



UNDER STRICT EMBARGO UNTIL 0900 hrs EST Wednesday 21 September 2022

Industry backs strategy for zero-emissions ammonia, up to six-fold growth possible by 2050

Mission Possible Partnership maps action in this decade to decarbonise key materials

Leading companies have endorsed a new strategy from the Mission Possible Partnership (MPP) to ramp up production of zero-emissions ammonia, potentially for use as a clean marine fuel. To date, 35 companies have endorsed the plan for action needed in this decade to achieve net-zero emissions by 2050, while contributing significantly to decarbonisation in other sectors of the economy.

Signatories to the report include CF Industries, Yara, BASF, and SABIC, and renewable energy providers ACWA Power, Iberdrola, and Ørsted. Support for MPP's strategy spans the ammonia value chain including both current and future buyers of ammonia as a zero-carbon energy carrier, a measure of growing momentum for action in the near-term. The sector generates about one percent of global CO₂ emissions, with demand for ammonia likely to increase by three- to six-fold by mid-century.

Matt Rogers, CEO of MPP said: "This Ammonia Transition Strategy is operationally relevant and industry-backed, not wishful thinking or pie in the sky. We know how to reduce emissions, initially deploying resources and technology available today. The imperative is to act now, in this decade: we're working with industry, supply chains and finance to deliver the clear thinking and asset-by-asset plans to make net zero viable".

Tony Will, CF Industries president and CEO, said: "Achieving net-zero ammonia will not only transform our industry but also help accelerate the world's transition to clean energy. This report is an important milestone, setting forth the opportunities and pathways for the entire industry to reach net zero and highlighting the many important ways that clean ammonia can help decarbonise other industries such as power generation and maritime shipping."

Shipping will make or break rapid scaling of zero-emissions ammonia capacity

MPP's report maps critical steps for - including emissions data and real-economy milestones - for the sector to achieve net zero emissions by 2050. The strategy forecasts strong demand for both green ammonia (where the hydrogen is produced via electrolysis from renewable electricity and water) and blue ammonia (from hydrogen produced from natural gas with carbon capture) with green ammonia emerging as the dominant material.

New applications for green ammonia as an energy carrier - in particular as a marine fuel – could increase demand, as ammonia assumes a larger role in the transition to a green economy. Rapid scaling of near-zero-emissions ammonia production depends on the shipping sector – which is likely to use it as an alternative fuel to heavy fuel oil, and on demand from the power sector – where green ammonia could replace coal in Japan and South Korea.

Today's ammonia production of 185 Mt annually is driven mostly by its use in fertilizer, a process which relies heavily on fossil fuels for both hydrogen feedstock and heat generation. To remain within a 1.5°C-aligned sectoral 'carbon budget', between 20% and 40% of total production should come from near-zero emissions production technologies by 2030. This requires scaling up the current project pipeline by 200-400%.

Key insights

- Ammonia production could increase three-to-six-fold in a decarbonized and resource-efficient economy, from 185 Mt in 2020 to 540-1,140 Mt by 2050. New applications as a carrier for hydrogen energy will drive demand for shipping and power generation.
- The shipping sector alone can make or break the scale up of near-zero-emissions ammonia production. Targeted demand-side policy support is critical to certify, adopt, and extend ammonia's new application as a marine fuel.
- Blue ammonia will assume a transitional role, particularly for existing fossil fuel-based assets. Costs for green ammonia are forecast to become competitive in some regions as early as 2030, helped by cheaper renewables and more investment in electrolyzers.
- Rapid deployment of both green and blue ammonia production from 2025 is required to scale near-zero emissions production capacity, from the current pipeline of around 27 Mt to between 50 Mt - 120 Mt of blue and green ammonia by 2030. This is equivalent to 60-160 ammonia plants with an average project development timeline of five years.
- Investment to commercialise and deploy technologies for near-zero emissions ammonia will cost between \$60 billion - \$105 billion each year to 2050, of which more than 80% is for green ammonia which includes the installation of electrolyser capacity of 780 GW - 1,500 GW by 2050 and 3,700-7,100 TWh in renewable electricity annually.

- Use of ammonia in fertilizer will increase up to 30%, although improving agricultural practices and reducing food waste could moderate growth.

Endorsing companies

Signatories to the report at September 20, 2022 include:

- ACME Group
- ACWA Power
- AFC Energy
- Air Liquide
- Ambient Fuels
- AmmPower
- BASF
- Casale
- CF Industries
- Clariant
- Covestro
- Ecolab
- Global Centre for Maritime Decarbonisation
- Horisont Energi
- HSBC
- Iberdrola
- IGNIS Energía
- IHI Corporation
- ITOCHU Corporation
- Mitsui O.S.K. Lines
- NYK Group
- Ocean Network Express Pte. Ltd.
- Ørsted
- PETRONAS
- Repsol
- Vopak
- SABIC Agri-Nutrients Company
- Saga Pure ASA
- Smart Freight Centre
- Starfire Energy
- Sumitomo Corporation
- Trafigura
- Vattenfall
- Wan Hai Lines LTD

- Yara

To download the report

Please go to the MPP website:

Making Net-Zero 1.5°C-Aligned Ammonia Possible

<https://missionpossiblepartnership.org/wp-content/uploads/2022/09/Making-1.5-Aligned-Ammonia-possible.pdf>

Interactive tool

MPP has released an interactive ‘Explorer’ tool to compare decarbonisation options in different regions, with the functionality to generate custom user scenarios. The Python model for STS analytics is also available, with full coding and open-source input data.

Ammonia: Explore the Net-Zero Transition

<https://dash-mpp.plotly.host/mpp-ammonia-net-zero-explorer/>

<https://github.com/missionpossiblepartnership/mpp-shared-code>

Making net zero industry possible

MPP seeks to inspire cross-sector learning and real-world projects that will translate global strategic thinking into local action.

This Steel Transition Strategy joins a series of industry transition strategies developed by MPP to guide decarbonisation of seven hardest-to-abate sectors. Of these, four are from the materials industries: aluminium, chemicals, concrete, and steel. Transition strategies for the mobility and transport sectors - [aviation](#), [shipping](#), and [trucking](#) – were released earlier this year and are available online.

Each sector transition strategy is premised on the same modelling assumptions, to enable policymakers and financial institutions usefully to compare the findings of all MPP sector transition strategies.

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The Mission Possible Partnership is an alliance of climate leaders focused on supercharging efforts to decarbonize some of the world's highest-emitting industries. By leveraging the convening power, talent and expertise of world-leading organizations on climate action, the MPP aims to trigger a net-zero transformation of seven industrial sectors; Aviation, Shipping, Trucking, Steel, Aluminium, Chemicals and Concrete. MPP is led by four core partners: the Energy Transitions Commission, RMI, We Mean Business Coalition and the World Economic Forum. Our goal is to propel a committed community of CEOs from carbon-intensive industries—together with their financiers, customers, and suppliers—to agree and act on decarbonizing industry and transport in this decade.