

NY Energy Forum Webinar

Will Ammonia Deliver Hydrogen to Meet the Industrial Decarbonisation Challenge?

Is the US Still the Investment Hotspot Under Trump?

Schedule



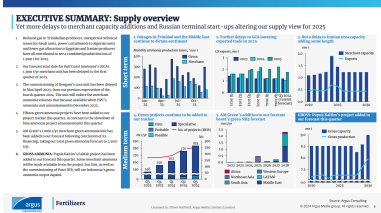

10:00 - 10:05 AM ET	Quick introduction and house rules - Louise Burke, Argus
10:05 - 10:15 AM ET	Oliver Hatfield, Argus - introduction and clean ammonia overview (101 slides)
10:15 - 10:45 AM ET	Introduction to panellists
10:45 - 11:30 AM ET	Panel discussion and audience Q&A

Clean Ammonia 101

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Quick overview of Argus ammonia credentials

<h3>Daily pricing</h3> 	<h3>Consulting</h3> 
<h3>Analytics/forecasts</h3> 	<h3>Conferences</h3> 



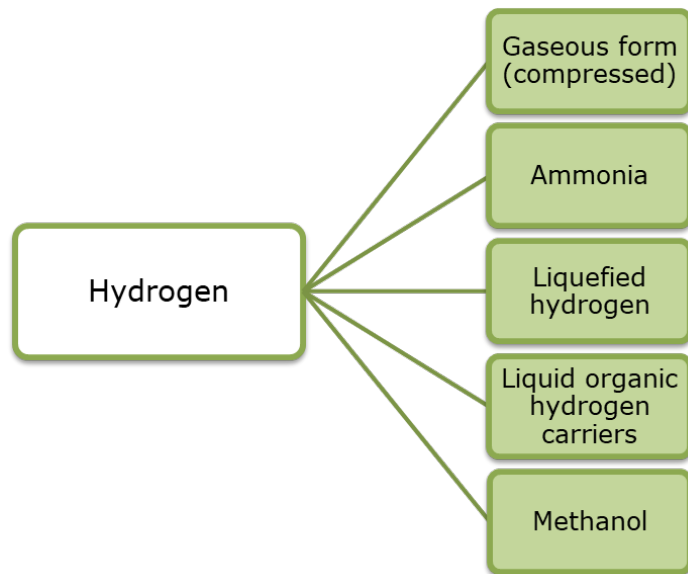
Hydrogen is widely seen as a solution to decarbonising hard to abate sectors

- Using renewal power to replace existing fossil fuel-based energy uses is generally optimal
- However, this option is not always practical, or renewable electricity might not be unavailable.
- Renewable/low carbon hydrogen is seen as a solution

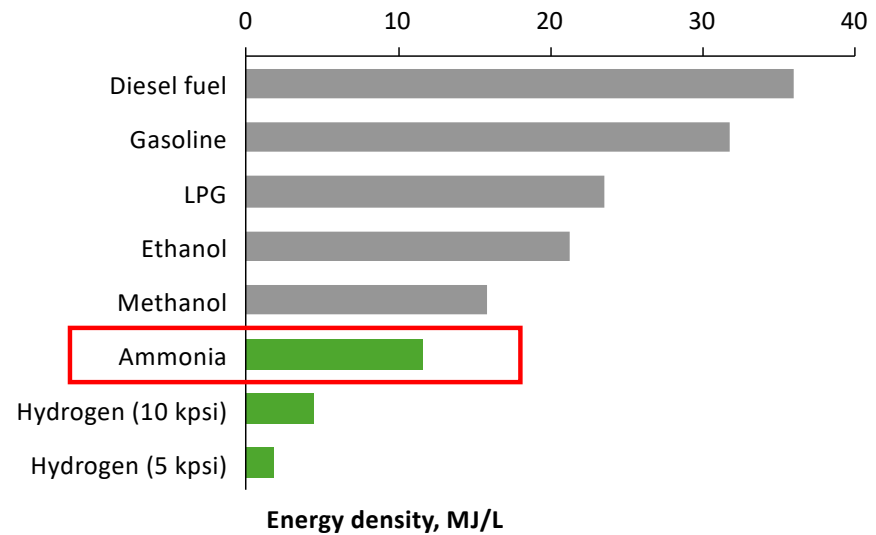
Transport	Industry	Heating in buildings	Power generation & electricity storage
Light-duty vehicles (cars & vans)	Oil refining	Blending	Co-firing ammonia in coal power plants
Heavy-duty vehicles (trucks & buses)	Ammonia + methanol	Methane produced from clean hydrogen	Flexible power generation
Maritime	Iron & Steel production	100% hydrogen	Back-up and off-grid power supply
Rail	High-temperature heat	Fuel cells and co-generation	Long-term and large-scale energy storage
Aviation			

Multi-sectoral decarbonization achieved with a globally tradable commodity

Ammonia outperforms hydrogen and alternative potential H carriers



- Hydrogen has a high energy density on a mass basis; however, on a volume basis energy content is very low.
- The low energy density of hydrogen means that it can be very expensive to transport over long distances necessitating a conversion to a carrier form.

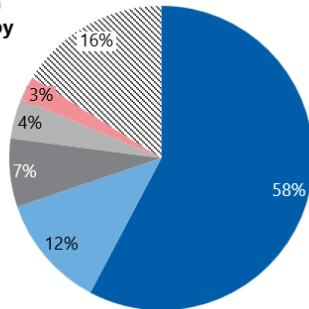


Current ammonia demand situation

Gross ammonia demand

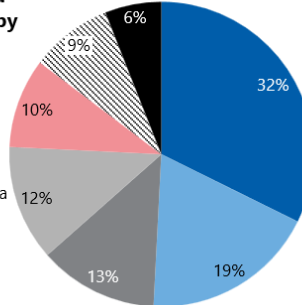
2020 ammonia consumption by end use

- Urea
- AN/CAN
- MAP/DAP
- AS
- Direct application
- Other uses

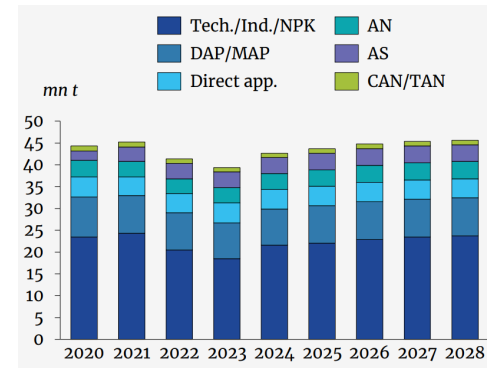


2020 ammonia consumption by region

- NE Asia
- ROW
- N America
- South Asia
- Russia & C Asia
- Middle East
- W Europe



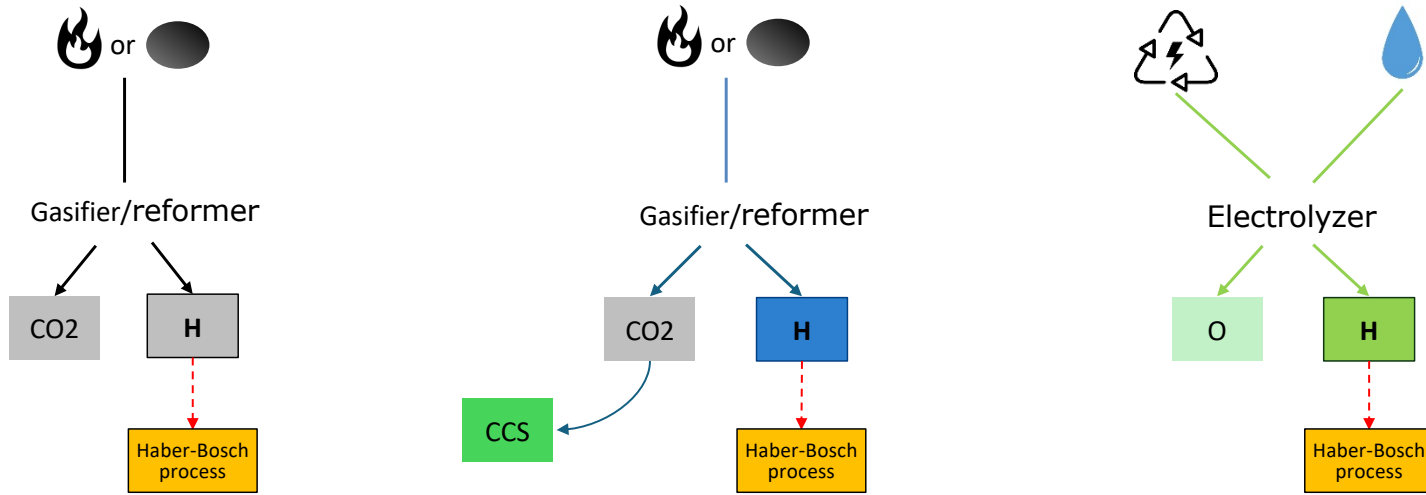
Merchant ammonia demand



Alternative H/ammonia production routes

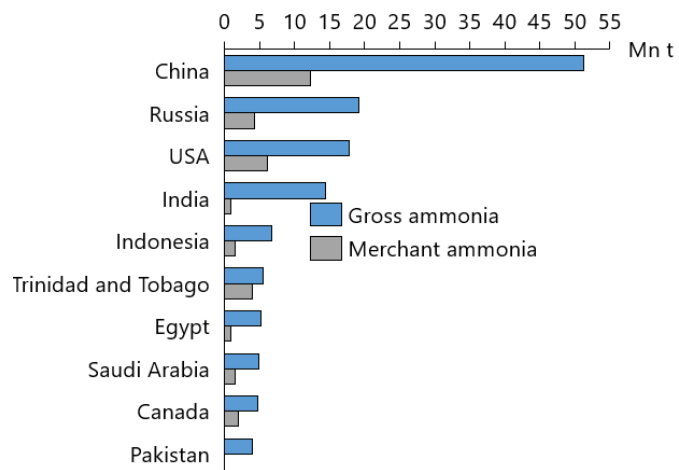


Blue hydrogen captures and stores most of the carbon dioxide output



Current ammonia supply situation

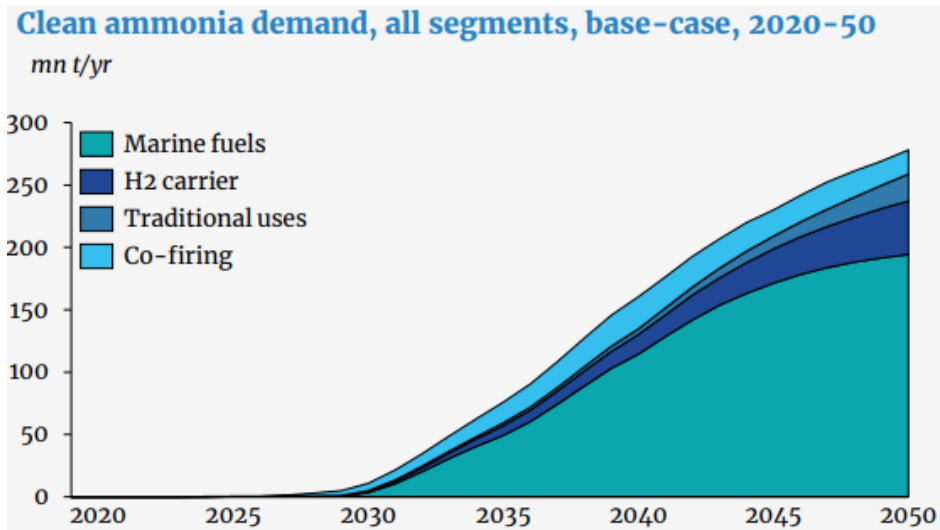
Total ammonia capacity by country, gross vs. net ammonia, 2020



Ammonia trade matrix 2020

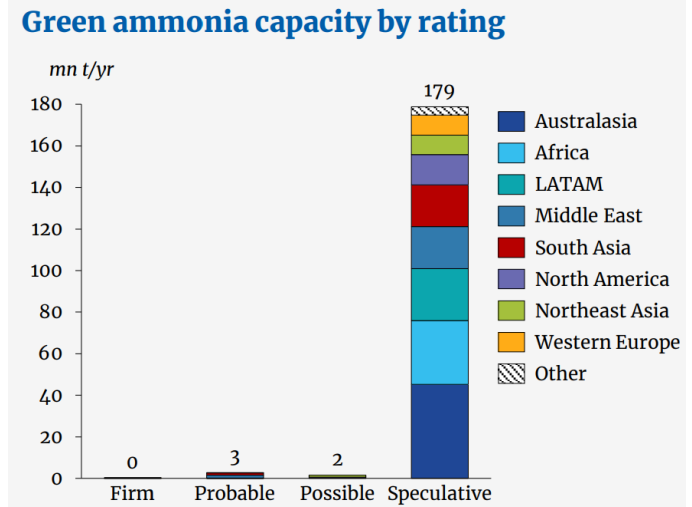
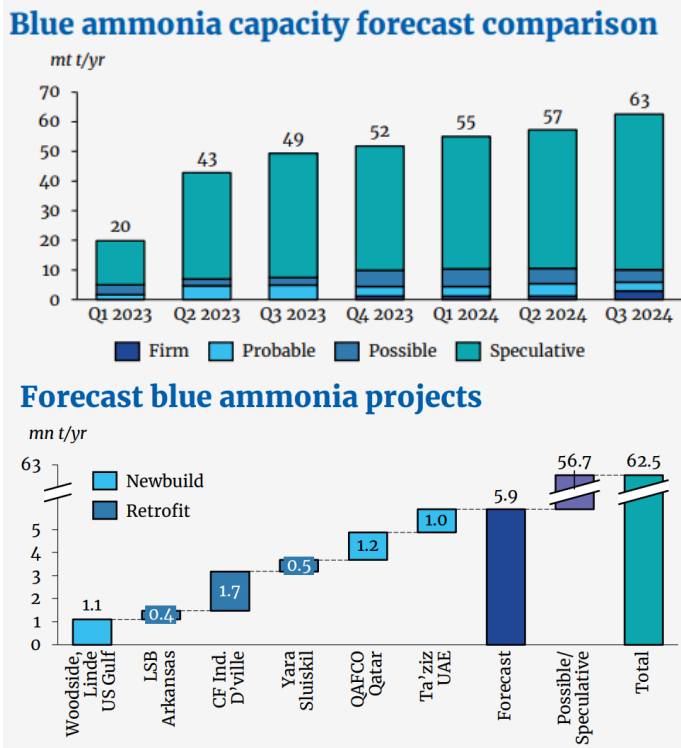
Exporters / Importers	Russia	Trinidad and Tobago	Saudi Arabia	Indonesia	Canada	Algeria	Iran	Qatar	USA	Egypt	Other	Total Imports
India	265	50	800	165	-	15	395	555	-	200	160	2,605
USA	-	1,400	-	-	1,050	25	-	-	-	-	-	2,475
Morocco	900	760	25	-	-	50	-	-	95	-	20	1,850
South Korea	25	-	450	500	30	-	-	-	50	15	200	1,270
Turkey	720	100	-	-	-	260	10	-	-	75	100	1,265
China	-	25	295	510	-	-	150	-	-	35	150	1,165
Mexico	-	485	-	-	-	-	-	-	220	-	-	705
Belgium	470	125	-	-	-	-	-	-	-	-	70	665
Taiwan	-	-	150	210	-	-	110	-	20	-	115	605
Germany	75	20	-	-	-	-	-	-	-	-	475	570
Other	1,700	1,110	155	280	-	550	-	40	95	110	1,430	5,470
Total exports	4,155	4,075	1,875	1,665	1,080	900	665	595	480	435	2,720	18,645

Clean ammonia demand projection



- Whereas the existing production is largely captive or consumed within each producing country, the development of clean ammonia will be largely merchant and international trade-based

Clean ammonia supply projection



Project capex cost guide

- Blue ammonia projects are \$2bn for 1 million tpy
- Green ammonia projects are \$6bn + for 1 million tpy

Thank you... panel introductions