Clean Ammonia


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Ammonia Energy Association

A global industry association that advocates for the responsible use of ammonia in a sustainable energy economy.

Supply: decarbonize ammonia production.
Demand: adopt ammonia in energy markets.
Ammonia Energy Association

MEMBER LIST — September 2021

* indicates representation on Board of Directors

Ammonia Supply and Demand

According to IRENA, by 2050 in a 1.5° scenario:

- ~70 million tonnes existing ammonia capacity shut down or converted from fossil to renewable inputs
- ~500 million tonnes new ammonia capacity developed using renewable inputs (electricity, biomass)

Ammonia as a Hydrogen Carrier

- Ammonia (NH$_3$) is 17.8% Hydrogen
- Liquid at -33°C (vs. -253°C)
- 50% more H$_2$ than H$_2$ (volumetric)
- Ammonia pipelines: 1/2 cost of natural gas, 1/4 cost of hydrogen
- Ammonia tanks: 60,000 tonne tank holds 90 GWh (largest battery on Earth: 0.129 GWh)
- Ammonia cracking: energy penalty, but competitive for long-duration / long-distance hydrogen transport

Ammonia for Maritime Fuel

- IMO: Initial GHG Strategy, 2018
- Reductions in carbon intensity for existing fleet (CO2e/ton-km):
  - 40% by 2030
  - 70% by 2040
  - 85% by 2050
- COP26 Climate Champions / GTZ: Zero-carbon molecules are 5% of fuel mix by 2030: (60 GW electrolyzers, 30 million tonnes ammonia)
- Ammonia / LPG gas carriers represent ~2% of fuel mix

Ammonia for Electric Power

Japan — METI Road Map:
- Ammonia-coal co-combustion: 3 million tonnes by 2030
- Ammonia turbine: 30 million tonnes domestic, but 100 million tonnes regional demand by 2050

JERA and IHI Corporation:
- Co-combustion began Aug 2021

Mitsubishi Power:
- 40 MW ammonia gas turbine
- Low NOx, available ~2025

**Announced projects (low-carbon capacity):**

- CF, Ince: ~200,000 tonnes ammonia
- CF, Billingham: ~400,000 tonnes
- OCI, Beaumont: 365,000 tonnes
- ADNOC, Ruwais: ~1 million tonnes
- PAU, Sulawesi: ~660,000 tonnes
- SAFCO, Jubail: ~1 million tonnes
- Nutrien, Redwater: ~250,000 tonnes
- Nutrien, Geismar: ~200,000 tonnes

**Definitions and thresholds are required:** these volumes are not equally low-carbon.

HyNet North West project map (including CF Ince), [https://hynet.co.uk](https://hynet.co.uk)
Low-Carbon Ammonia Certification

AEA is facilitating the development of a Low-Carbon Ammonia Certification Scheme.
- Absolute emission intensity (LCA) of ammonia
- Boundaries:
  - well-to-gate (scopes 1, 2, and upstream 3)
  - extendable well-to-tank or -wheel/wake
- Production pathways defined and explicit
- International, cross-sectoral harmonized framework
- Aim: pilot certification in 2023, operational in 2024

- Provide your input:
  - ammoniaenergy.org/certification/
  - certification@ammoniaenergy.org