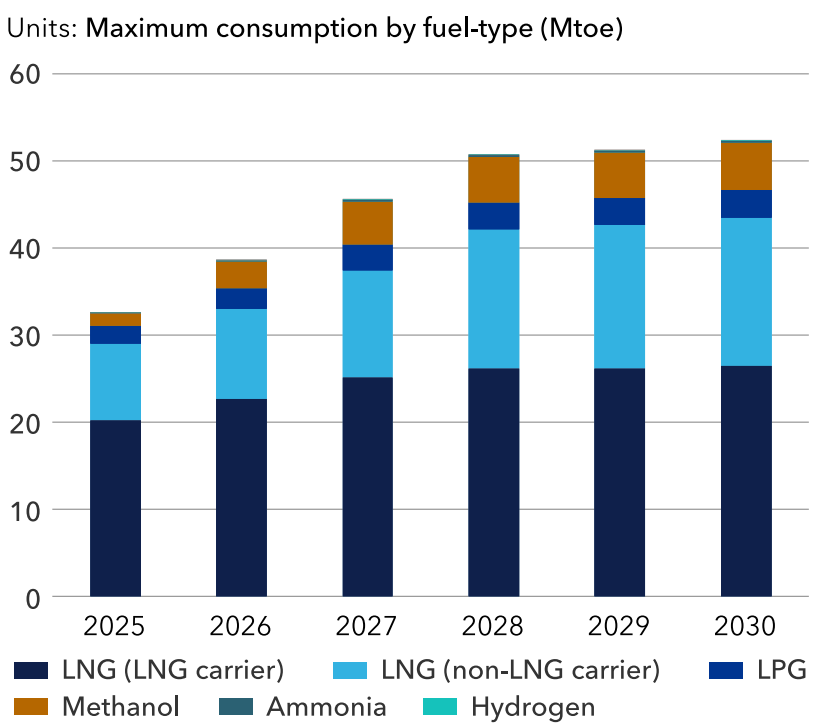


The world fleet can consume up to 50 Mtoe of non-oil fuels by 2030, dominated by LNG

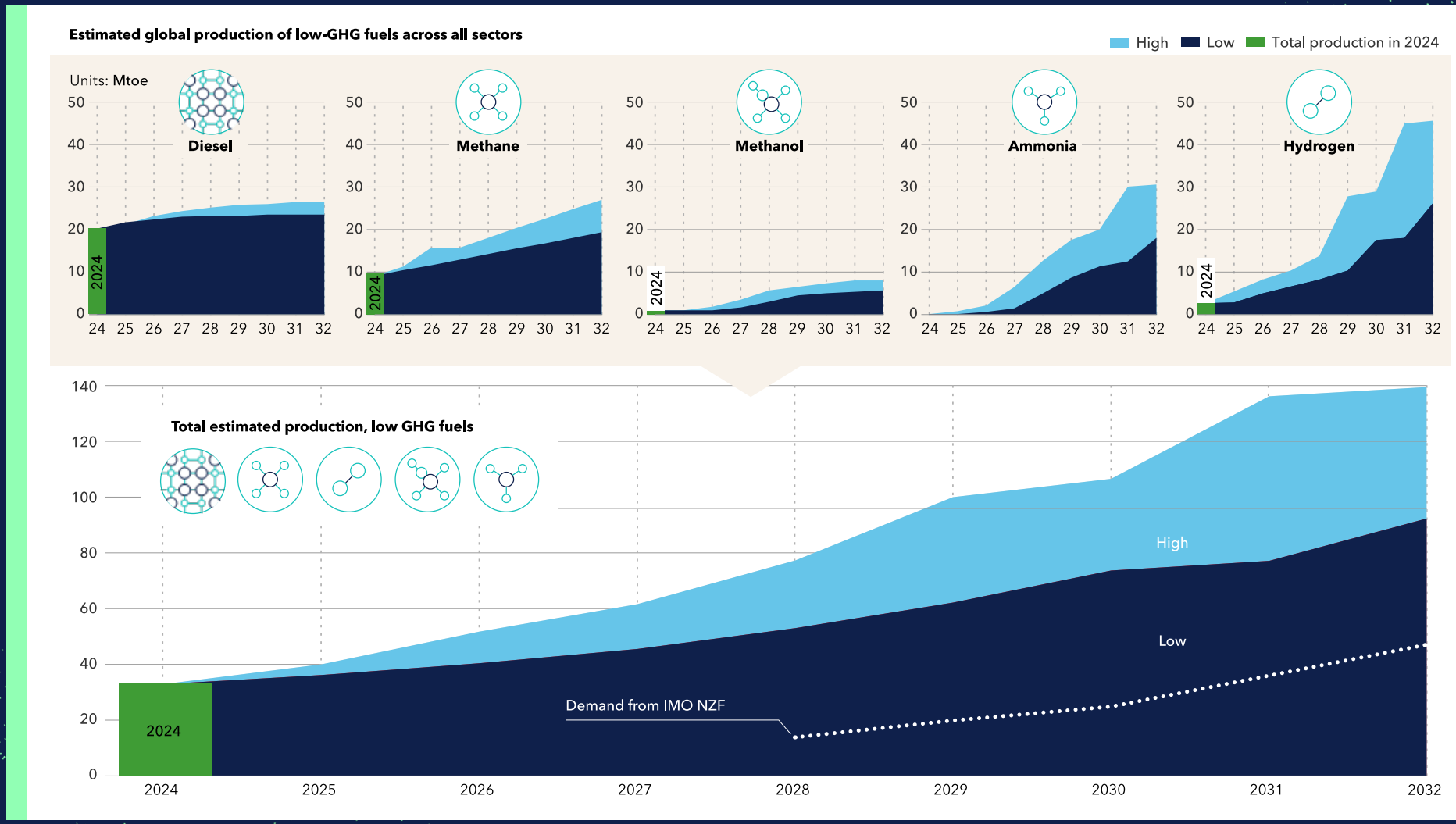
In 2030, sailing fleet with today's order book could potentially consume:

- **44 Mtoe LNG – 44/280 % of world fleet**
- **6 Mtoe methanol**
- **3 Mtoe LPG**
- **0.2 Mtoe ammonia**
- **0.04 Mtoe hydrogen**

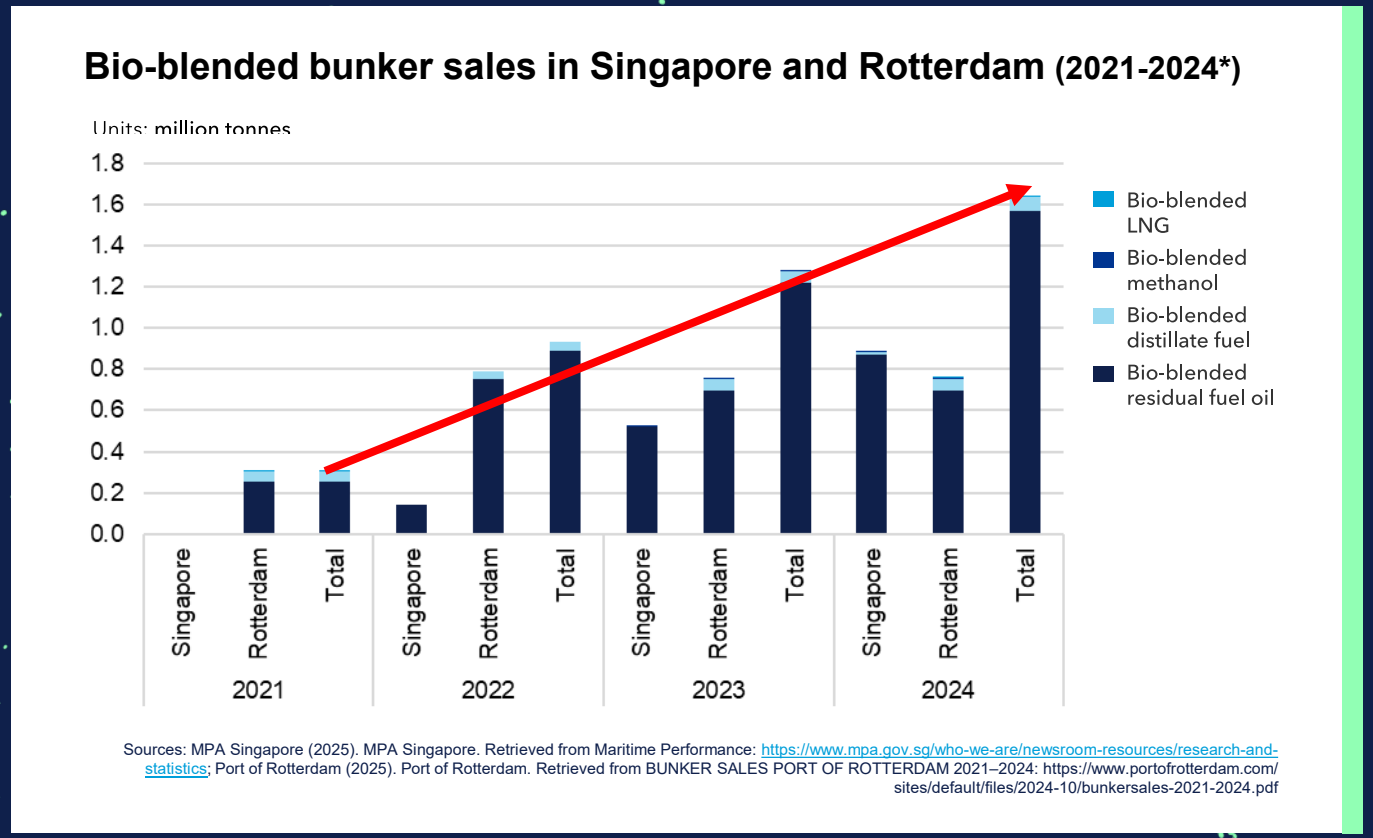
Maximum consumption of LNG, LPG, methanol, ammonia and hydrogen for the world fleet and vessels in the order book. Powered by AFI – afi.dnv.com



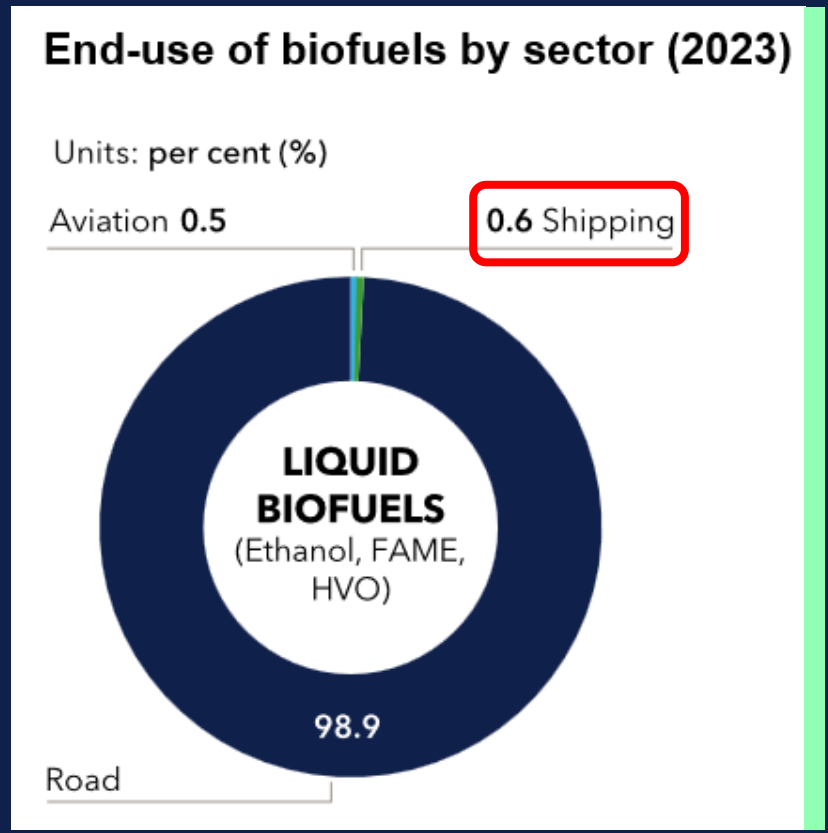
Fuel production facing headwinds – IMO 2030 requires up to one third of global low-GHG fuel supply of 70-100 Mtoe



Bio-blended bunker market is increasing



Sources: MPA Singapore (2025). MPA Singapore. Retrieved from Maritime Performance: https://www.mpa.gov.sg/who-we-are/newsroom-resources/research-and-statistics; Port of Rotterdam (2025). Port of Rotterdam. Retrieved from BUNKER SALES PORT OF ROTTERDAM 2021–2024: https://www.portofrotterdam.com/sites/default/files/2024-10/bunkersales-2021-2024.pdf



Thank you.

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