

Scaling Ammonia as Marine fuel

IMO technical seminar on Ammonia

Session 1: Ammonia production pathways, supply outlook for shipping and infrastructure



Knowledge grows

Yara - world-leading crop nutrition and ammonia company

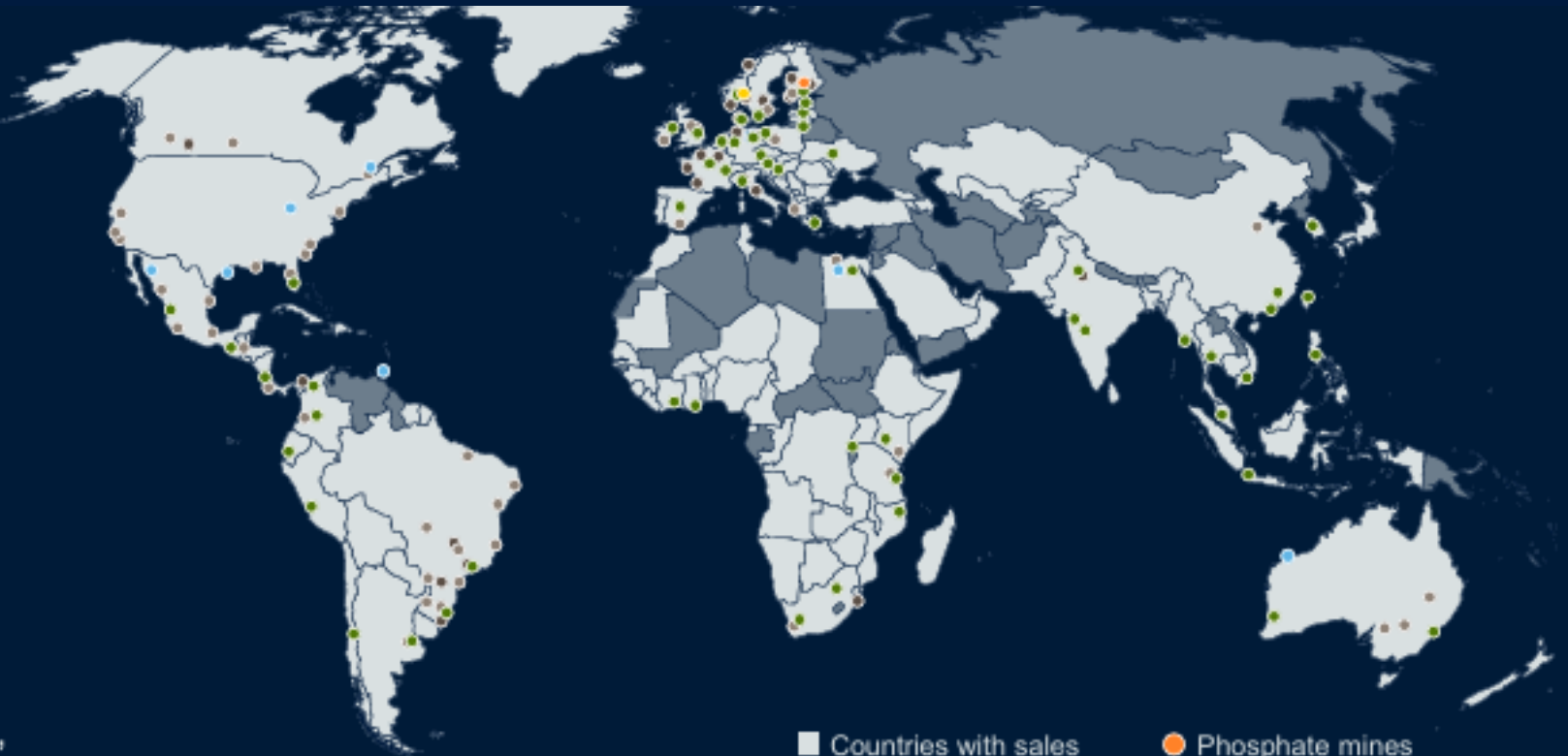
#1 producer of Nitrate and compound NPK¹

#1 in traded ammonia¹

25 production plants

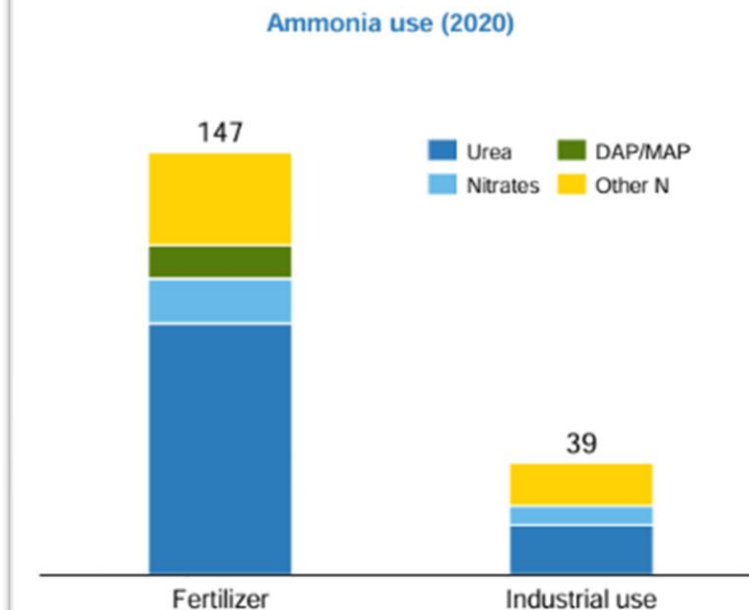
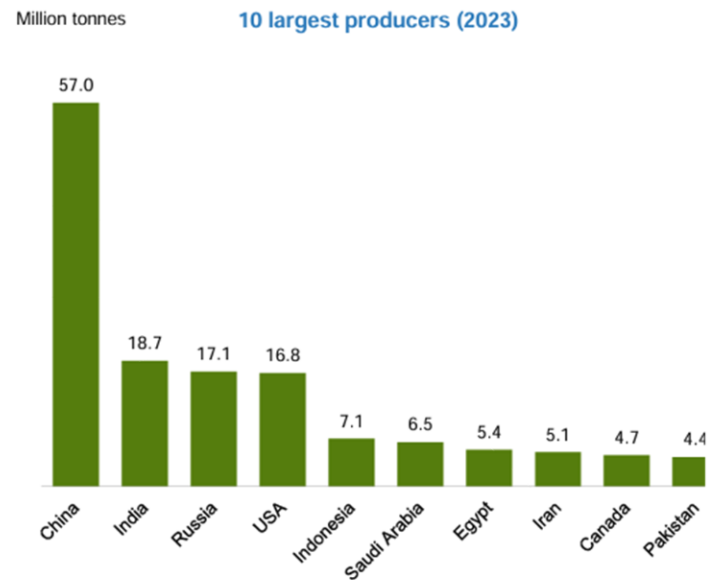
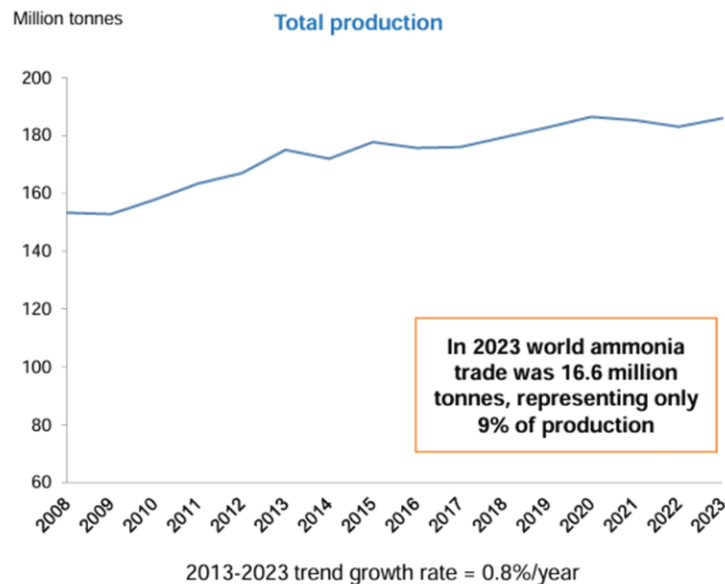
140+ sales countries

200 terminals, blending units, warehouses and bagging facilities



■ Countries with sales
● Head office
● Production sites

● Phosphate mines
● Joint ventures
● Sales offices and R&D sites

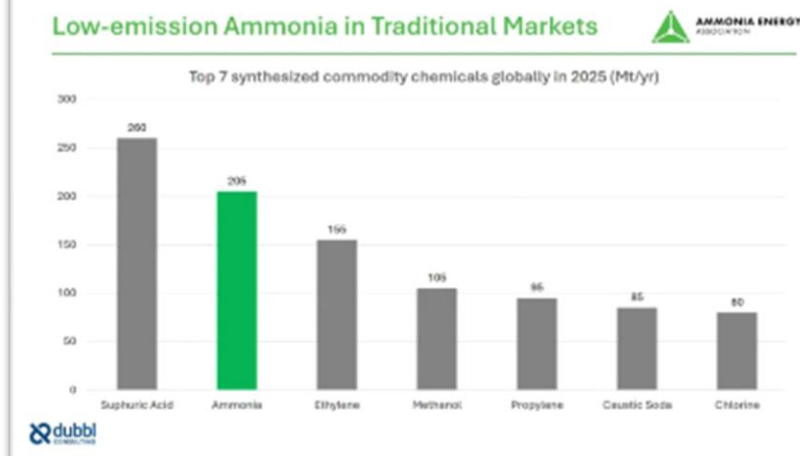


Source: Fertecon

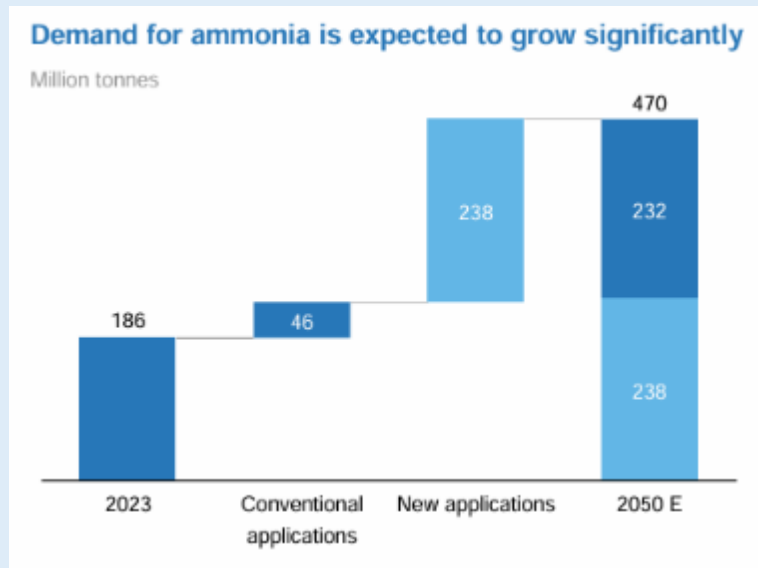
Global ammonia production is around 200 million tons annually

Global ammonia production was 186 million tons in 2023.

Most of global ammonia production is upgraded to urea and other finished fertilizer, only about 10% of the production is traded.



Expected demand growth from new applications such as Marine Fuel



Fertilizers

- Nitrates
- Urea

Power

- Co burning
- Hydrogen carrier



Chemicals

- Ad Blue
- Acrylonitrile

Transport

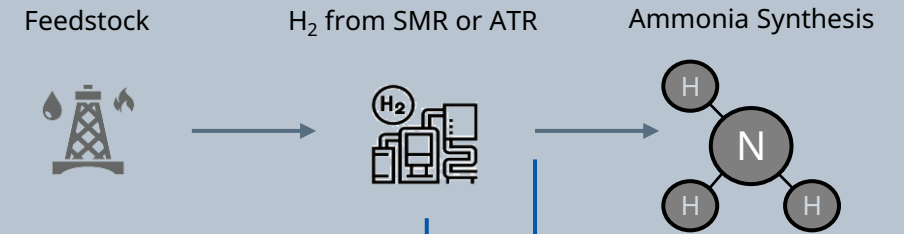
- Marine Fuel
- Other

Carbon intensity of the ammonia

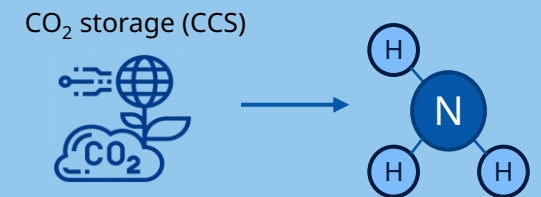
Ammonia Production Pathways



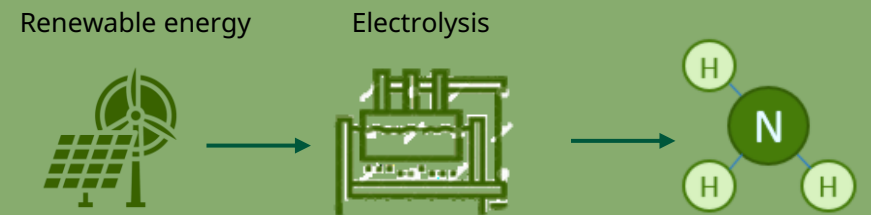
Conventional ("Grey") Production



Low Carbon ("Blue") Production



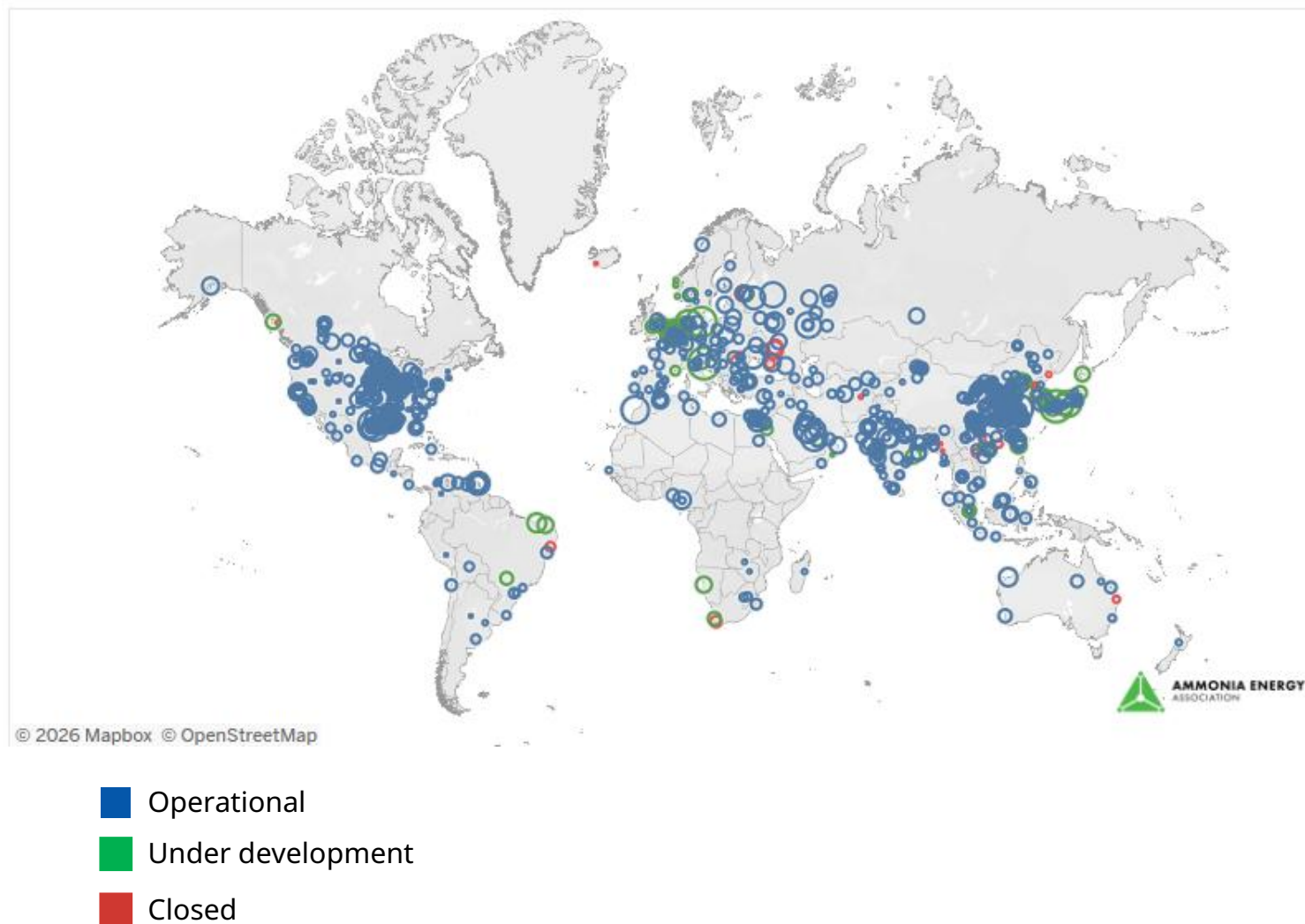
Renewable ("Green") Production



Ammonia Terminals Globally

- ✓ In 2025, around 44 million tons of ammonia (~ 20% of the global production) was transported.
- ✓ The disconnect between supply and demand locations for low emission ammonia will require substantial growth in ammonia transport infrastructure.

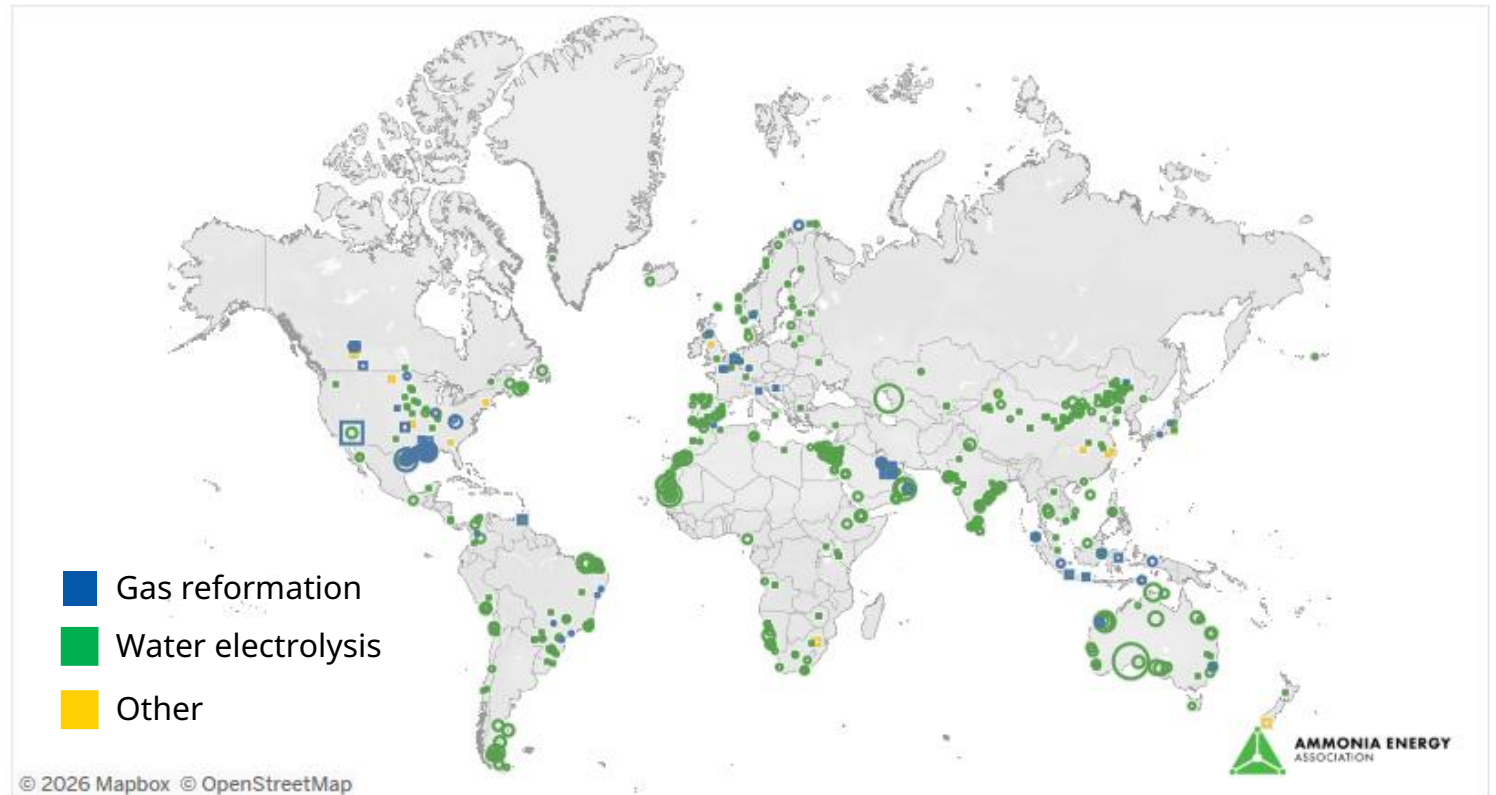
Ammonia Storage Terminals



Planned Ammonia Production

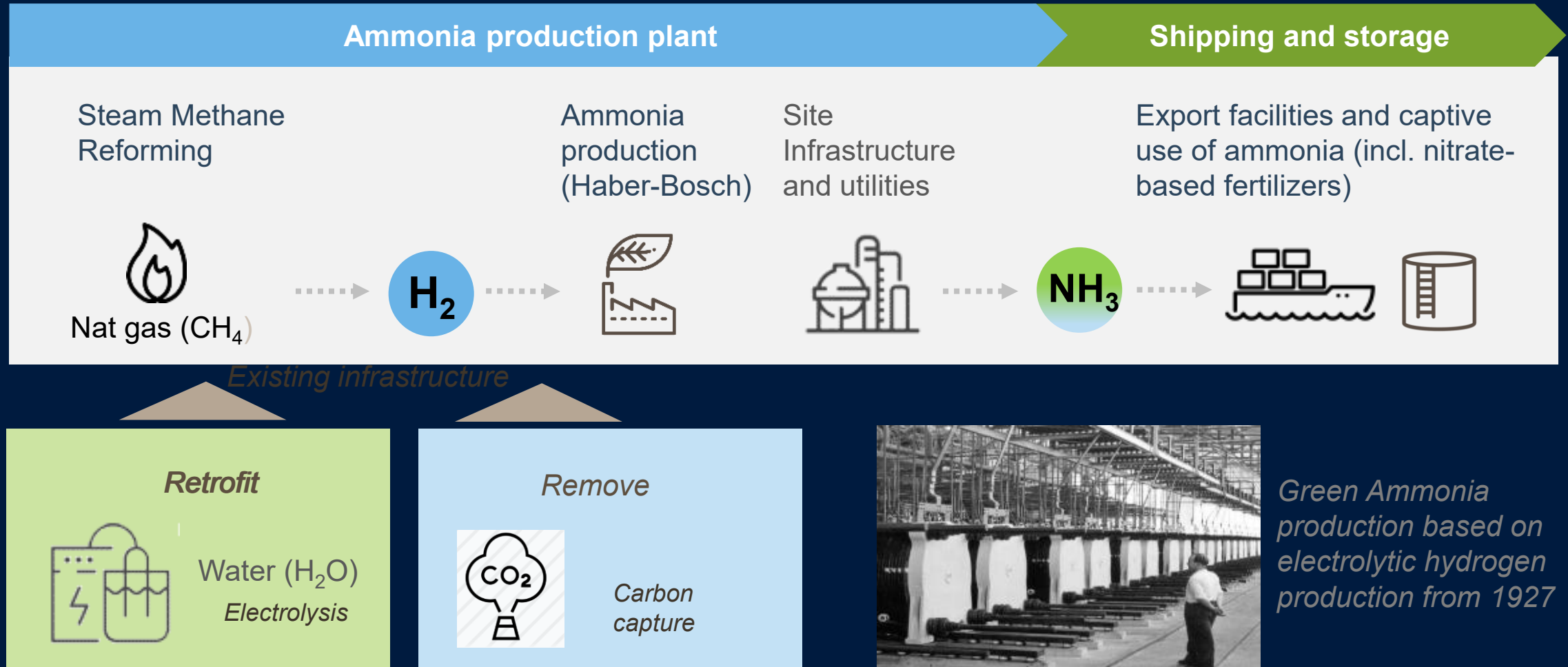
- ✓ Planned production and consumption hubs not necessarily co-located.
- ✓ This gives rise to global-scale transportation of molecules.
- ✓ Global ammonia transport/trade will increase.

Low-emission Ammonia Plants



- ✓ Database grown from 103 projects in 2022 to 515 projects as of August 2026
- ✓ Total of 405.8 Million tons (MT)
- ✓ 6.9 MT already operational (already low-carbon or in transition).
- ✓ 12.7 MT is firm (offtake secured / under construction / FID)
- ✓ 24.6 MT is Mature (offtake discussed / EPC selected / FEED)
- ✓ Another 111.8 MT is Developing (making progress)

Existing ammonia infrastructure to kick-start the scaling of low emission ammonia as marine fuel



Expanding and optimizing our World scale ammonia system



- Larger vessels and quay investments
- Terminal optimization (both import and export)
- New terminals



Renewable ammonia production in Porsgrunn, Norway

- 24 MW PEM electrolyser producing renewable hydrogen.
- The hydrogen is fed to the ammonia plant replacing about 3% of the natural gas feedstock.
- Annual production capacity of renewable ammonia is 20,000 tonnes.
- The ammonia is RFNBO Certified as of August 26.
- Will supply the container vessel Yara Eyde.

Yara Eyde demonstrating ammonia as shipping fuel

- Partnership with North Sea Container Line with CMB Tech as vessel Owners
- 1417 TEU Ammonia fueled container vessel
- Weekly roundtrip between Oslo Fjord and the Continental Europe
- Trading for Yara and other customers
- Building up a green value chain as an extension of the emission free shipping offered by the Yara Birkeland between Herøya and Brevik
- The vessel will run on renewable and low carbon ammonia from Yara's upstream project portfolio
- Estimated delivery from the shipyard end 2026



Low carbon ammonia production at Sluiskil, Netherlands

- Europe's largest cross border CCS project



Brunsbüttel ammonia import terminal – enabling import additional to Fertilizer Production

The new terminal at the Brunsbüttele plant in Germany can import up to 3 million tonnes of ammonia annually. Ideally located on the North Sea and the Kiel Canal.



Ammonia is a feasible and scalable fuel option for decarbonizing maritime transport

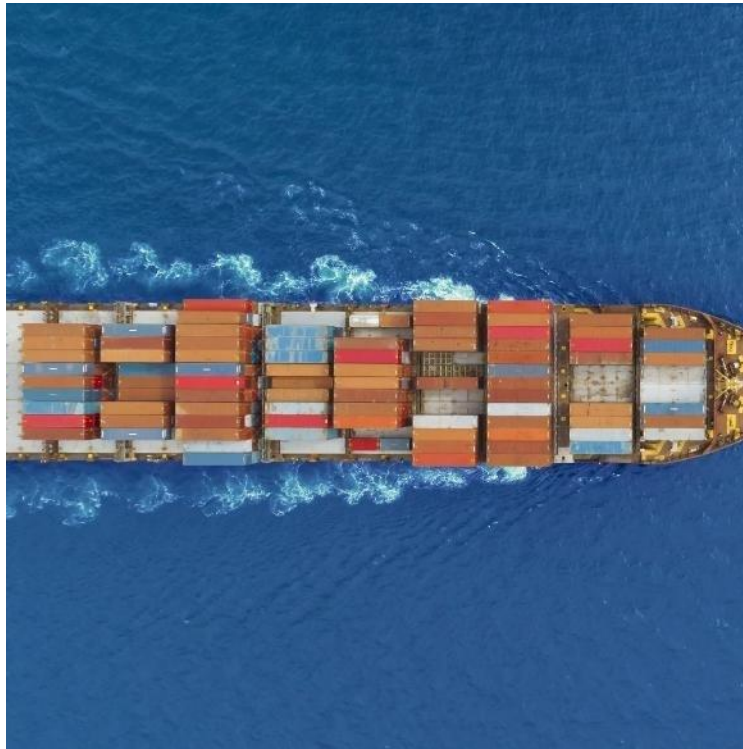
Carbon free Molecule

*No CO₂ from fuel combustion *1)*



Availability

Nitrogen not constrained resource



Established procedures

Knowledge transfer from existing industry



*1) WtW performance depends on pathway and on N₂O/slip management

... but there is a need to close the cost gap with conventional fuels

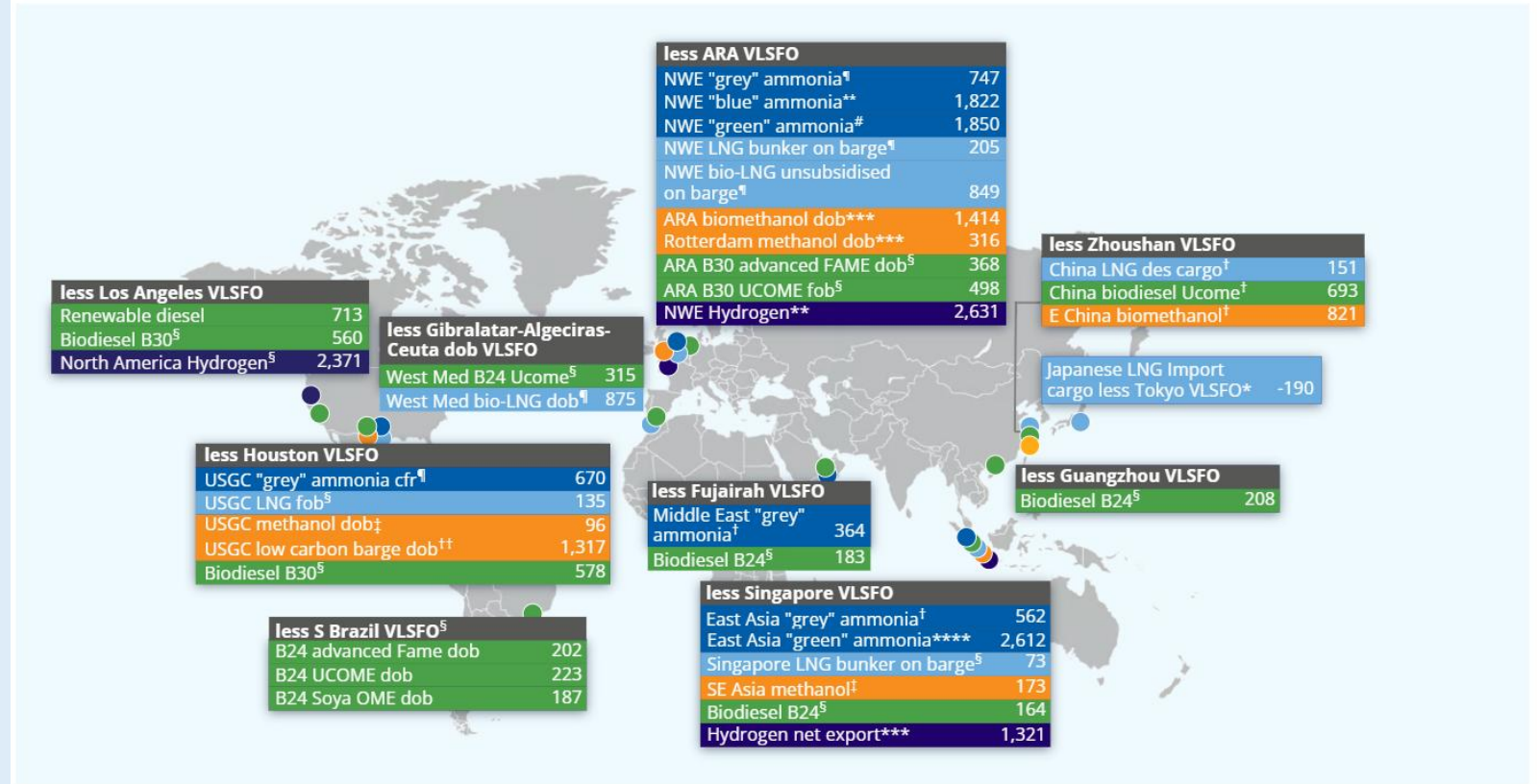
➤ Policies are needed to narrow the cost gap by;

- ✓ carbon cost for conventional fuels
- ✓ Rewarding low-carbon attributes
- ✓ Clear decarbonization pathway

Argus Alternative marine fuels less VLSFO

17 August 2026

\$/t VLSFO-equivalent



Source: <https://www.argusmedia.com/en/news-and-insights/topical-market-themes/alternative-marine-fuels>

- ✓ Conventional ammonia ("grey") have established price benchmarks; however, the low-carbon and renewable (and hence marine fuel) ammonia market remains illiquid.
- ✓ Ammonia fuel pricing today is assessment-based rather than transaction-based, with liquidity expected to improve as bunkering volumes and vessel deployment increase.

Clean ammonia – a fuel for the future

