AMMONIA ENERGY ASSOCIATION

Low-Emission Ammonia Data (LEAD): Vessels

Executive Summary

June 2025

Ammonia Energy Association

Project intelligence database

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The AEA's ammonia-fueled vessels (and ammonia-ready vessels) database has been available to members of the AEA since September 2024.

The database is growing quickly:

- September 2024: 263 vessels (96 ammonia-fueled, 167 ammonia-ready)
- December 2024: 322 vessels (129 ammonia-fueled, 193 ammonia-ready)
- March 2025: 355 vessels (130 ammonia-fueled, 225 ammonia-ready)
- June 2025: 385 vessels (146 ammonia-fueled, 239 ammonia-ready)

The database includes both newbuild vessels and potential retrofitted vessels. Vessels are classified as: (1) Ammonia-fueled, and (2) Ammonia-ready. The vessels classified as "Ammonia-ready" include potential retrofits.

Vessels are categorized according type (including capacity): (1) Ammonia carrier, (2) Gas carrier (non-ammonia), (3) Bulk carrier, (4) Oil carriers, (5) Container ships, (6) Auto carriers (Ro-Ro), and (7) Supply vessels / Tug boats.

Updates this quarter

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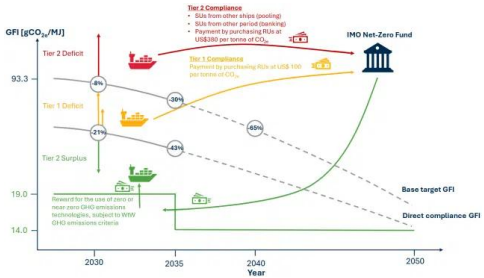
A total of 16 new ammonia-fueled vessels have been added this quarter, as well as 14 new ammonia-ready vessels.



MEPC 83: global shipping gets its first-ever emissions pricing mechanism. This marks an important step towards establishing a legally binding framework to reduce greenhouse gas (GHG) emissions. The regulation will be mandatory for ocean-going ships over 5,000 gross tons (a vessel cohort responsible for 85% of the total CO_2 emissions from international shipping).

Full-scale two-stroke and four-stroke engine tests have been performed using ammonia as fuel, providing evidence of low-emissions from ammonia-fueled engines, and indicating lower emission profiles than using fuel oil. Emission profiles for NO_X are already well below IMO Tier II limits without DeNOx, and meet IMO Tier III limits with DeNOx. N_2O levels are below 3-5 ppm, NH_3 slip emissions are below 10 ppm.

In April 2025, ammonia bunkering from ship-to-ship was demonstrated in the Port of Rotterdam. This builds upon previous ammonia bunkering successes like ship-to-ship transfers in Ngqura and Pilbara, truck-to-ship transfers in Dalian and Yokohama, and shore-to-ship transfer in Singapore.

Top: American Bureau of Shipping.
Bottom: Port of Rotterdam.

Significant Orderbook for Ammonia-fueled & Ammonia-ready Vessels

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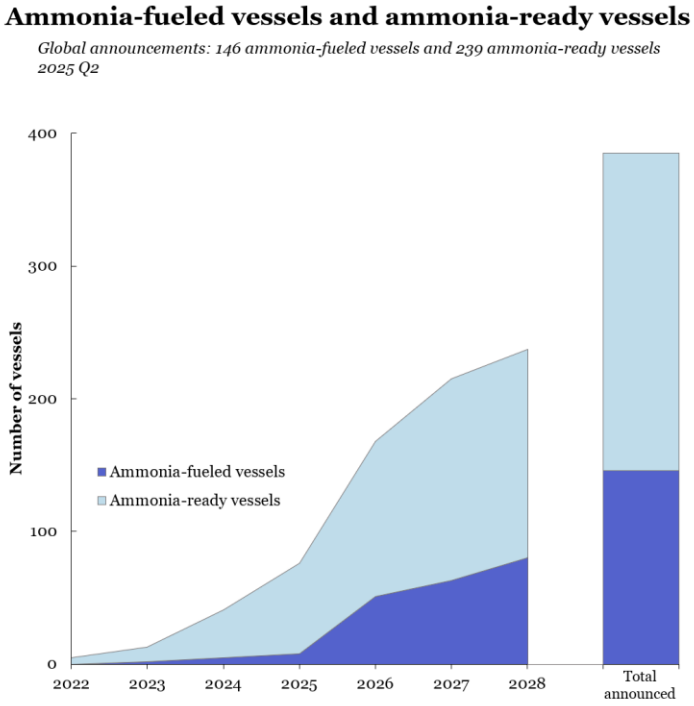
As of June 2025, the AEA tracks 385 Ammonia-fueled and Ammonia-ready Vessels.

- Out of these, 5 vessels currently operational using ammonia, which are Supply vessels & Tug boats, entering the water in 2023 and 2024.
- The first Ammonia-ready vessel entered the waters in early 2022. 30 Ammonia-ready Vessels are operational, including Ammonia carriers, Bulk carriers, Oil carriers, Container vessels, and Supply vessels.



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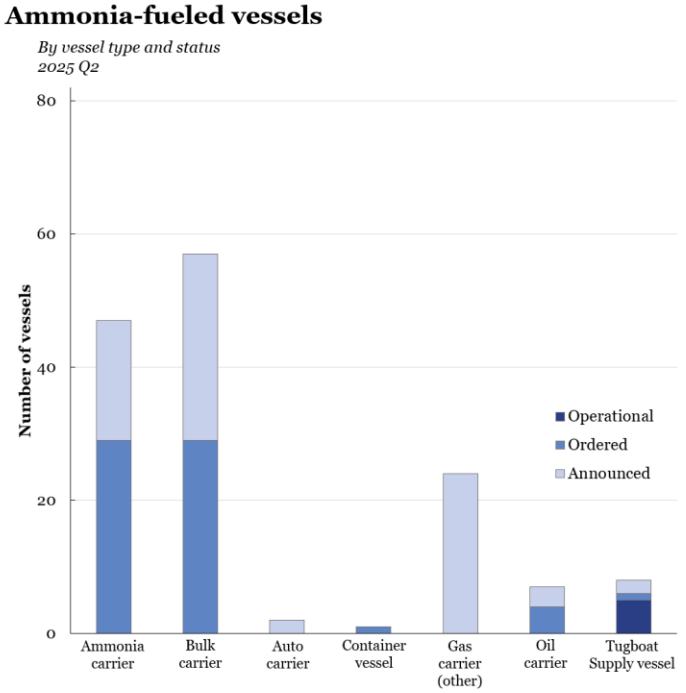
https://ammoniaenergy.org/lead/

Ammonia-fueled Vessels: Ammonia carriers & Bulk carriers

As of June 2025, the AEA tracks 146 Ammonia-fueled Vessels.

- Out of these, 5 vessels currently operational using ammonia, which are Supply vessels & Tug boats, entering the water in 2023 and 2024.
- Out of the 64 ordered Ammonia-fueled vessels, almost all vessels are Ammonia carriers (29) and Bulk carriers (29), with the first of these vessels expected to hit the waters in 2026 and 2027.
- Although Oil carriers, Auto carriers, and Container vessels represent a small portion of the Ammonia-fueled vessels to date, these Vessel classes are well represented in the Ammonia-ready vessels.



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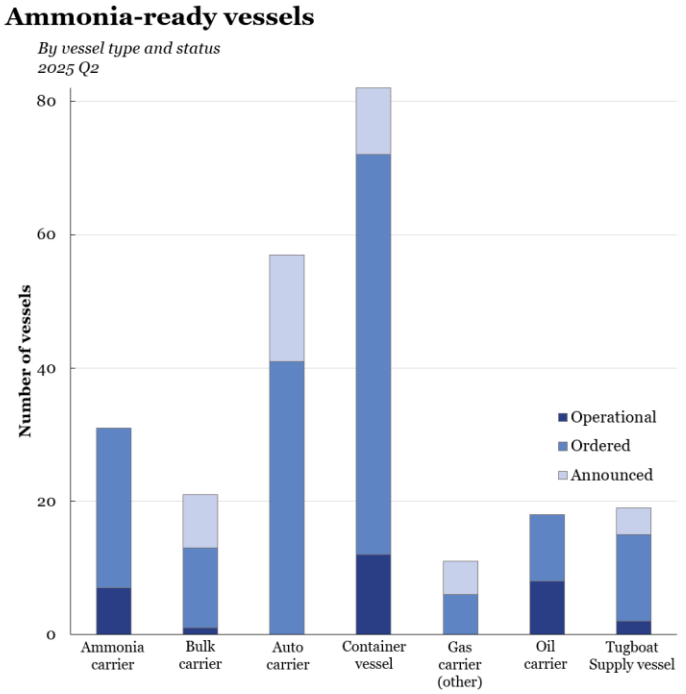
Ammonia-ready Vessels: Ammonia carriers, Auto Carriers & Containers

As of June 2025, the AEA tracks 239 Ammonia-ready Vessels.

- Ammonia-ready vessels typically have provisions for ammonia fuel supply systems, ammonia release mitigation systems, and Tank C tanks for ammonia fuel storage. Also, retrofit packages exist for Engines to use ammonia as fuel.

- The first Ammonia-ready vessel entered the waters in early 2022. As of June 2025, 30 Ammonia-ready vessels are operational, including Ammonia carriers (7), Bulk carriers (1), Oil carriers (8), Container vessels (12) & Supply vessels / Tug boats (2).

- Out of the 166 Ordered Ammonia-ready vessels, most are Ammonia carriers (24), Auto carriers (41), and Container vessels (60).



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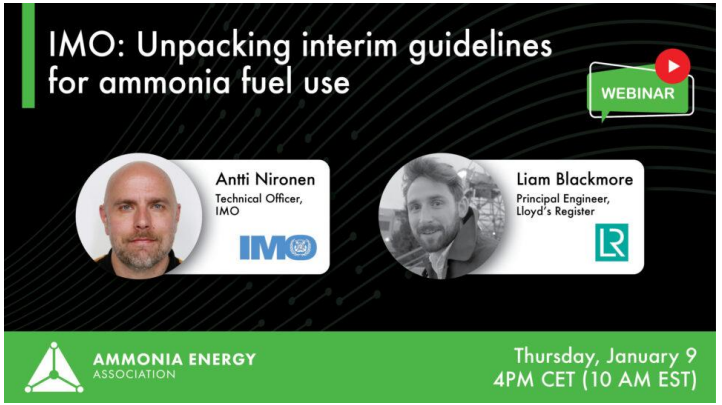
IMO Guidelines for Ammonia-fueled Vessels are Shaping up

In September 2024, the IMO (International Maritime Organization) Sub-Committee on Carriage of Cargoes and Containers (CCC) finalized interim guidelines for the use of ammonia as a fuel for vessels, ensuring safe handling of ammonia.

Following the 109th meeting of the IMO's Maritime Safety Committee (MSC) in early December, these interim guidelines for the use of ammonia fuel onboard vessels have been approved. Cargo ships weighing 500 gross tons or more and passenger ships using non-cargo ammonia as fuel can now use the guidelines as a basis for vessel design and systems layout, with work to continue on more detailed amendments to the IGF code.

In terms of the use of ammonia cargo as fuel (currently prohibited by IMO regulations), changes to the IGC code will enter into force on 1 July 2026 that allow for this fuel pathway. This aligns with the first large-scale ammonia-fueled vessels hitting the waters in 2026.

https://ammoniaenergy.org/articles/imo-approves-interim-fuel-guidelines/



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Ammonia-fueled Engines are ready for Deployment

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Engine manufacturers have performed extensive testing of ammonia-fueled two-stroke and four-stroke engines. In fact, first ammonia-fueled engine (a four-stroke engine) was delivered and deployed 2024. Engine manufacturers are ready for scale-up, with 60+ engines ordered. Also, retrofit packages exist for engines to use ammonia as fuel.

A two-stroke engine (the majority of ammonia-fueled engine orders) can operate with up to 95% ammonia as fuel, requiring around 5% pilot fuel such as fuel oil or diesel. In ammonia mode, NO_X emissions are up to 40-50% lower than in fuel oil mode. In ammonia mode, N_2O emissions are typically below 3-5 ppmv, and ammonia slip emissions are below 10 ppm. For context, this is well below the thresholds set for ammonia leakage in the IMO Interim Guidelines for ammonia-fueled vessels: 25 ppm in enclosed spaces, and 110 ppm in secondary enclosures.

Thus, ammonia-fueled engines are compliant with IMO Tier II NO_X emission limits without a DeNOx system, and are compliant with IMO Tier III NO_X emission limits with a DeNOx system.

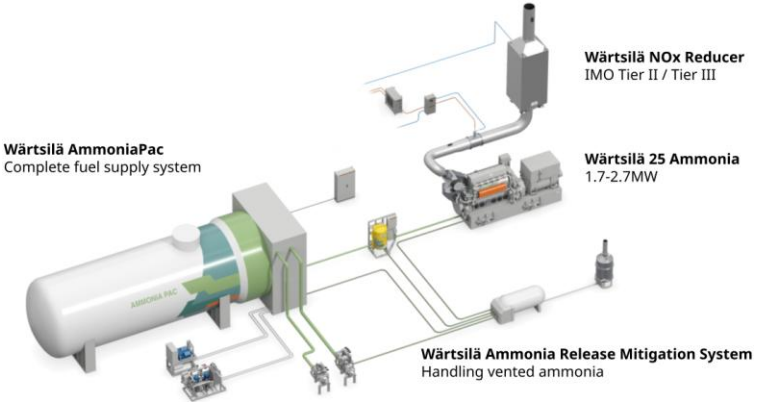
Top: WinGD. Middle: MAN ES. Bottom: NYK.

Technology toolkit ready for Deployment

In addition to engines being commercially available, the rest of the technology toolkit is ready for ammonia-fueled vessels, in line with the timeframe for the IMO guidelines:

- **Onboard ammonia fuel storage**: Ammonia fuel will be stored in Type C Tanks on the deck of a vessel. These tanks are also used for LNG, LPG, LEG, Hydrogen, etc.
- **Ammonia bunkering**: Various ship-to-ship bunkering operations have been safely demonstrated in 2024.
- **Ammonia Fuel Supply System (AFFS)**: Safe ammonia supply systems (liquid or gas) supply ammonia to the engine
- **Ammonia Release Mitigation System (ARMS)**: Safe handling and dilution of vented ammonia at acceptable concentrations.
- **Gas detection**: Potential leaks can be measured with gas detection, allowing for immediate action, and ammonia containment.
- **Emission mitigation**: DeNOx systems are commercially available, reducing NO_X emissions down to IMO Tier III levels.

https://ammoniaenergy.org/articles/ammonia-energy-conference-2024-ammonia-for-maritime-propulsion-is-full-speed-ahead/



Top: Fuel Supply System, Ammonia Release Mitigation System, DeNOx (Wärtsilä). Bottom Left: Ship-to-Ship bunkering (GCMD). Bottom Right: DeNOx system (BUTTING).

Evaluation of status

The AEA tracks criteria:

- Order date
- Engine manufacturer selected
- Shipyard selected

Every vessel order is assigned a status:

- **Operational**: the vessel is operational
- **Ordered**: The vessel is ordered
- **Announced / Optional**: The vessel is not yet ordered
- **Defunct**: The vessel project is on hold or not ongoing

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For more information or questions related to this material, please contact Kevin Rouwenhorst at krouwenhorst@ammoniaenergy.org, Technology Manager, Ammonia Energy Association.

The original data upon which this material is based is available to the members of the Ammonia Energy Association. If you are interested in joining the AEA, please visit ammoniaenergy.org/members for more information. The original data is based on publicly available materials.