

Ammonia Certification

Quad Workshop on Ammonia Value Chain

December 2, 2022

Ammonia Value Chain Session, Challenge II:
GHG emission and measurement of Carbon Intensity

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Ammonia Energy Association



Who

The **Ammonia Energy Association** (AEA) is a global industry association.

Members: 200 companies, global and cross-sectoral.

Established in 2004, relaunched in 2018.

What

Our mission is to promote responsible use of ammonia in a sustainable energy economy.

Supply: decarbonize ammonia production.

Demand: adopt ammonia in energy markets.

How

Strategic Pillars:
knowledge stewardship,
program development,
collaboration,
advocacy

AEA Members (Nov 2022)

** indicates representation on Board of Directors*

PLATINUM: bp, CF Industries*, CWP Global*, Denbury, The Hydrogen Utility*, Hy Stor Energy, InterContinental Energy*, KBR*, LSB Industries*, Mitsui & Co., Monolith Materials*, Nutrien*, OCI*, Reliance Industries, Starfire Energy*, Yara*. **GOLD:** ACME Group, AFC Energy, Airgas, Aker Clean Hydrogen, Casale*, Enaex, Engie, Equinor, Fortescue Future Industries, FuelPositive, Hamilton Locke, Horisont Energi*, Maersk*, Marnco*, Mitsubishi Heavy Industries, Origin Energy*, Proton Ventures*, ReNew Power, S&P Global, Syzygy Plasmonics, thyssenkrupp Industrial Solutions*, Topsoe*, Trammo, Trigon, Tri-State Generation & Transmission. **SILVER:** AES, Air Products, Ambient Fuels, Ammonigy, AmmPower, Amogy, Argus Media, BASF, Bechtel, Black & Veatch, Bureau Veritas, Burns & McDonnell, Casa dos Ventos, Christof Group, Clean Hydrogen Works, Consorcio Eólico, ControlRooms.ai*, Copenhagen Atomics*, Copernic Catalysts, CRU Group, CS Combustion Solutions, Cummins, Eastman Chemical, European Institute for Energy Research (EIFER), Enterprize Energy, Envision Group, Fertiberia, First Ammonia, Fujitsu Research of America, GenCell Energy, GTI Energy, Gunvor Group*, H2Site, Heraeus, Humble Midstream, HyFuels Holdings, IHI Americas, Inherent Solutions Consult, inodú, Intecsa Industrial, JGC Corporation, Johnson Matthey, Koch Fertilizer, Linde, Liquium, Lotte Fine Chemical, Mabanaft, Mercuria, MineARC Systems, Mitsui OSK Lines, Nel Hydrogen*, Oldendorff Carriers, Pacific Green Technologies*, SagaPure*, Shell, Skeiron, Stamicarbon, Starbulk Carriers, Sunborne Systems, Switch2, Talos Energy, Technip Energies, Técnicas Reunidas, Terrestrial Energy, Thorium Energy Alliance*, TotalEnergies*, TrittenIAG, Tsubame BHB, Universal H2, Vesta Terminals B.V., Wonik Materials, Woodside Energy. **MEMBERS:** 8 Rivers Capital, AB Achema, ACEN Australia, Advanced Ionics, Advanced Thermal Devices, AHEAD Energy*, AHMON, Air Liquide, alfanar, Antea Group, Apex Clean Energy, Arizona Public Service, Ark Energy, Atmonia, AustriaEnergy, Avaada Energy, Axetris, Borden Ladner Gervais (BLG), Brittany Ferries, C-Job Naval Architects, Carbon-Neutral Consulting*, CHZ Technology, Cozairo, Cura IT, CyaNH3, Danaos Shipping, DBI Fire and Security, Duiker Combustion Engineers, EDF Renewables, EIH2, Energy Estate, Eneus Energy, Evers, EVOS, Greenfield Nitrogen, GTI North America, H2Carrier, Idemitsu Kosan, Incitec Pivot, Ingenostrum, Inpex Corporation, Interlock Energy, Intersect Power, IT Power Australia, John Cockerill, Jupiter Ionics, Karachaganak Green Energy Corporation, Keppel Infrastructure*, Koole Terminals, Mainspring Energy, MAN Energy Solutions, Moda, Nebraska Public Power District, Neology, Netsco, New Energy Technology, Next Hydrogen, NGLStrategy, Nikki-Universal, Nordex, Northern Nitrogen, Northern Plains Nitrogen, NovoHy, NYK Energy Transport (USA), Oceanic Vessels, Oiltanking, Osaka Gas USA, Pacifica Energy, Radia, Renewable Hydrogen Corporation Canada, RES, SBM Schiedam, Scatec, Shrieve Chemical Company, Suzlon Australia, TasRex, Tokyo Gas, Umicore, Unconventional Gas Solutions, Vahterus, Vopak.



Supply can be available



Massive volumes of new / revamp low-carbon ammonia capacity have been announced so far.

By 2030:

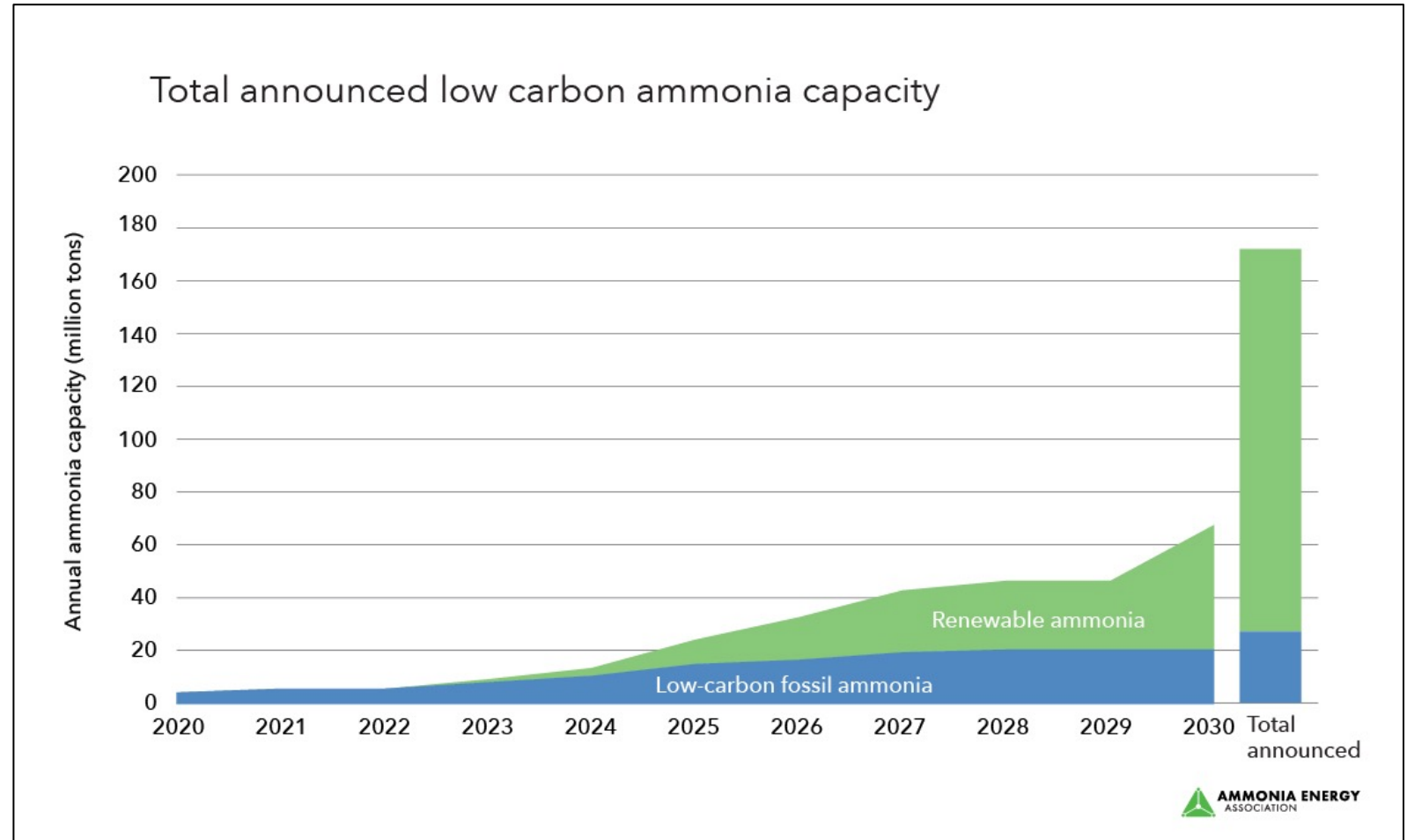
- 20.6 million tons of fossil-based
- 47.2 million tons of renewable.

Total announced (no date) includes:

- 27.1 million tons of fossil-based
- 144.7 million tons of renewable.

The challenge is: how to move these projects from feasibility to FID?

- financiers require offtake
- offtakers require certification.



Global Project List: Low-Carbon Ammonia Plants, AEA (October 2022),
<http://www.ammoniaenergy.org>

Ammonia Certification

The AEA is developing a certification scheme for ammonia, to account for the GHG emissions associated with production.

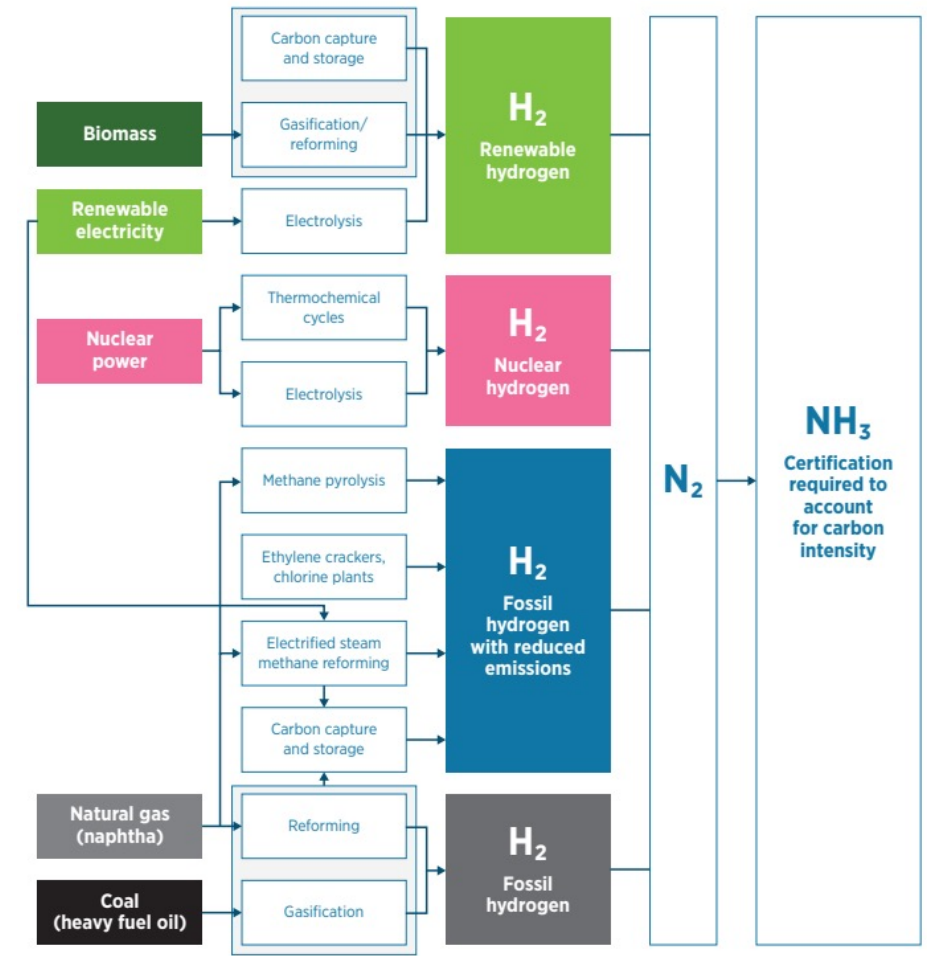
Our strategic objectives include:

- **Global harmonization**, across multiple regions and sectors
- **Technology neutrality**, including fossil, renewable, bio, nuclear
- **Absolute GHG emissions**, site-specific, measured not modelled
- **Well-to-gate**, including upstream Scope 3, as input to full LCA
- **Tradable**, enabling the low-carbon ammonia commodity market

Not colors (green/blue) or labels (clean/low-carbon) but **credible and transparent** absolute GHG intensity (tCO₂e/tNH₃).

AEA Member-led working groups, including international partners, are currently developing the design principles and methodologies.

- Design phase is underway.
- Implementation phase to begin in 2023.



Starting point: define the trade certificate

Cradle-to-Gate carbon intensity (footprint) of ammonia product for the designated 'batch', with relevant supporting information (parameters)



Registration
Evaluation Methodology
Pathways
Auditing

Certificate

Consumer requirements
Mass balancing (common network)
Allowed flexibilities (e.g. mixed batches)

Scheme Management and Administration

AEA Working Group 1/2

AEA Working Group 3

Ammonia Certification



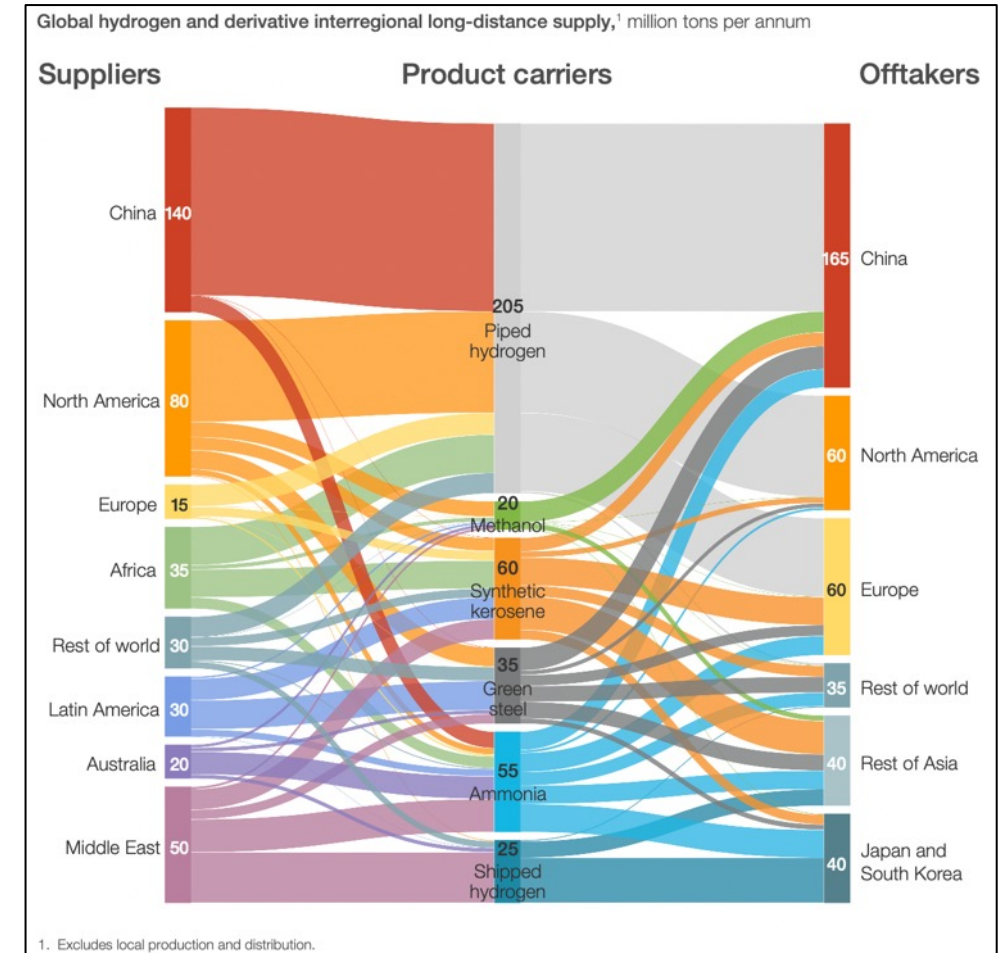
Multiple ammonia certification schemes are in development:

- Fertilizers Europe
- Green Hydrogen Organization
- Smart Energy Council
- Australian Government
- The Fertilizer Institute
- TÜV SÜD
- CertifHy

... and more will come next year

We need to work together on:

- **International standards**, building upon ISO and IPHE
- **Data standards**, for comparability between schemes
- **Mutual recognition**, for compatibility between schemes
- **Modular certification steps**, to manage carrier conversions, transportation and storage



Global Hydrogen Flows: Hydrogen trade as a key enabler for efficient decarbonization. Hydrogen Council (October 2022), <https://hydrogencouncil.com/wp-content/uploads/2022/10/Global-Hydrogen-Flows.pdf>