Being Part of Energy Transition

Asia Pacific Green Hydrogen Conference

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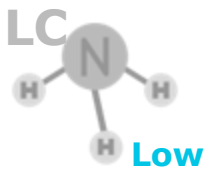
Ammonia market is evolving from traditional use cases to new use cases, primarily driven by energy transition

	Traditional Market		New Market		
	 Fertilizer	 Industries & Chemicals	 Power	 Marine	 Hard-to-abate sectors
Nature of market	• Grey ammonia produced from NG • ~200 MTPA market and **~15-20 MTPA is seaborne** • Grey ammonia market is not expected to grow between 2025-40 • **Use is expected to be limited** to existing sectors, which will have mandates to transition		• Low Carbon ammonia, initially blue from NG and CCUS and in long term Green through water electrolysis • ~350-400 MTPA market by 2050 and **~60-70% is expected to be seaborne** • Low carbon ammonia apart from **substituting** grey **in existing market** is also finding use case in **new sectors like power & marine**		
Key features of the market	• Short term contract duration • Regional trade flows • Gas price indexed • Price sensitive to global factors		• Comparatively longer-term contracts • Intra-regional trades • Gas price linked (blue) or fixed (green) • Higher Willingness to Pay (WTP) • Larger quantities		

Market Summary

Market growth is primarily driven by national decarbonization policies and enabled by support schemes (near term) and carbon prices (mid-long term)



Low Carbon Ammonia Market

- Global Ammonia market is expected to increase from ~200 MTPA in 2027 to ~600 MTPA by 2050, of which low carbon ammonia will be ~60-70%.
- Clean ammonia is broadly defined as ammonia produced using carbon neutral or low-carbon technologies having carbon content less than 1 gCO2eq/gNH3 (Well-to-gate basis).
- Countries globally are forming policies to transition to cleaner fuels, led by countries like Japan & Korea as well as EU.

Demand Drivers

- Driven by national strategies and governmental policies on decarbonization, proposed mandates for clean fuel & increase in carbon pricing.
- Growth in ammonia trade is primarily as hydrogen carrier for transportation of energy.
- In addition, demand will come from marine bunker fuel and industrial feedstock.
- Key markets will be Japan, Korea followed by Europe.

Key Demand Centres

- **Japan**: USD20 billion announced for hydrogen supply chain to Japan and import and storage facilities in Japan to support its demand target of 3 MTPA-H2 (17 MTPA-NH3) by 2030.
- **Korea**: Power generation target of 6.9TWh (3 MTPA-NH3) by 2030 and 20.9TWh (9 MTPA-NH3) by 2036 and considering US-inspired tax credits for domestic H2 production.
- **Singapore**: Working on auction for LC fuels for marine bunkering & power sector, targeting ~3.5 MTPA-NH3 & 1 MTPA-NH3 by 2050.
- **Europe**: Import targets of 10 MTPA-H2 and local production of 10 MTPA-H2 by 2030, with focus being on green.

Cost/Price Overview

- Low Carbon Ammonia production cost vary in the range of ~400 to 1200 USD/ton depending on the color, location, input raw material and technology costs.
- Companies who have existing synergies (Natural Gas for blue and RE for green) are leveraging their current presence to be competitive.
- Various Govt. are offering subsidies/ incentives to bridge the gap between grey & low carbon ammonia, e.g., Contract for Difference (CfD) scheme in Japan.

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Thank you