Trinidad & Tobago: future production pathways for the world's largest ammonia exporter

WEBINAR

Dale Ramlakhan

Chair Decarbonization Taskforce, The Energy Chamber of Trinidad & Tobago

Marina Simonova

Principal – Fertilizer & Ammonia Consulting, Argus Media

AMMONIA ENERGY ASSOCIATION

Friday, January 24
3PM CET (9AM EST)

House rules

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- Please post your questions for the speakers in the Q&A section. Your questions will be answered by text by the speakers or will be discussed live.

- The recording of this webinar will be shared with all registrants after the webinar, and will be available at www.ammoniaenergy.org

- An article summarizing this webinar will be posted on www.ammoniaenergy.org in the coming days.

Global ammonia trade flows

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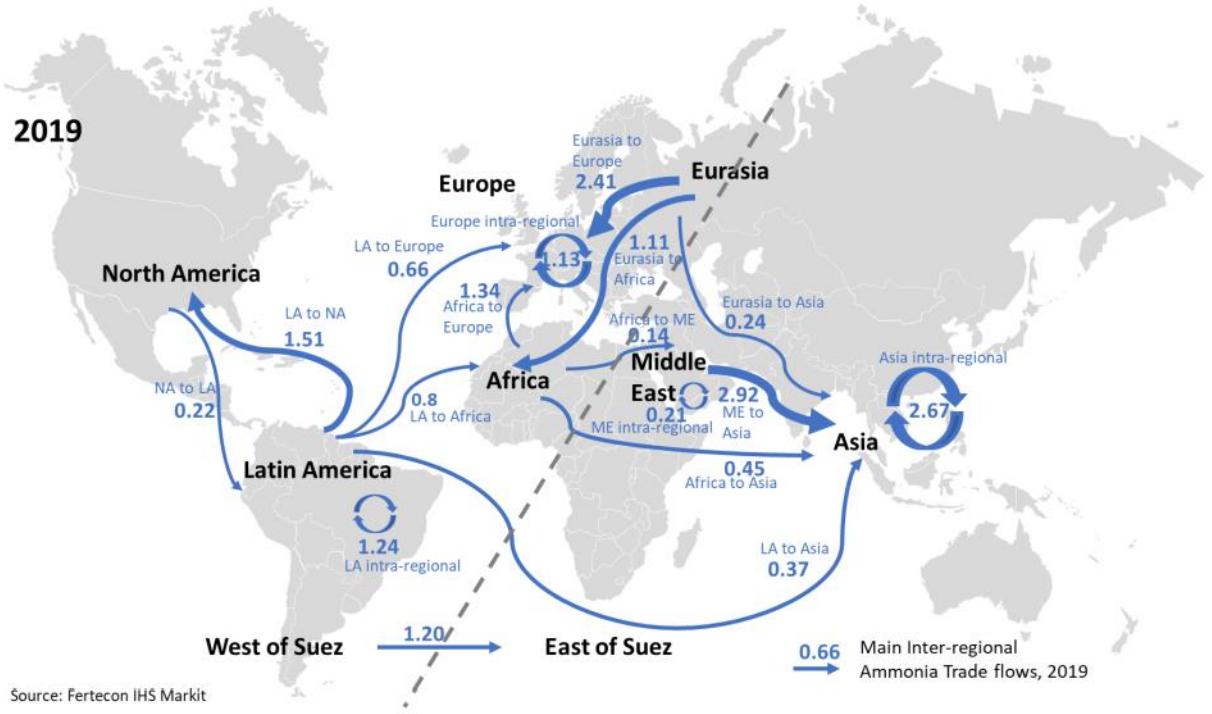
Ammonia demand was 201 million tons in 2024, according to S&P Global.

Only, 17-20 million tons is traded internationally by ocean going vessels.

Trade is usually divided by a portion "West of the Suez Canal" and a portion "East of the Suez Canal"



https://www.topsoe.com/hubfs/DOWNLOADS/DOWNLOADS%20-%20White%20papers/Ammonfuel%20Report%20Version%2009.9%20August%203_update.pdf

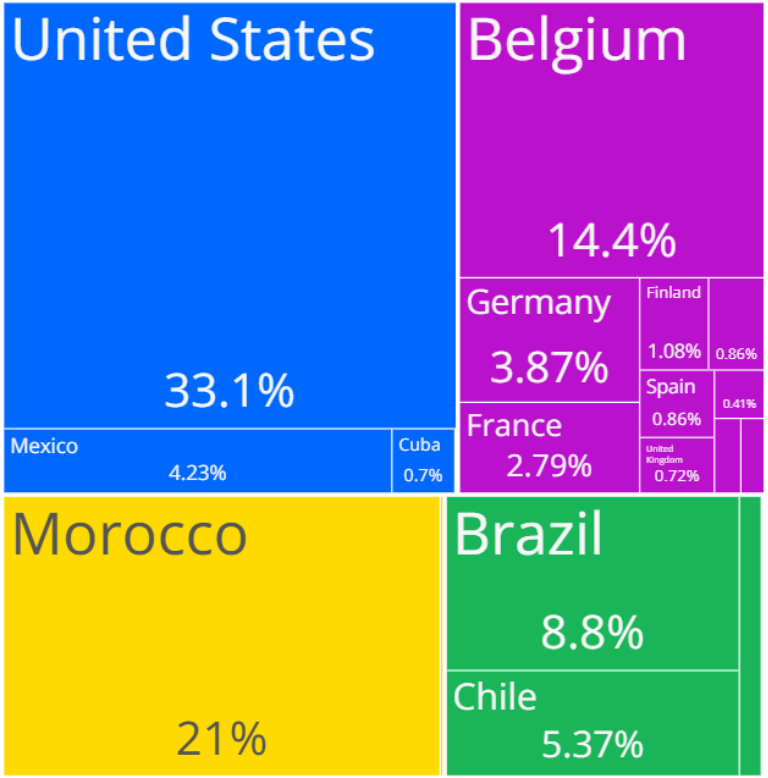
https://ammoniaenergy.org/wp-content/uploads/2024/11/G-Eliseev-2024.pdf

Trinidad & Tobago as an existing ammonia exporter

AMMONIA ENERGY ASSOCIATION

Trinidad & Tobago is the largest ammonia exporter globally, representing about 15-20% of global ammonia exports by ocean going vessels.

- In 2022, Trinidad & Tobago exported around 3.2 million tons. According to the World Bank, this was valued at $3.68B.
- Current exports are globally distributed, with exports to North America, Northern Europe, Northern Africa, and Latin America.
- New low-emission ammonia demand from East Asia and Northern Europe for energy applications is expected to change ammonia trade flows.



https://oec.world/en/profile/bilateral-product/ammonia/reporter/tto

https://wits.worldbank.org/trade/comtrade/en/country/TTO/year/2022/tradeflow/Exports/partner/WLD/product/281410

Decarbonization of ammonia export from Trinidad & Tobago

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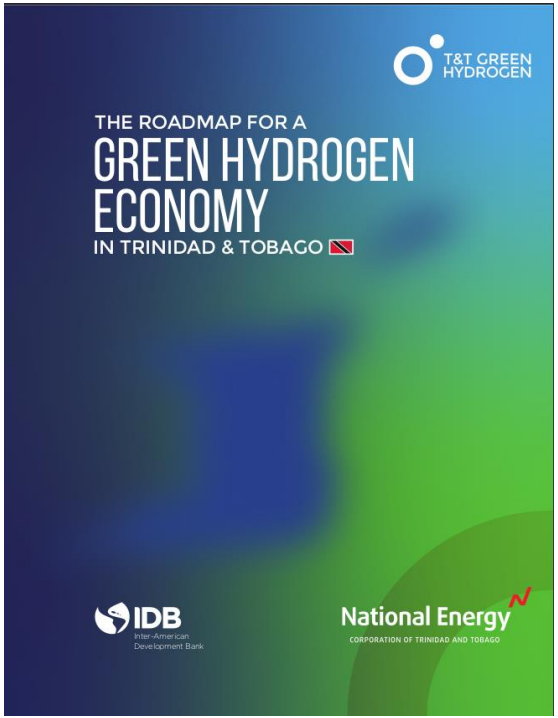
In 2022, a roadmap for decarbonization of hydrogen and ammonia production, led by KBR, the Inter-American Development Bank and Trinidad's National Energy Corporation.

Various ammonia decarbonization initiatives are ongoing in Trinidad & Tobago, including a carbon capture and storage (CCS) project, which received support from the Green Climate Fund (GCF) of the United Nations Framework Convention on Climate Change (UNFCCC).

There is also a 90 MW solar PV project under development, which can be coupled to an electrolyzer for hydrogen production. Decarbonization of hydrogen and ammonia production in Trinidad & Tobago is critical to the island nation maintaining its market position.



https://ammoniaenergy.org/articles/trinidad-tobago-launches-roadmap-to-decarbonise-hydrogen-ammonia-production/

https://publications.iadb.org/en/roadmap-green-hydrogen-economy-trinidad-and-tobago

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Ammonia Sector in Trinidad and Tobago: **A Path to Sustainability**

Dr. Dale Ramlakhan

Contents

01

Introduction to Trinidad and Tobago's Ammonia Sector

Historical Overview

History of Ammonia Production

T&T’ s ammonia production began in 1959, W.R. Grace commissioned a 250,000(tpa) plant named Federation Chemicals Limited (Fedchem).

Strategic Location and Resources

T&T ‘s strategic location in the Altantic Basin and the creation of the Point Lisas Industrial Estate in the 1970s along with its abundant natural gas resources provided the necessary infrastructure for world-scale plants.

Global Market Position

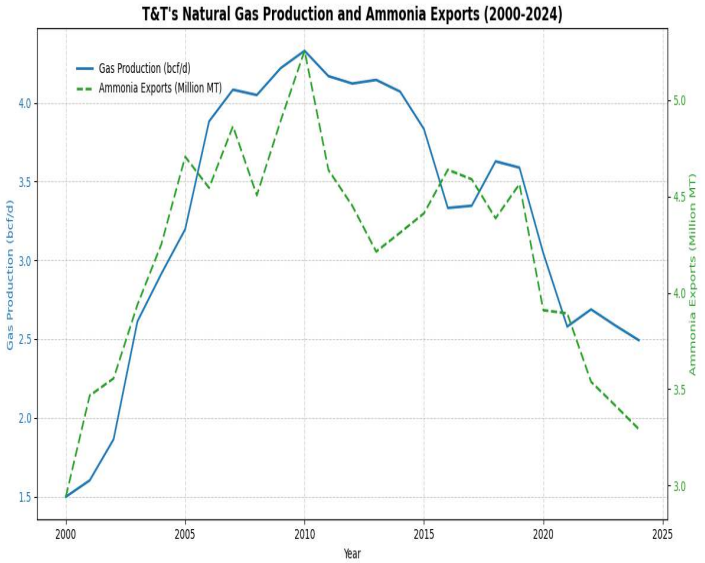
T&T has historically been the one of largest exporter of ammonia globally with an installed capacity of 5.67 million tonnes per year and a strong presence in international markets due to its competitive production costs.

Current Status

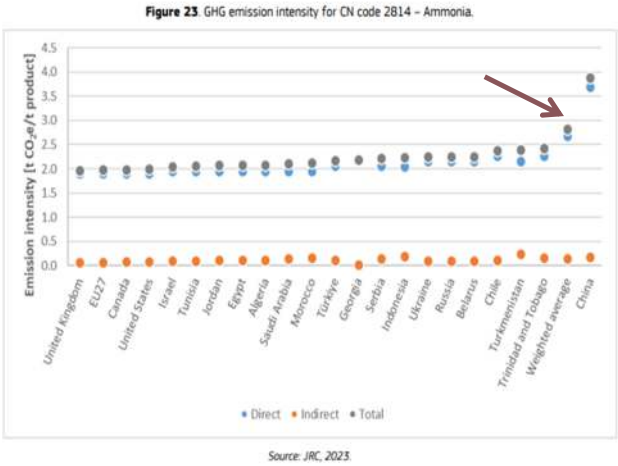
Production Capacity

Start Up Date	Plant	Capacity (MTPY)
1959	Yara	285000
1977	Tringen 1	500000
1981	O1	445000
1982	O2	445000
1988	Tringen 2	495000
1996	O3	250000
1998	PLNL	650000
1999	O4	650000
2002	CNC	650000
2004	Nitrogen 2000	650000
2009	AUM Ammonia	650000

Impact of Declining Production



Need for Decarbonization

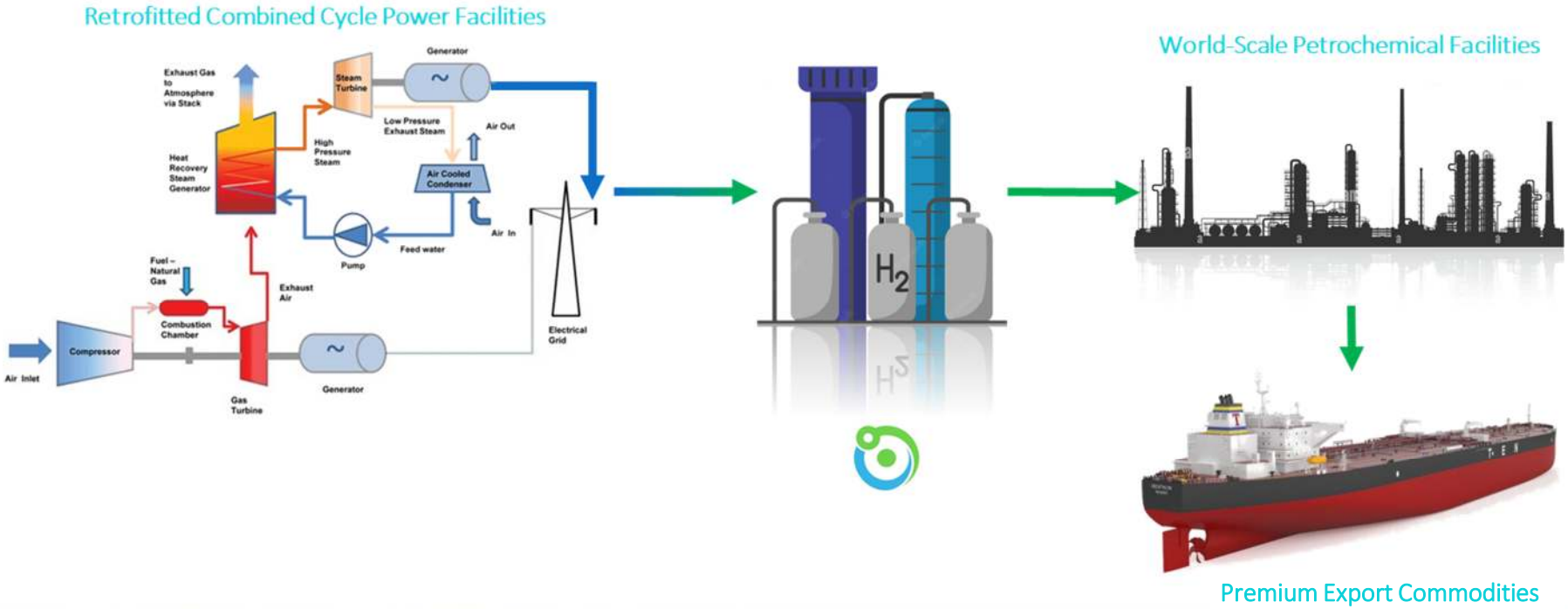


02

Decarbonization Initiatives

Green and Low Carbon Hydrogen Initiatives

NewGen Energy Project



Green and Low Carbon Hydrogen Initiatives

Collaboration with Inter-American Development Bank

The National Energy Corporation is collaborating with the Inter-American Development Bank to explore the establishment of a renewable hydrogen market.

Findings on Renewable Hydrogen Market

The collaboration has released findings on the potential for renewable hydrogen production and its integration into the global market.

Approved Green Hydrogen Projects

The Cabinet has approved the first green hydrogen demo project, with further renewable energy initiatives under exploration.

Future Renewable Energy Initiatives

Future initiatives include expanding renewable energy projects to support the hydrogen economy and improve sustainability.

Renewable Energy Initiatives

01

Solar Energy

92 MW of solar is in construction and should be commissioned in 2025.Plans for a solar feed in tariff program and utility scale solar on selected sites.

02

Wind Energy

A Wind Resource Assessment Programme has started in Nov 2024. A target of 2GW of wind energy by 2035 has been proposed.

03

Hydrogen Economy

KBR's study done in 2022 looking at establishing a green hydrogen economy in T&T by repurposing existing grey hydrogen and ammonia facilities with offshore wind produced green hydrogen.

Carbon Capture and Storage (CCS)

CCS Policy Development

The government is finalizing a CCS policy to capture carbon from existing ammonia plants and store it in abandoned wells.

GCF Funding

In a historic move, T&T secured funding from the GCF for a CCS project, marking the first time the GCF has funded such an initiative. The project focuses on assessing the storage potential in deep saline formations and creating a national storage atlas.

Utilization and Storage Strategies

The CCS strategy involves capturing combustion and process carbon emissions and storing them in the identified wells and to prevent atmospheric release.

03

Challenges in Transitioning to Green Ammonia

Resource and Technological Barriers

01

Declining Gas Reserves

Declining natural gas reserves have led to production shortfalls, necessitating a shift towards renewable energy sources for ammonia production.

02

High Costs of Green Hydrogen

Producing green hydrogen through electrolysis is currently more expensive than traditional methods, posing a financial challenge for the industry.

03

Technological Development Needs

The technology for green ammonia production, particularly water electrolysis, is still in development and requires further research to scale up.

Infrastructure and Human Capital

01 Workforce Reskilling

Transitioning to green ammonia requires reskilling the workforce to handle renewable energy technologies and new production methods.

02 Transition from Fossil Fuels

The shift from fossil fuel-based operations to renewable energy operations demands changes in infrastructure and expertise.

03 Infrastructure Adaptation

Existing infrastructure must be adapted to support green hydrogen production, including retrofitting ammonia plants and integrating renewable energy sources.

Policy and Market Dynamics

01 Policy and Regulatory Framework

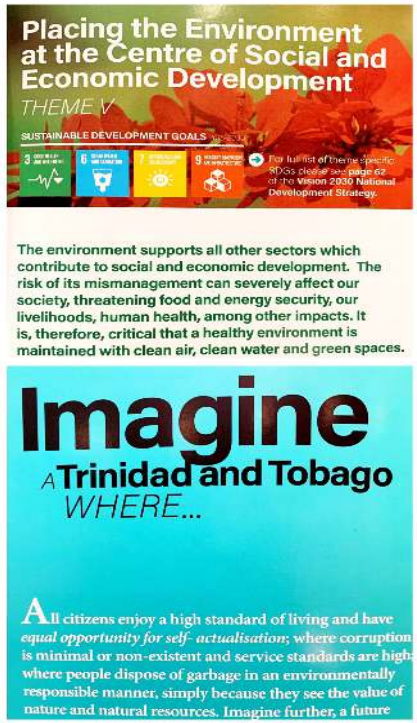
Establishing a supportive policy environment, including incentives and subsidies, is crucial for encouraging investment in green ammonia production.

02 Global Market Pressures

Global decarbonization efforts, including carbon border adjustment mechanisms, are pressuring T&T to transition to green ammonia to maintain its export markets.

03 Economic Transformation Opportunities

The transition to green ammonia presents opportunities for economic diversification and job creation in renewable energy and hydrogen production sectors.



04

Leveraging Existing Infrastructure

Repurposing Ammonia Plants

Green Hydrogen Integration

Existing ammonia plants can be retrofitted to incorporate green hydrogen production, including the installation of electrolysers and renewable energy systems.

Retrofitting Existing Facilities for Carbon Capture and Storage

Retrofitting and upgrading existing infrastructure to support carbon capture and storage.

Case Study: NewGen Energy

NewGen Energy's project in Point Lisas is a prime example of reimaginig existing facilities to produce low carbon hydrogen for ammonia production.

06

Conclusion and Future Outlook

Strategic Investments

Renewable Energy Investments

Strategic investments in renewable energy projects are essential for supporting the transition to green ammonia production in T&T.

CCS and Green Hydrogen Projects

Investments in CCS and green hydrogen projects will play a key role in reducing the carbon footprint of the ammonia sector.

Maintaining Global Leadership

By transitioning to green ammonia, T&T aims to maintain its leadership in the global ammonia market while aligning with global decarbonization goals.

Future Opportunities

Economic Diversification

The transition to green ammonia presents opportunities for economic diversification, reducing reliance on fossil fuels and creating new industries.

Job Creation in New Sectors

The shift towards renewable energy and hydrogen production will create new job opportunities in sectors like renewable energy and green technology.

Positioning as a Green Energy Hub

T&T has the potential to become a green energy hub in the Caribbean, leveraging its existing infrastructure and expertise in ammonia production.

Questions

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Trinidad's role in the evolving global ammonia market:
new risks or opportunities?

Prepared for AEA webinar
"Trinidad & Tobago: future production pathways for the world's largest ammonia exporter"

Marina Simonova
Principal – Fertilizer & Ammonia Consulting
marina.simonova@argusmedia.com
24 January 2025

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Agenda

Trinidad's role in the evolving global ammonia market: risks or opportunities?

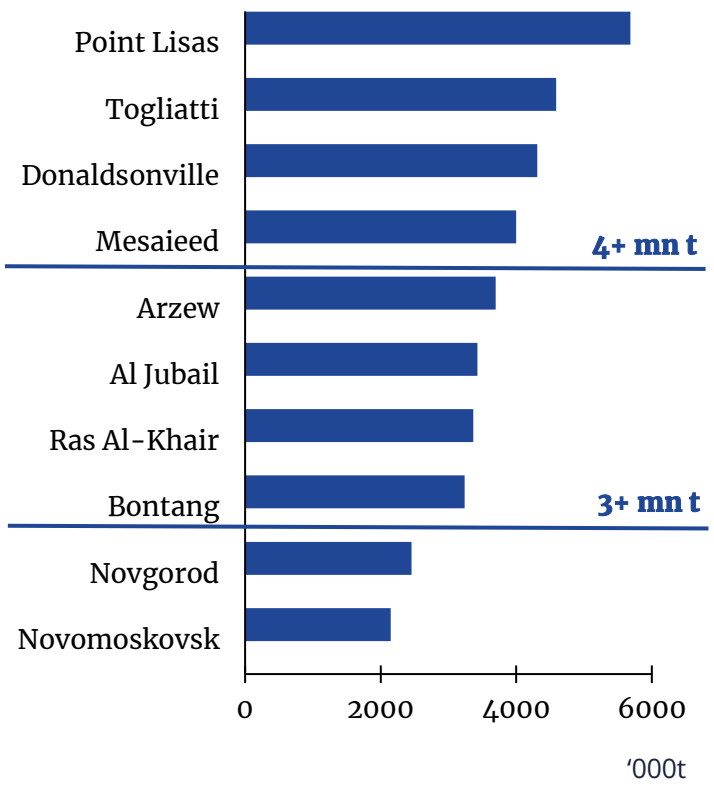
1. Role of Trinidad as the key ammonia supply hub globally
2. Destination markets for Trinidad today: evolution of ammonia exports overtime
3. Potential target markets for Trinidad tomorrow: emerging markets of clean ammonia
4. Decarbonization & energy transition: challenges or opportunities for Trinidad?

Source: Argus Consulting

Point Lisas site in Trinidad is the largest ammonia supply hub in the world

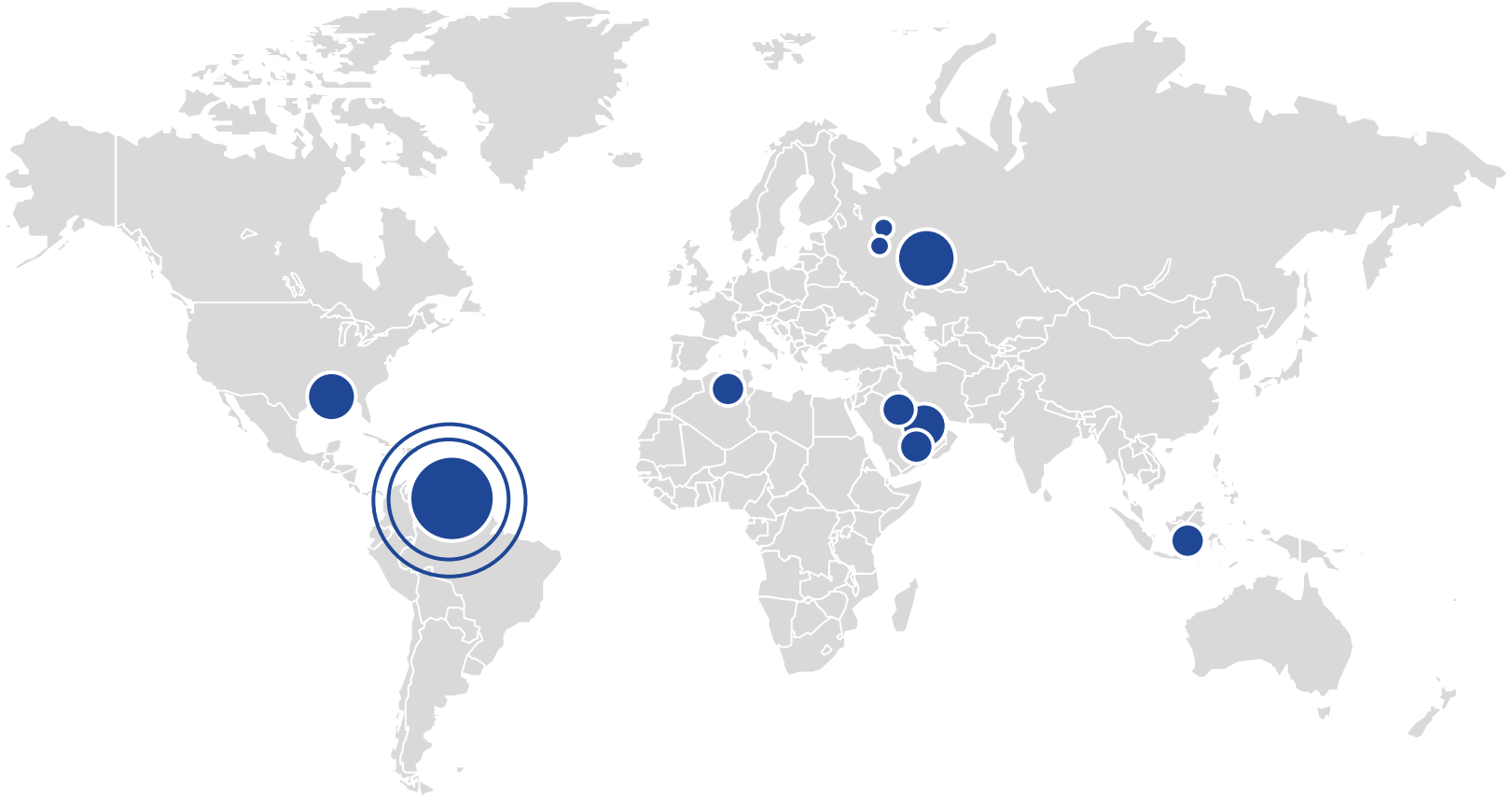
Most ammonia capacity in Trinidad is dedicated for exports

Largest ammonia supply hubs: top 10



Note: Donaldsonville, incl. Faustina

Largest ammonia supply hubs by gross capacity: top 10



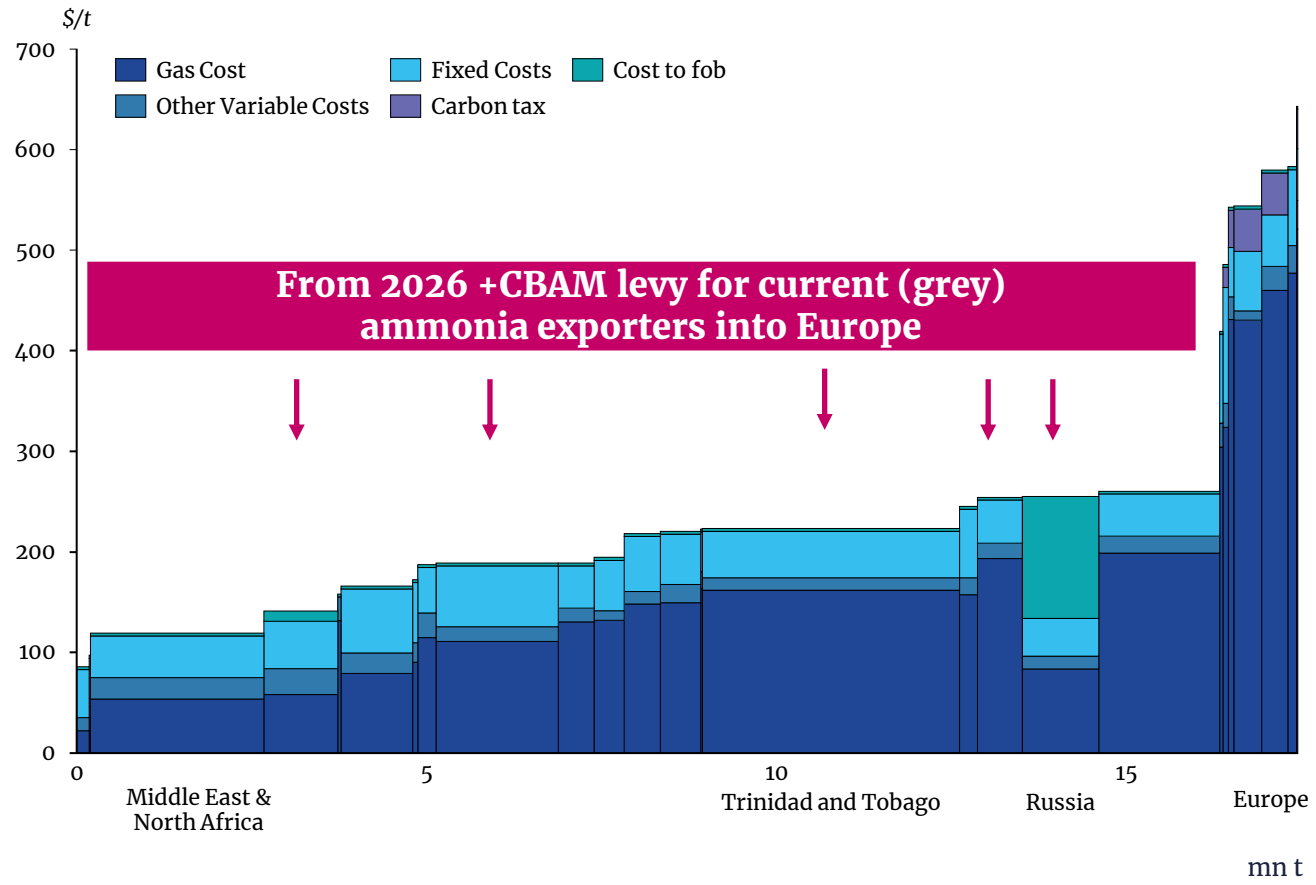
Note: Schematic, not to scale

Source: Argus Ammonia Analytics, Argus Consulting

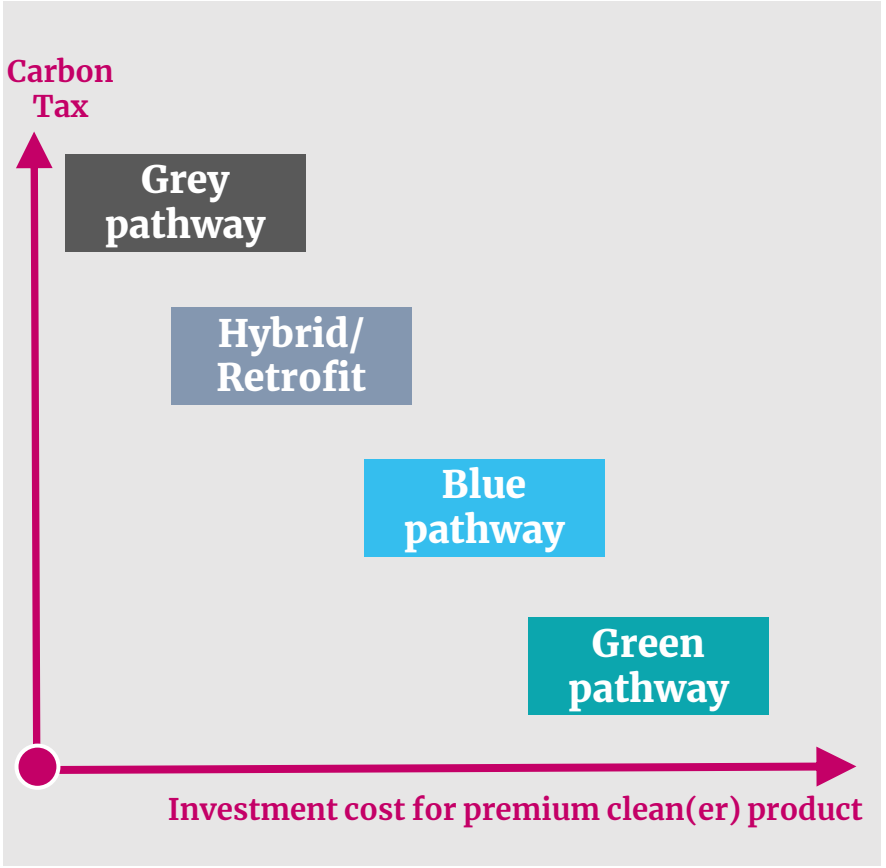
Industry cost curve: Argus traded ammonia supply curve 2025, fob basis

Trinidad merchant ammonia supply is positioned in the middle of the global cost curve

Ammonia export cost curve, 2025 (fob/fca basis)



CBAM will also trigger lower CI products into EU

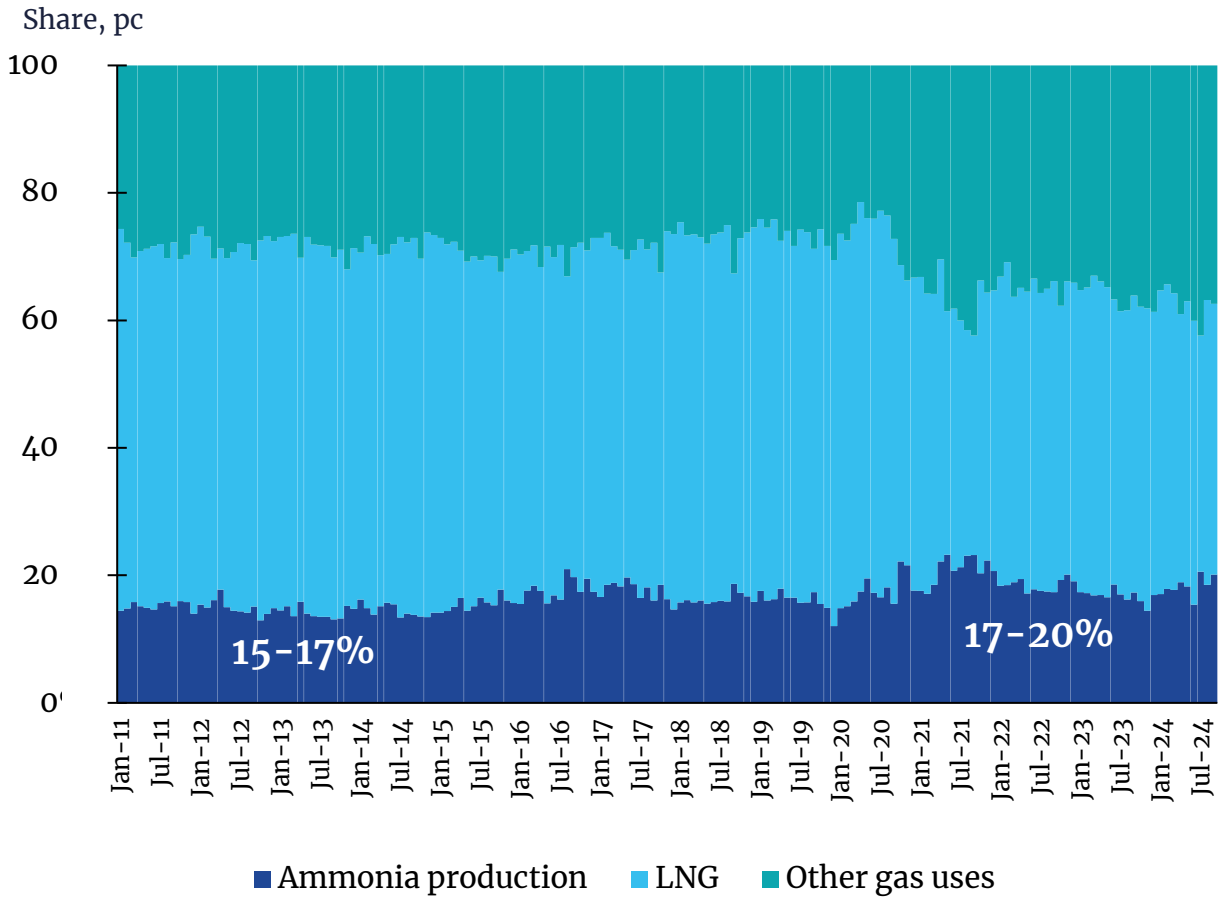


Source: Argus Ammonia Analytics, Argus Consulting

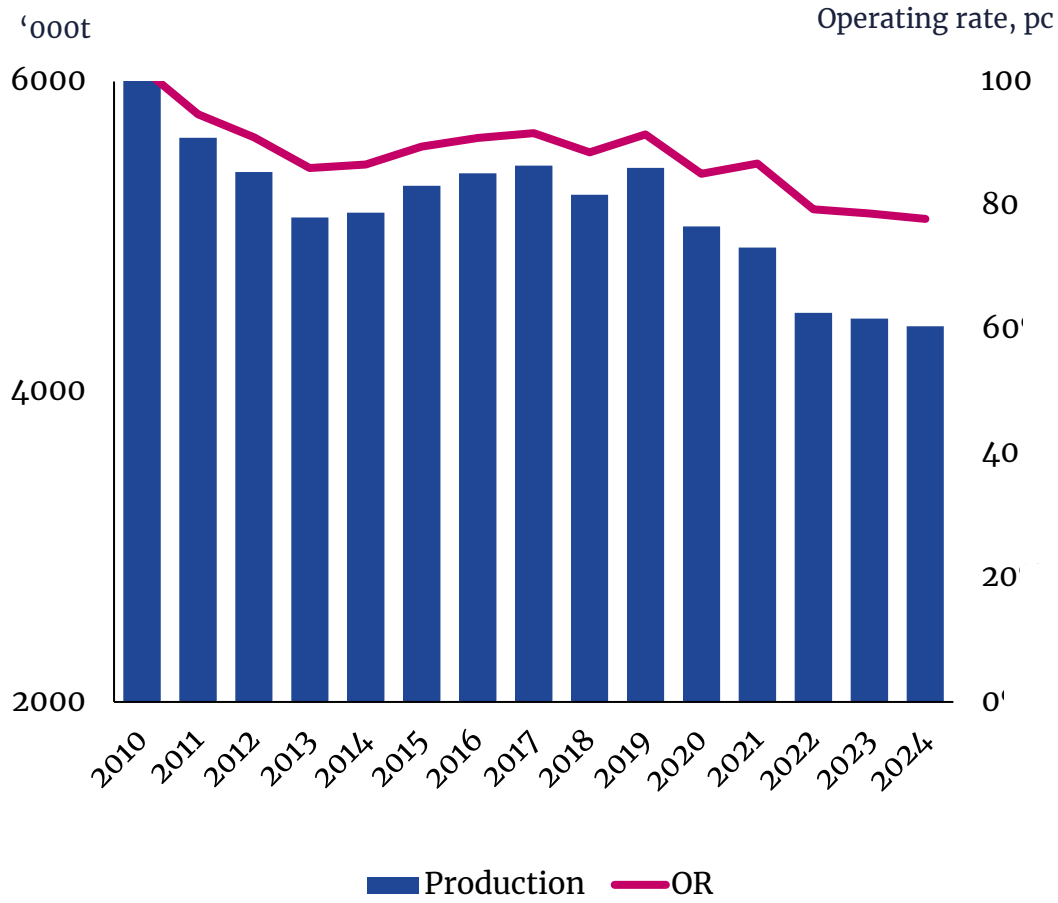
Ammonia production competes for gas with other industries in Trinidad

17-19% of natural gas consumption in Trinidad is dedicated to ammonia production

Natural gas consumption in Trinidad by end use, Jan-2011 to Sep-2024



Ammonia industry performance in Trinidad

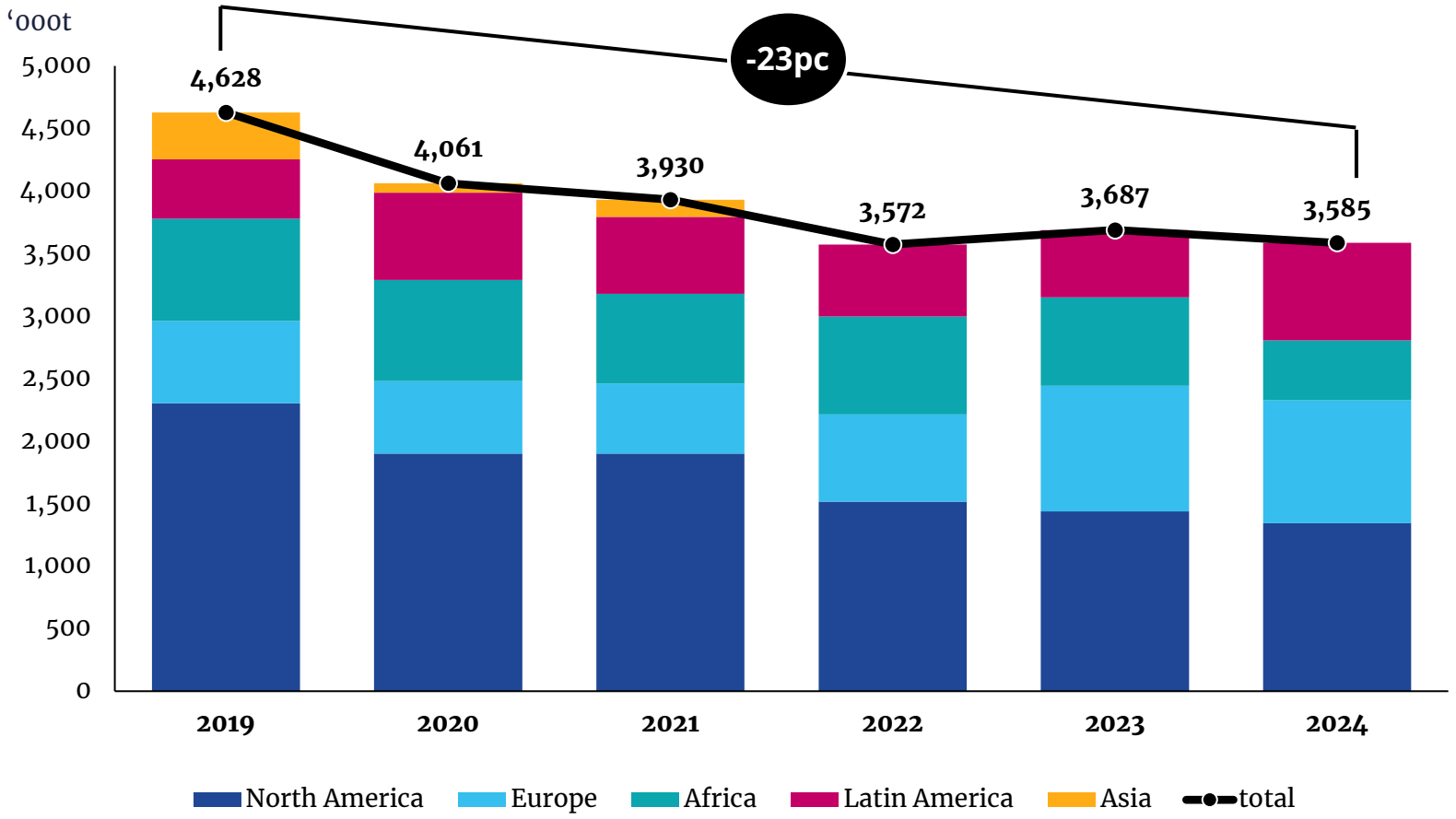


Source: Ministry of Energy and Energy Industries of Trinidad and Tobago, Argus Consulting

Ammonia exports out of Trinidad by destination

Over the past 6 years over 35 countries relied on ammonia supply from Trinidad.

Evolution of ammonia exports ex-Trinidad by region, '000t



1. Ammonia exports out of Trinidad have declined by 23 pc (-1.0 mn t) from 2019 to 2024
2. In 2024, North America and Europe accounted for 65pc of total exports out of Trinidad
3. Ammonia shipments to North America have reduced in the past 6 years
4. Ammonia deliveries to Europe have increased from 0.7 mn t to 1.0 mn t
5. Asia represented opportunistic shipments, but logistics & Panama canal
6. Steady presence in Latin American markets, varying from 0.5 mn t to 0.8 mn t in 2019-2024

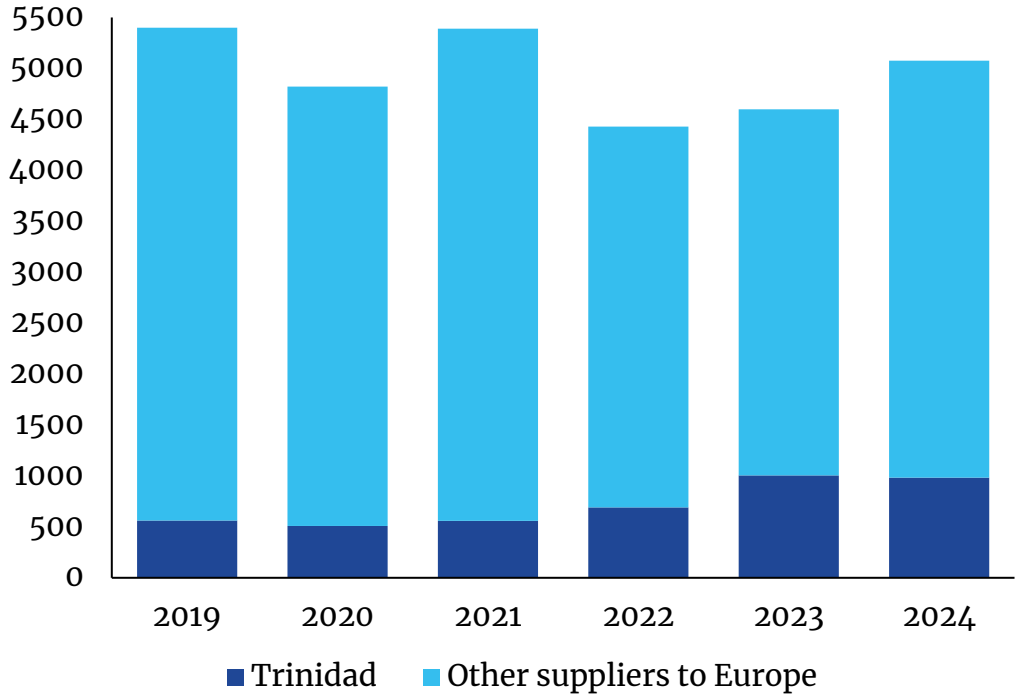
Note: North America, incl. USA and Mexico. Europe, incl. shipments to Turkey

Source: Argus Ammonia, Trinidad and Tobago ammonia export lineup, Argus Consulting

Key destination markets for Trinidad are undergoing significant changes

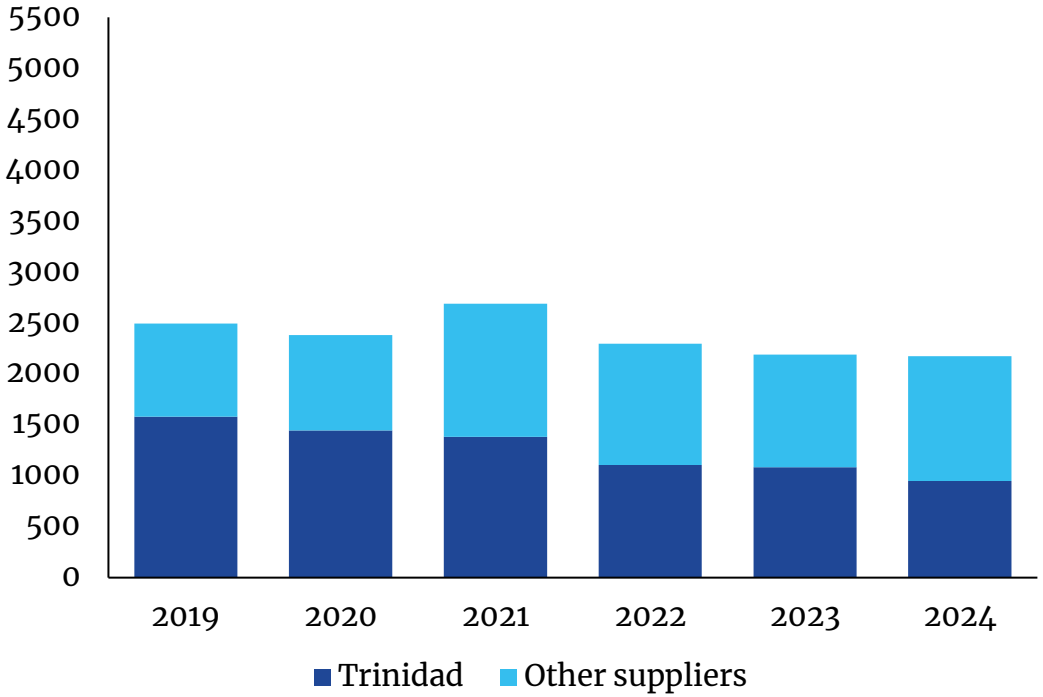
CBAM tax in Europe coupled with RED and development of blue ammonia capacity in the USA

Ammonia imports in Europe, ‘000t



- European ammonia imports ranged between 4.4-5.4 mn t in 2019-24;
- The presence of Trinidad in Europe has increased to ≈1.0 mn t
- Main markets in Europe for Trinidad: Belgium, France, Norway, other

Ammonia imports in the USA, ‘000t



- US ammonia imports ranged between 2.0-2.5 mn t in 2019-24;
- The presence of Trinidad in the USA has declined from 1.6 to 0.9 mn t
- Increased blue ammonia projects activity in the USA poses risk

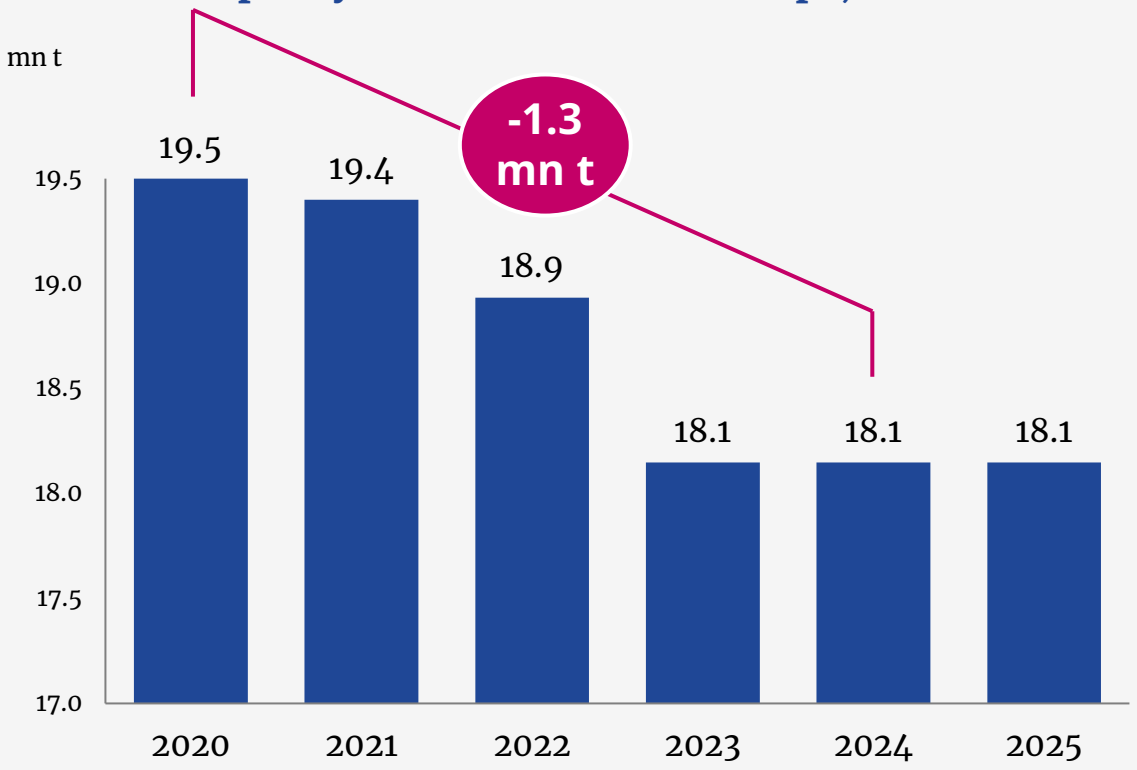
Note: European imports excl. Turkey but including intra-regional trade

Source: Argus Consulting

Operating rates of nitrogen producers in EU under pressure: structural shifts

A series of plant closures have been reducing domestic nitrogen capacity. Further closures cannot be excluded.

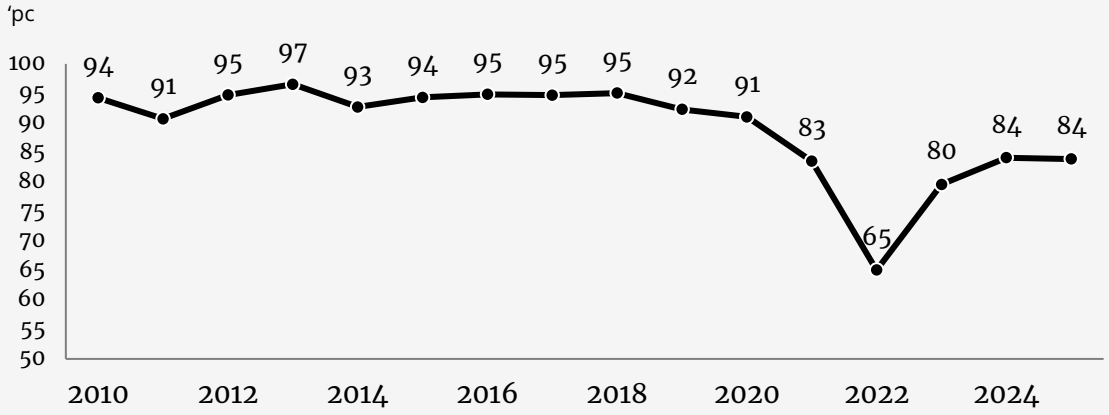
Ammonia capacity rationalization in Europe, 2020-2025



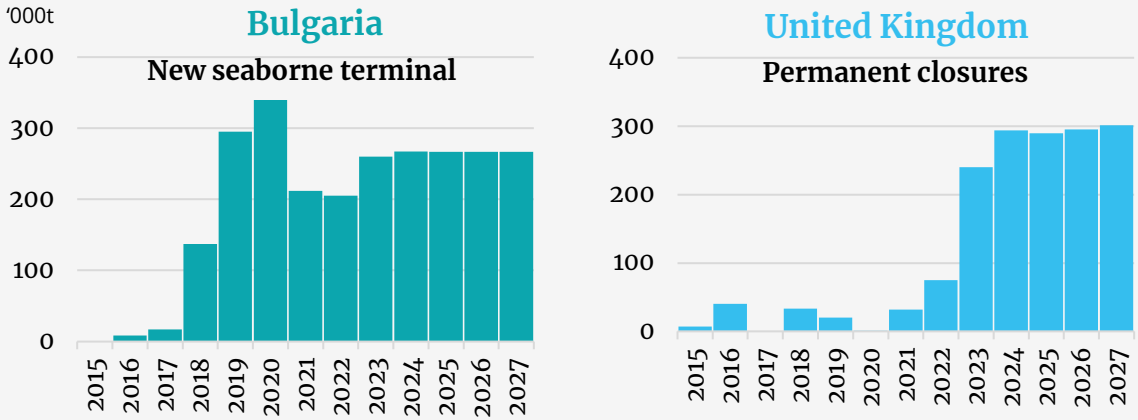
Permanent closures
United Kingdom, Ince (380,000)
Germany, Ludwigshafen (420,000)
United Kingdom, Billingham (546,000)

Potential rationalization:
Belgium, Tertre (tbc, 383,000)
Poland (tbc)
France, Others ?

Ammonia operating rates in Western Europe, pc, 2010-2025



Ammonia imports (structural shifts), 2015-2027

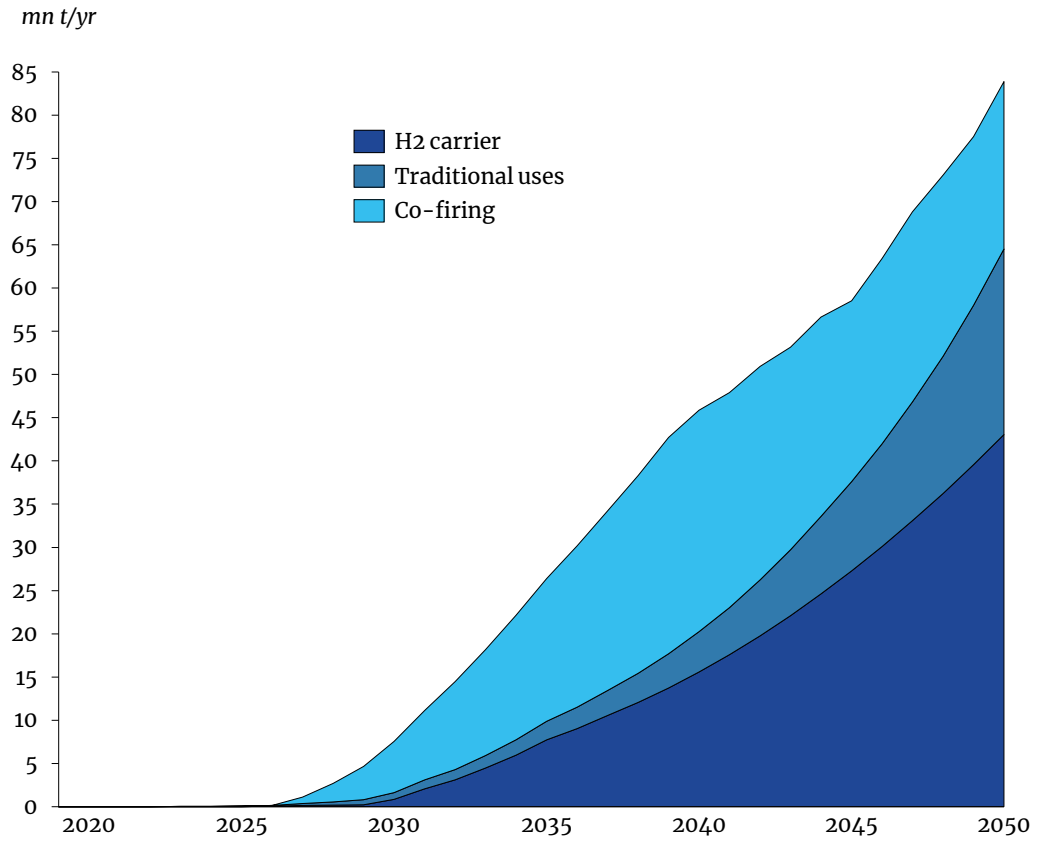


Source: Argus Consulting

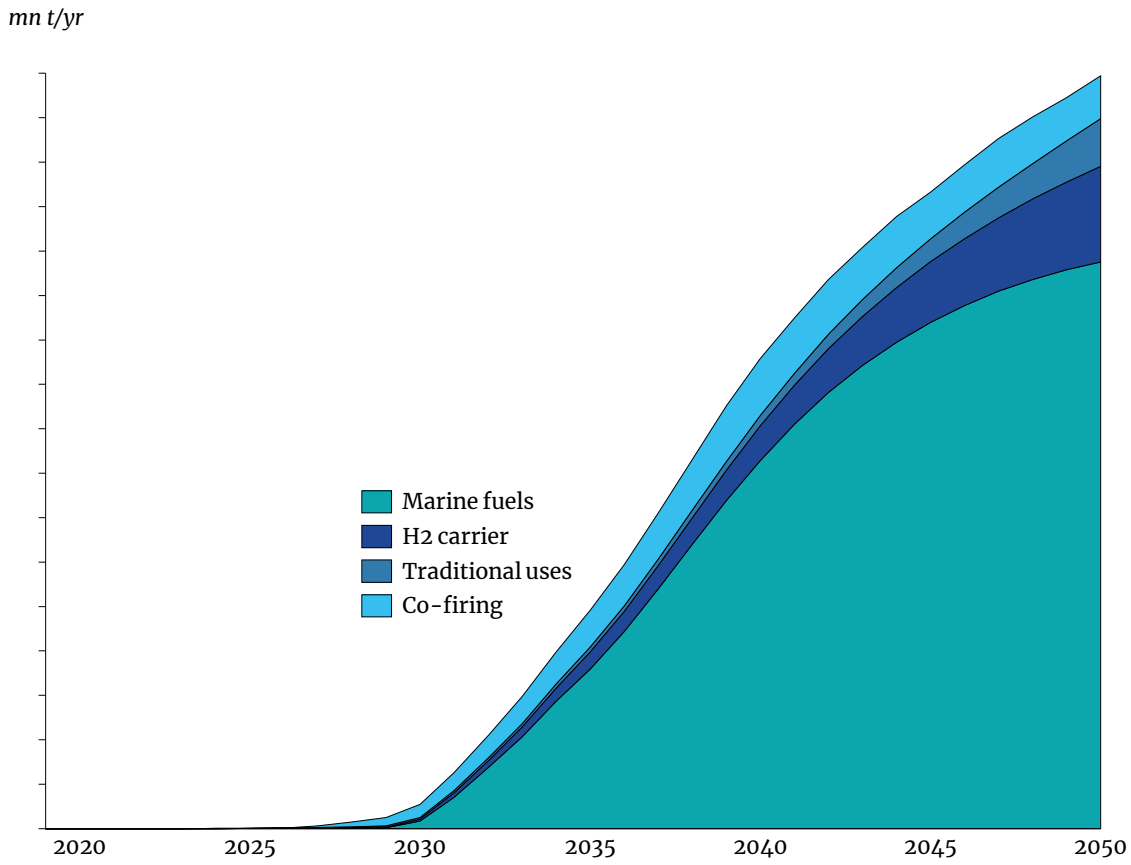
Clean ammonia demand for new applications offers new opportunities... in the long-run

Clean ammonia demand outlook dominated by marine bunker fuel sector

Clean ammonia demand excl. marine fuel segment, 2020-50



Clean ammonia demand, all segments, base-case, 2020-50

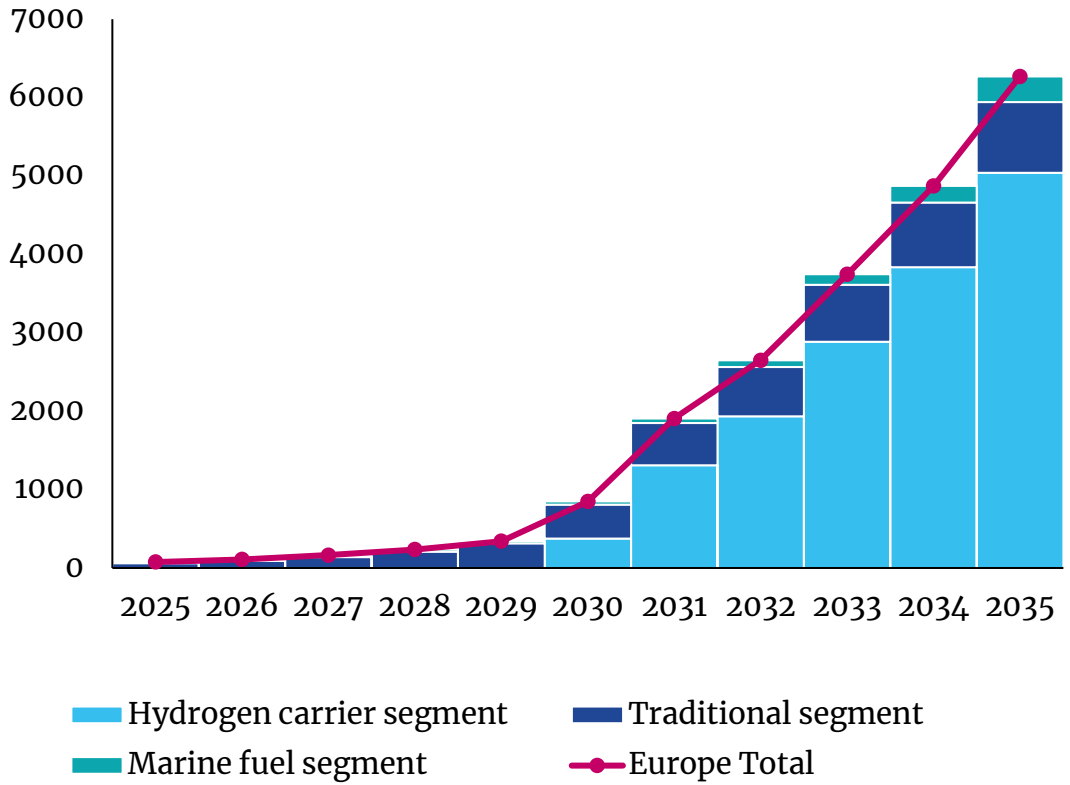


Source: Argus Ammonia Analytics, Argus Consulting

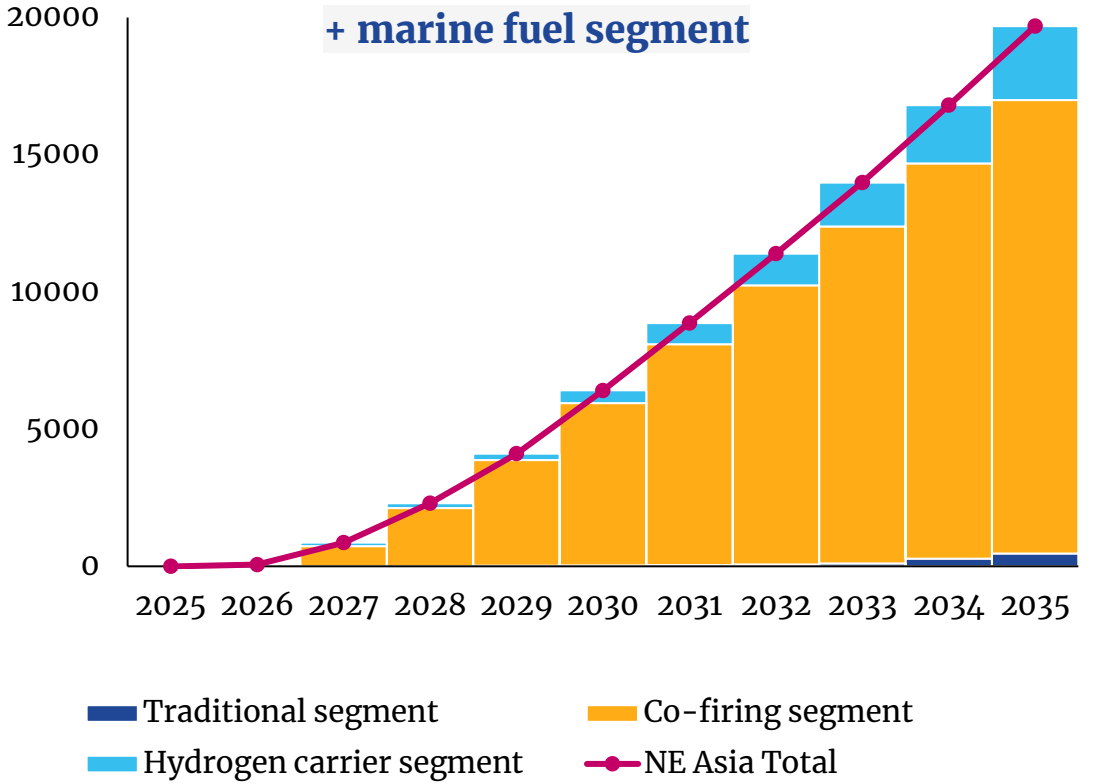
Clean ammonia demand by key geographies to 2035: varying mix

Europe and NE Asia are expected to be the key drivers for clean ammonia market deployment

Clean ammonia demand outlook in Europe, '000t



Clean ammonia demand outlook in NE Asia, '000t



... but competitive landscape is expanding with supply diversified by carbon footprint & wider geographical footprint

Source: Argus Consulting

Global blue ammonia capacity forecast, 2024-38

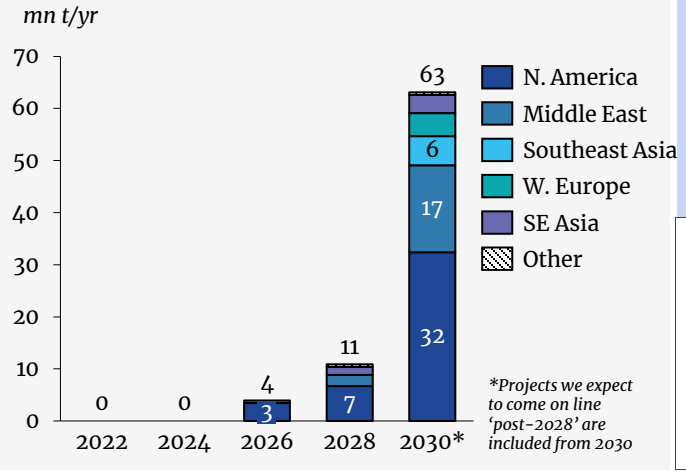
Blue ammonia project pipeline dominated by North America

Proposed blue ammonia projects fit into two categories:

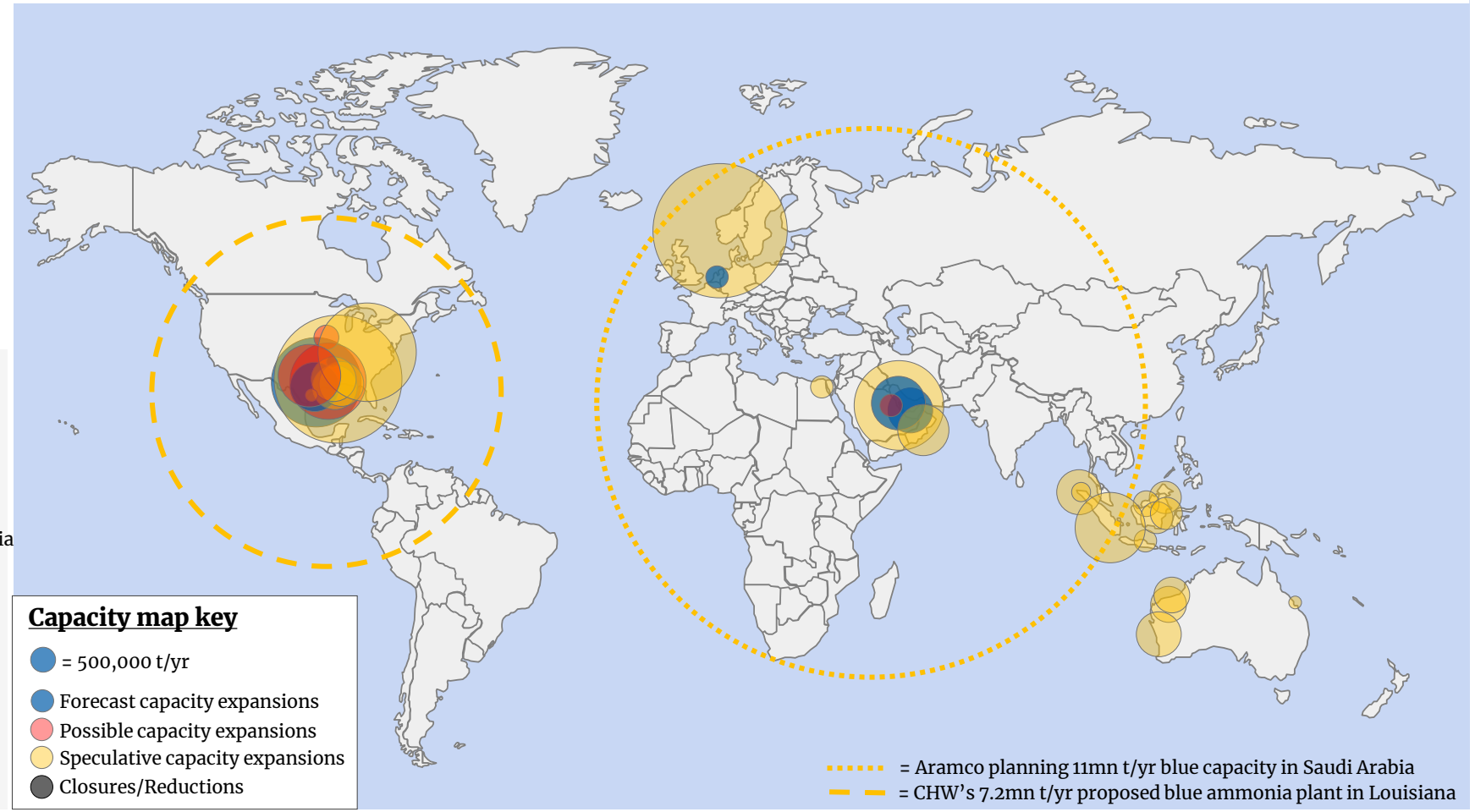
- new-build conventional methane reforming-based ammonia units with integrated CCS technology, and
- CCS retrofits to decarbonise existing grey capacity.

The timeline below shows the potential capacity that would come on-line if all the projects that we are tracking continue to progress. These are not all included in our forecast.

Blue ammonia capacity timeline, incl. Speculative



Blue ammonia capacity expansions

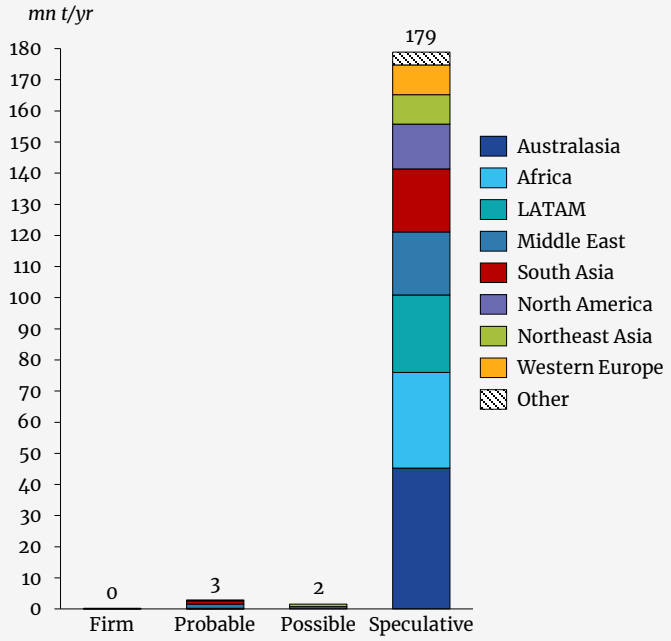


Source: Argus Consulting, Argus Ammonia Analytics,

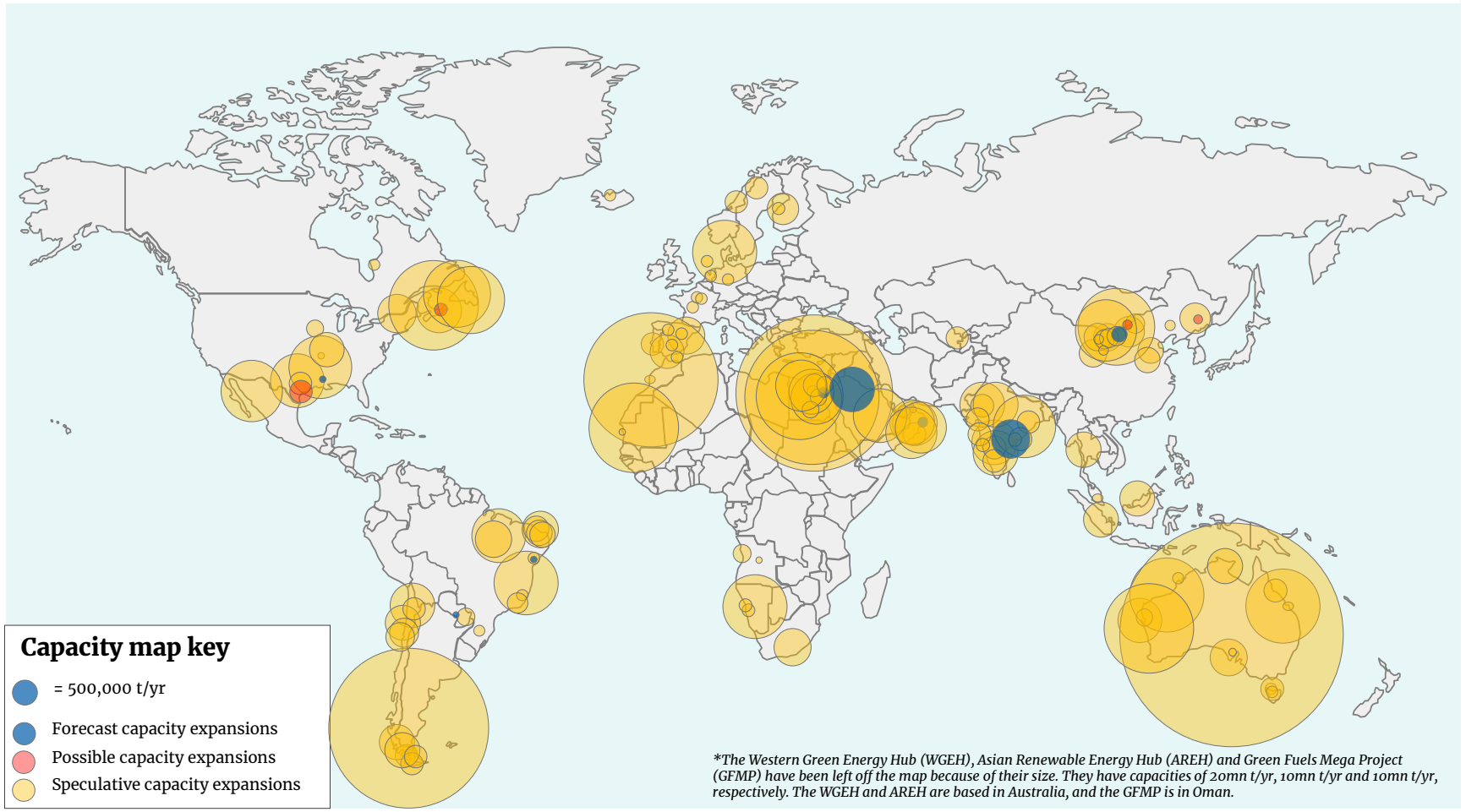
Global green ammonia capacity forecast, 2023-38

Grean ammonia project pipeline varies by geography, but many projects are either small scale or at a very early stage

Green ammonia capacity by rating



Green ammonia capacity expansions



**The Western Green Energy Hub (WGEH), Asian Renewable Energy Hub (AREH) and Green Fuels Mega Project (GFMP) have been left off the map because of their size. They have capacities of 20mn t/yr, 10mn t/yr and 10mn t/yr, respectively. The WGEH and AREH are based in Australia, and the GFMP is in Oman.*

Source: Argus Consulting, Argus Ammonia Analytics

Different regulatory frameworks are driving interest in clean ammonia

Multiple national hydrogen strategies and roadmaps, ETS systems and PTCs schemes

Implications to clean ammonia demand in Europe

- EU Green Deal / Fit for 55
- REPower EU
- ETS (Emissions Trading System) >> CBAM
- FuelEU Maritime
- RED (Renewable Energy Directive)

National Hydrogen Strategies & Roadmaps

Japan	Morocco	Trinidad
Germany	Spain	Many other

Differentiated support to the clean NH3/H2 value chain

IMO emissions reduction targets — **Implications to marine fuel uptake**

IRA, 45Q, 45V, 45Z — **Implications to clean ammonia supply**

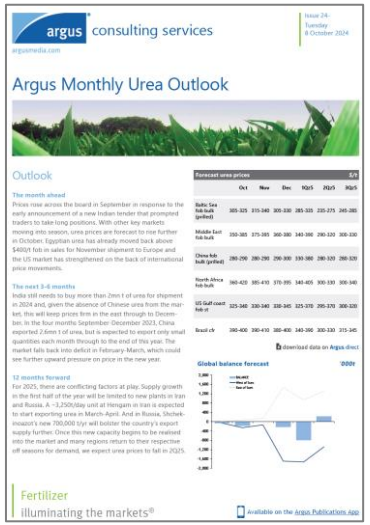
Low-Carbon Hydrogen Auctions (H2Global) — **Developing clean ammonia market/trading**

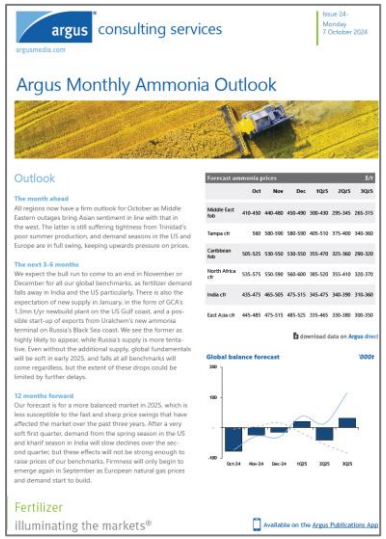
Source: Argus Consulting, Argus Ammonia Analytics, December-2024

Argus Nitrogen portfolio of Short-Term Outlooks & Long-Term Fertilizer Analytics

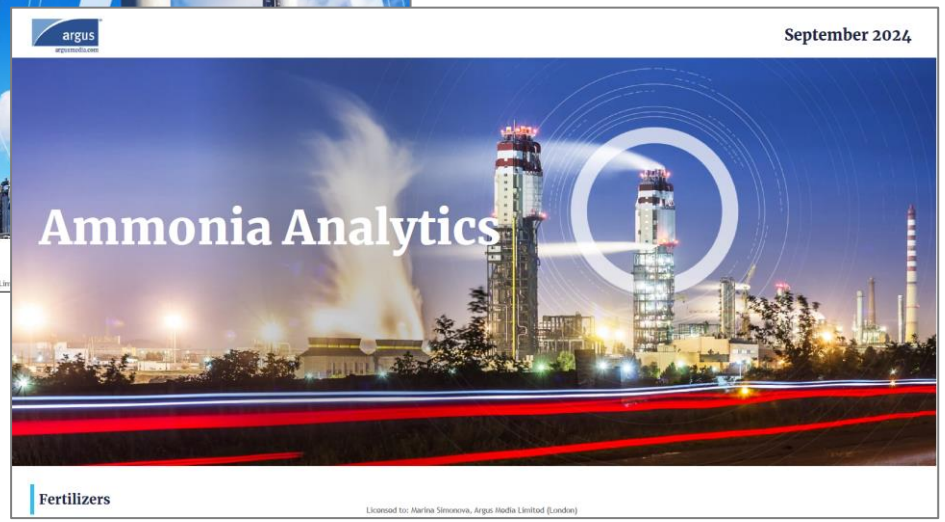
Developed by an experienced team and supported by Data Science Team

Ammonia & Urea Outlooks





Ammonia & Urea Analytics: Long-Term Forecasts



Thank You!

Marina Simonova
Principal – Fertilizer & Ammonia Consulting
marina.simonova@argusmedia.com

Source: Argus Consulting