

Decarbonization outlook 2025: Developments & pathways forward

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Greener Shipping Summit

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+ 65%
Passenger vehicles



+ 130%
Flights



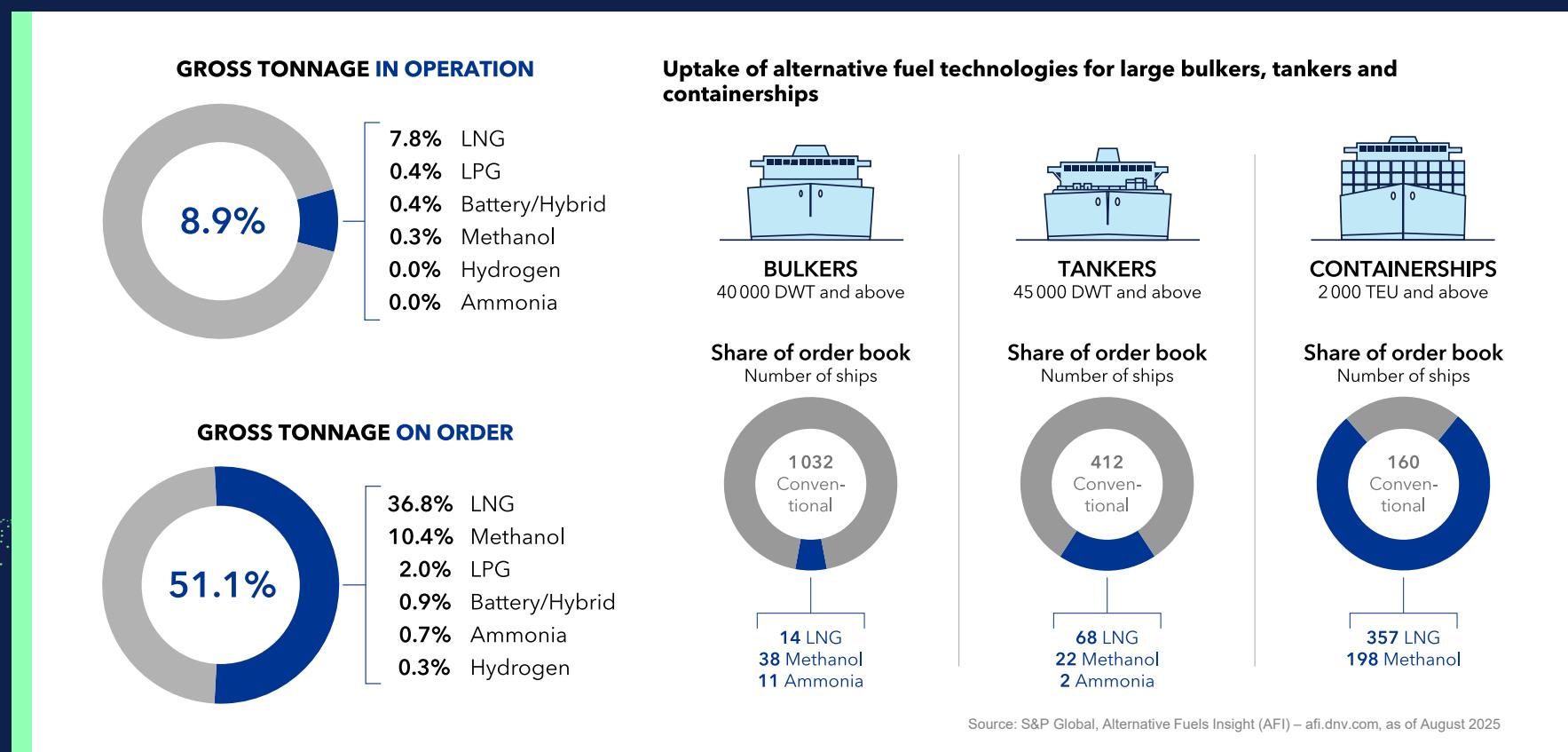
+ 30%
Cargo tonne-miles

Decarbonization: Threat? Opportunity?

Last minute question: Is it happening?

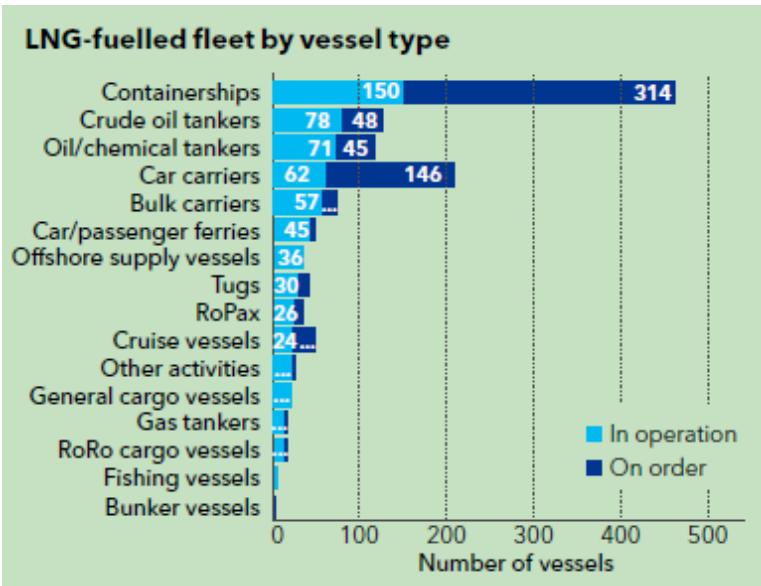
Three-quarters of the order book for container vessels above 2000 TEU have dual-fuel capability

- Alternative-fuel capable ships set to almost double by 2028
- 33,000 seafarers require training for alternative fuels over next 3-4 years

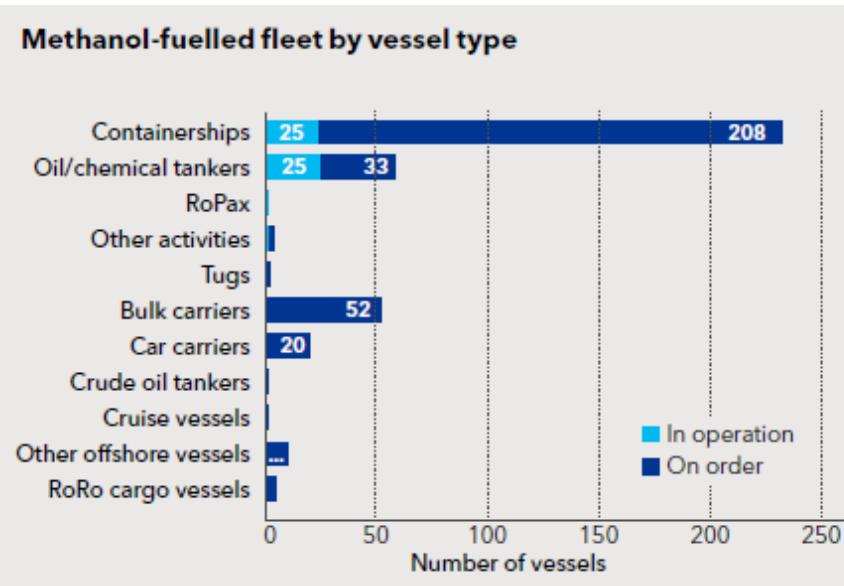


Alternative fuels uptake

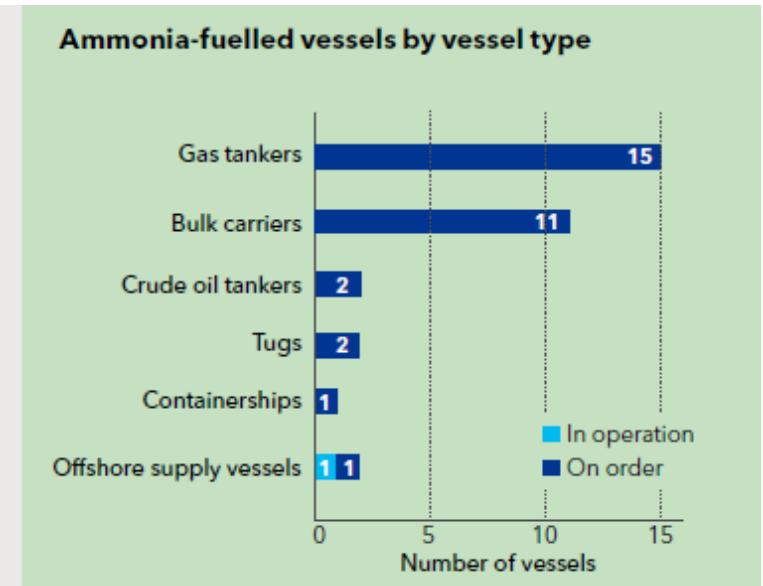
2. LNG / RNG



3. Methanol



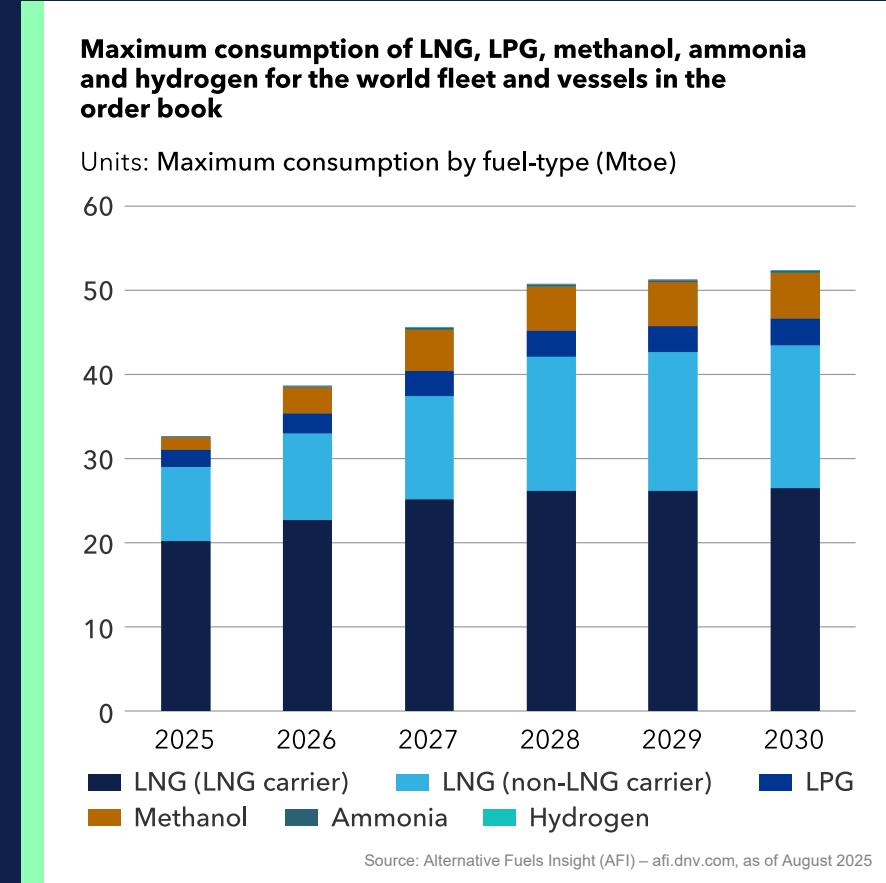
4. Ammonia



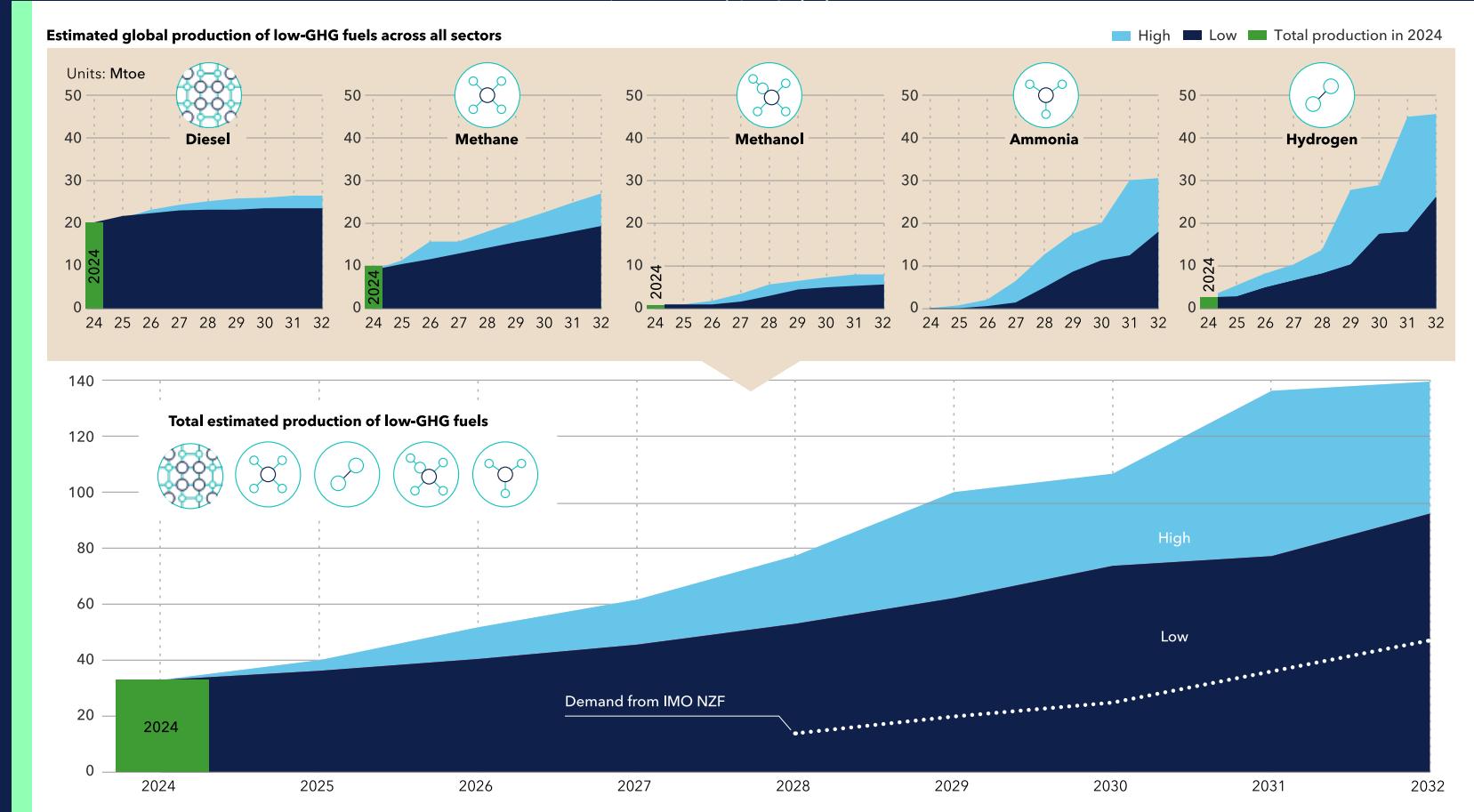
The world fleet can consume up to 50 Mtoe of non-oil fuels by 2030, dominated by LNG

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

- 44 Mtoe LNG
- 6 Mtoe methanol
- 3 Mtoe LPG
- 0.2 Mtoe ammonia
- 0.04 Mtoe hydrogen



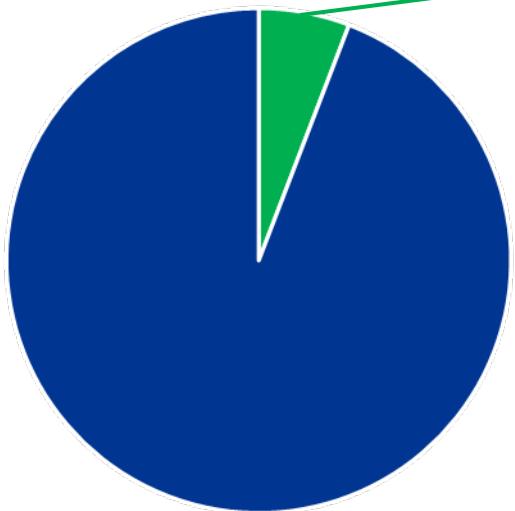
Fuel production facing headwinds – IMO 2030 requires up to one third of global low-GHG fuel supply of 70-100 Mtoe



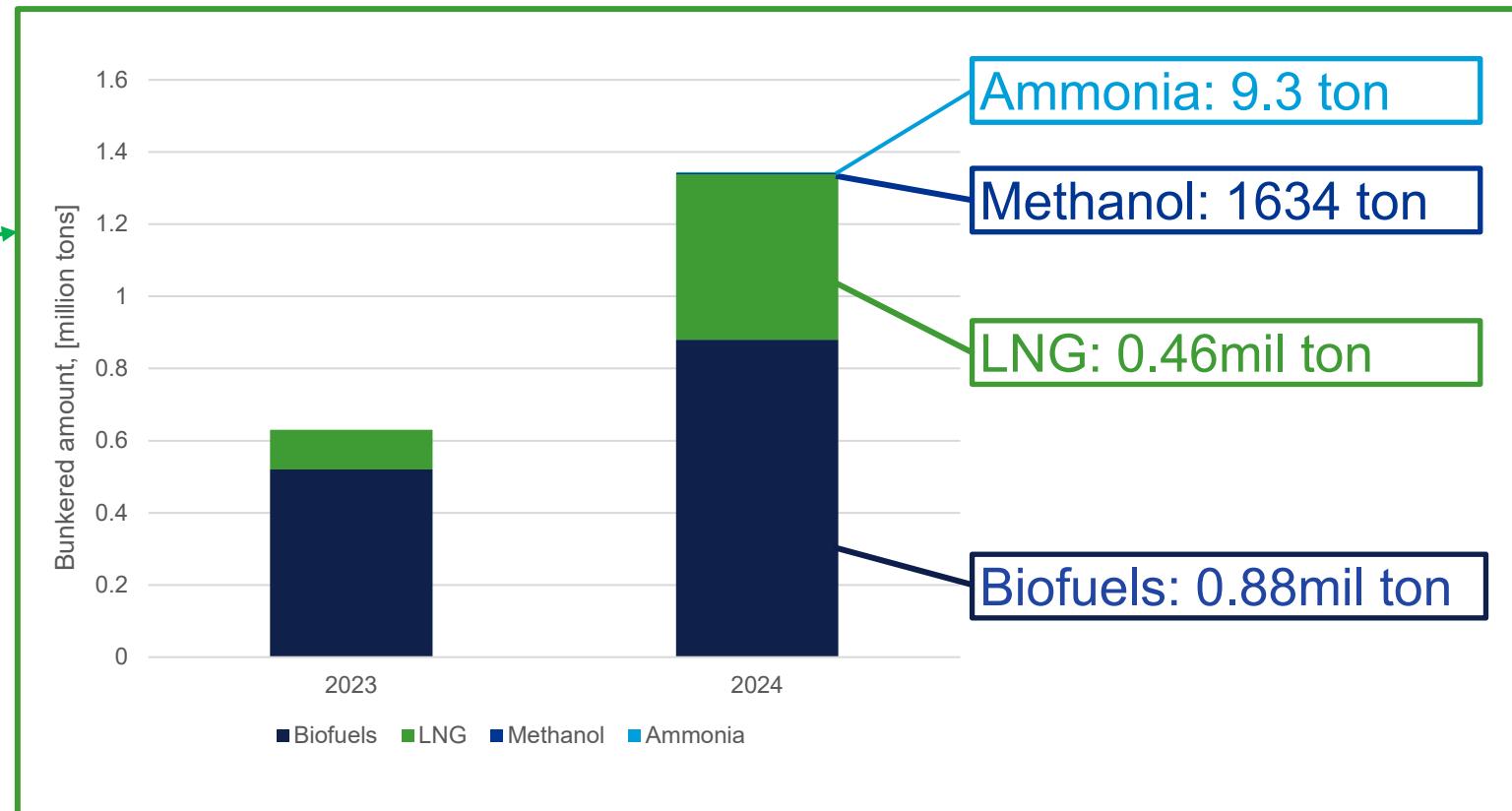
Alternative fuels bunkering

Fuels Bunkered in Singapore

2.3%



■ Alternative ■ Conventional

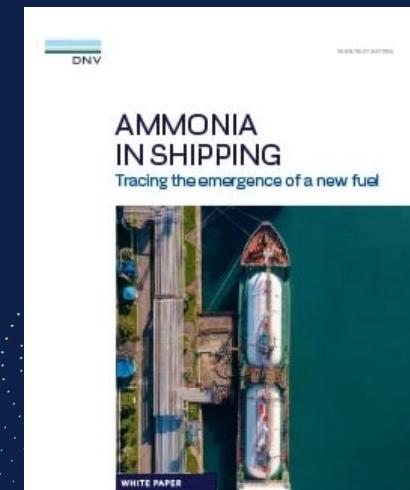


Source: Strong growth momentum for Maritime Singapore | Maritime and Port Authority of Singapore

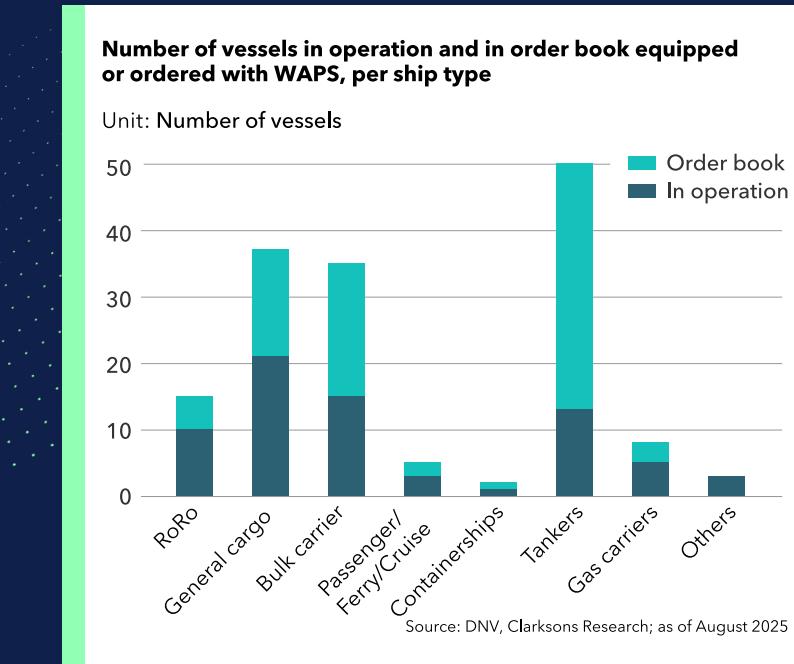
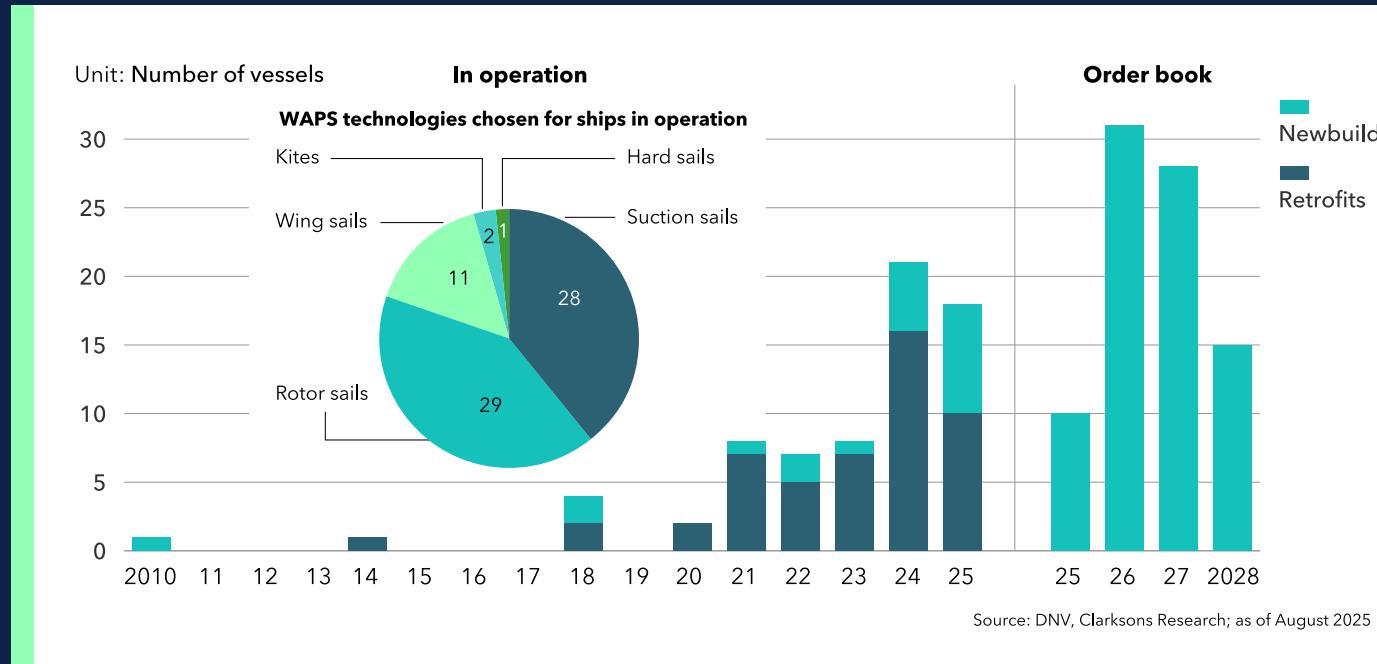
First ammonia-fuelled vessel on water



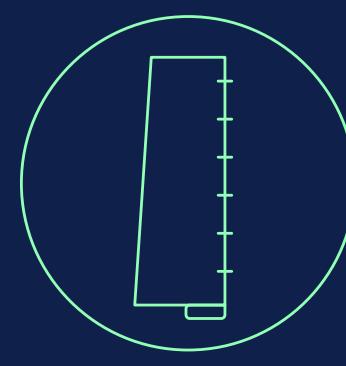
- DNV Class, Singapore flag
- Overcame many technical and regulatory challenges
 - Extensive collaboration between Fortesque, Singapore MPA, and DNV
 - On-deck machinery layout visibility to support showcase
- First-hand experience in crew safety considerations and ammonia Operating environment



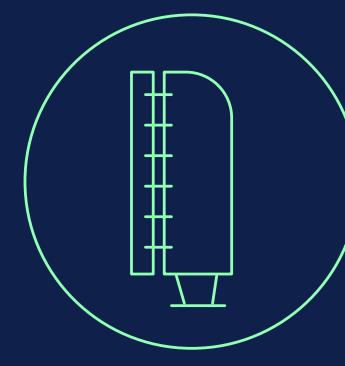
Breakthrough year for wind? – 50 installations so far with another 100 in the order book



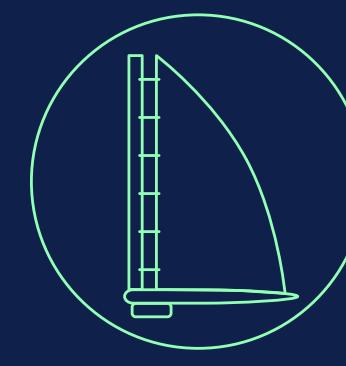
Rotor sail



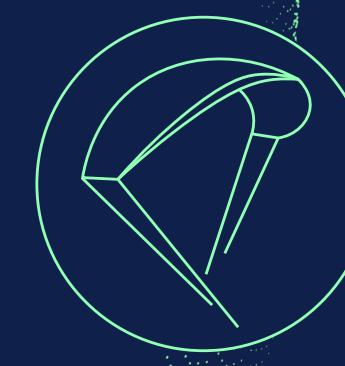
Suction sail



Wing sail



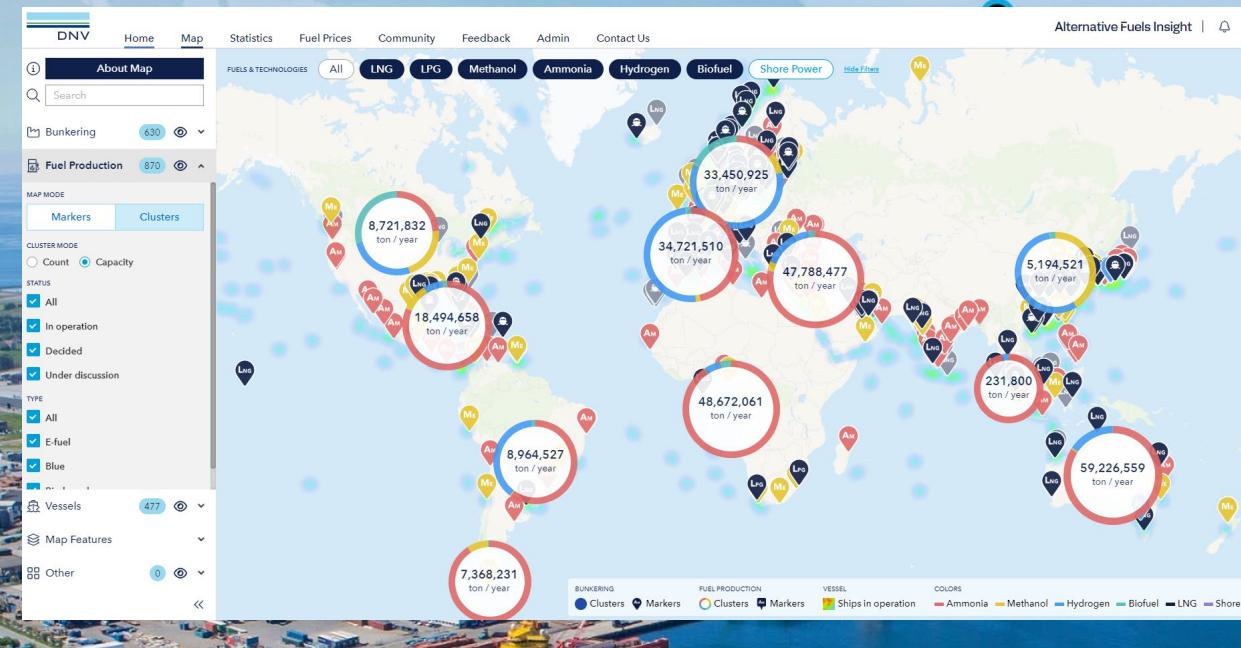
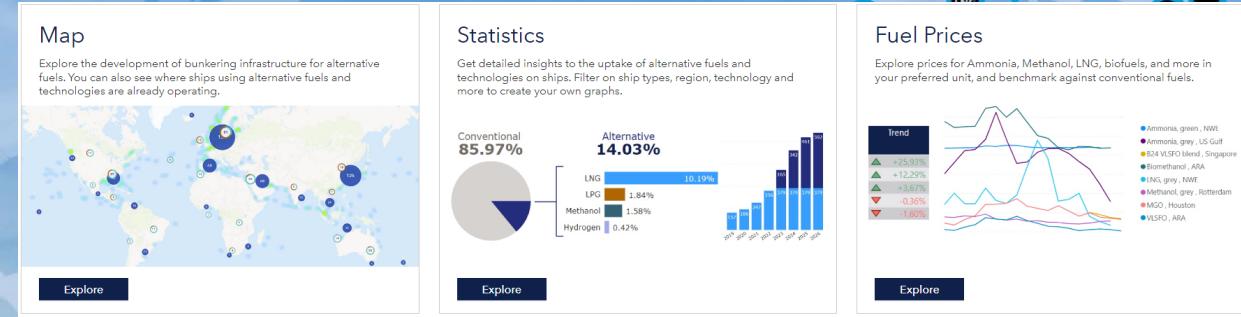
Soft sail



Kite

AFI – Alternative Fuels Insight

www.dnv.com/afi



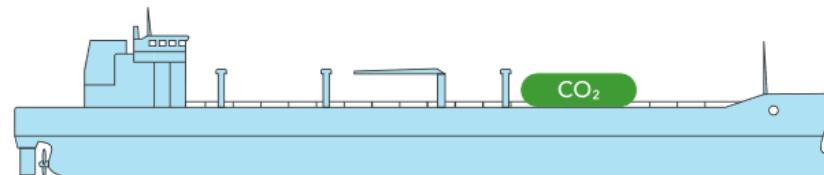
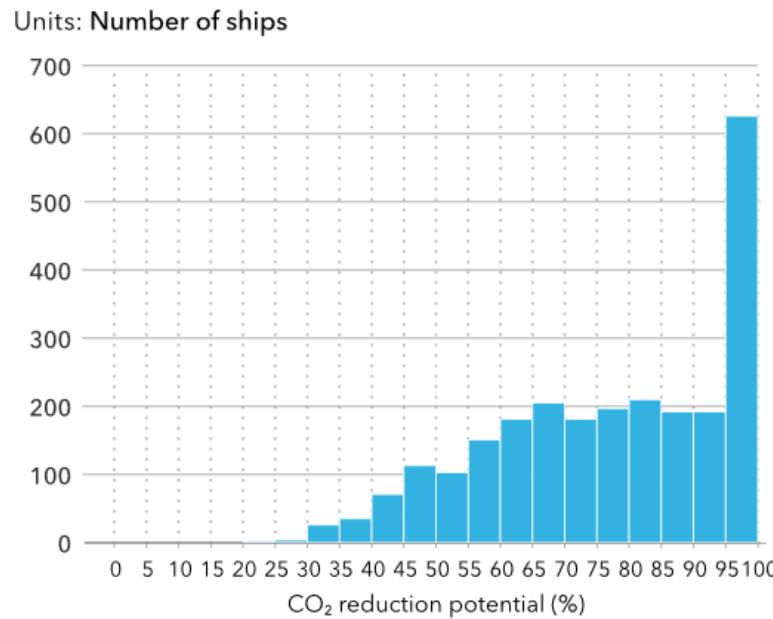
18,000 AFI subscribers

Partners:

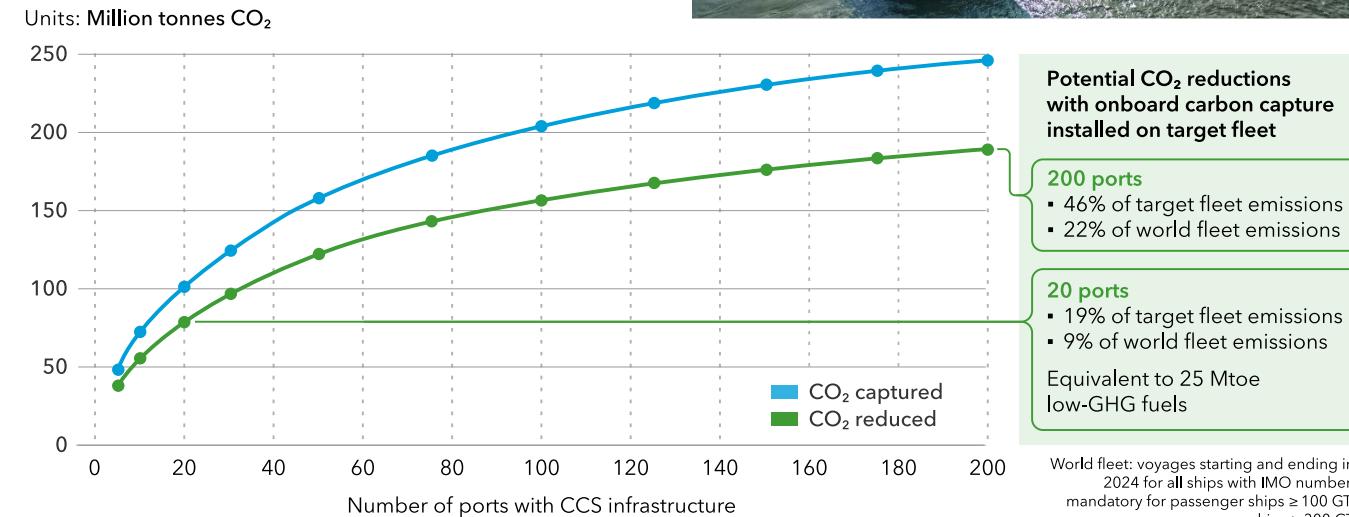


Onboard carbon capture can cut large bulker/tanker/container ship emissions by 19% with infrastructure in only 20 ports

Number of tankers above 45 000 DWT (2 489 ships in total) with different annual CO₂ reduction potentials from onboard CO₂ capture, given the assumed storage tank sizes



The potential CO₂ capture from large bulkers, tankers, and containerships in million tonnes (blue line) and the corresponding net CO₂ reduction (green line), as a function of number of ports with CCS infrastructure



Assumptions:

- CO₂ tank volumes based on existing LNG tank installations
- 100% capture rate

Decarbonization solutions and pathways



Low-carbon & Carbon-neutral fuels

High uptake in NBs, availability and price are the main challenges.



Biofuels

Most popular short- and mid-term solution, reasonable price premium, challenge is availability of sustainable biomass.



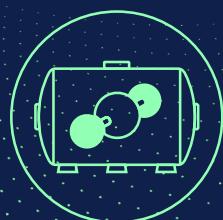
Energy Efficiency

Large experience, many new developments, great enabler of new fuels.



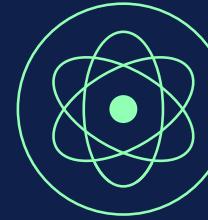
Fuel Cells

Already used in short-sea shipping. Challenging to scale up for oceangoing vessels but promising for auxiliary power.



Onboard Carbon Capture

Promising technology. Lack of maturity, regulatory framework and infrastructure.



Nuclear

Carbon-neutral energy. Challenges on various aspects; technical, regulatory, societal acceptance.

Thank you.



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