Making an impact on the clean energy transition

TRANSPORT

MARITIME HYDROGEN: THE NEXT BIG WAVE

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New fuel for an expanding market

Cargo vessels, cruise ships and ferries are all important parts of the global economy. For example, about 90 % of all freight goods are transported at sea. But most ships burn fossil fuels for power, emitting CO_2 and other pollutants. Ocean freight shipping alone releases about 3 % of global greenhouse gases, a figure which is predicted to grow as the maritime sector continues to expand. In April 2018, the shipping industry committed to a GHG target of reducing emissions by 'at least' 50 % by 2050. Achieving this target will require new ships, new engines and – above all – a new fuel.

Clean fuel in cool conditions

Two FCH JU-funded projects are researching the use of hydrogen fuel cells to replace fossil fuels to power ships. The MARANDA project, which started in 2017, aims to develop a 165-kW fuel-cell powertrain able to provide power to a research vessel's electrical equipment and its dynamic positioning while in research mode, in the extreme cold of the Arctic. The FLAGSHIPS project is demonstrating that two commercial vessels, a push boat for river navigation and a passenger and car ferry, could operate on hydrogen fuel cells.

The maritime sector includes activities as varied as cruise-boat tourism, freight shipping, and ferry transport. It is also a big contributor to CO_2 emissions. The FCH JU is promoting research to develop and integrate efficient, hydrogen-powered fuel cells on ships and boats. The results could help to slash CO_2 emissions by a minimum of 50 % by 2050 (which is the target defined by the International Maritime Organization).

Charting a new industry course

MARANDA's researchers have designed hydrogen-storage containers and a fuel-cell system that are currently being tested and improved before their integration on-board the ship. Meanwhile, representatives of the recently launched FLAGSHIPS project have met with vessel operators to discuss safety aspects of hydrogen applications on push boats for inland waterways. Once completed, both projects will disseminate their results widely to boost the market potential of fuel cells in the maritime sector. Hydrogen and hydrogen-based fuels have great potential to meet the same operational requirements (range, refuelling time) as conventional fuels for ships. This is the task for the FCH2 JU in the future.

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THE UPSHOT

Hydrogen fuel cells can provide power for ferries, cruise ships and boats, lowering CO_2 emissions in the rapidly expanding maritime sector.

WIDENING THE HORIZONS FOR HYDROGEN FUEL CELLS

To increase the market potential of hydrogen fuel cells in the maritime sector, JCH JU brought together vessel manufacturers and operators. **The goal?** To demonstrate that hydrogen-fuel-cell technology can power ships and boats whilst also withstanding the shocks, vibrations and saline environments of maritime use. Two FCH JU-funded projects will demonstrate hydrogen-fuel-cell power. **Key results?** Outcomes will show that hydrogen fuel cells can compete with their fossil-fuel equivalents, enabling the broader market adoption of this technology and cutting greenhouse gas emissions.

KEY ACHIEVEMENTS

1
megawatt of PEM fuel-cell power to be installed in both vessels in the FLAGSHIPS project

3
FC types suitable for maritime transport (low- and high-temperature PEM and SOFC)
(Study on the use of fuel cells in shipping, EMSA, 2017)

21
hydrogen boats/ferries put into operation or under construction worldwide

70 %
proportion of H_2 needed in the maritime fuel mix to reach an ambitious 80 % carbon reduction in 2035 (beyond 50% by 2050)
(Decarbonising Maritime Transport, OECD, 2018)

2026
creation of the world's first zero-emission zone at sea in the UNESCO heritage Norwegian fjords

1.7 MtH2
annual volume of H_2 consumed in nine industrial hubs around the North Sea

250 MW
announced size of the electrolyser in Rotterdam's harbour (https://safety4sea.com/eus-biggest-hydrogen-plant-to-be-constructed-in-rotterdam/)

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www.fch.europa.eu/page/fch-ju-projects
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FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

A partnership dedicated to clean energy and transport in Europe