ZeroAvia says it could achieve commercialisation of hydrogen-fuelled flight as early as 2024. Picture credit: British Airways

DECARBONISING AVIATION

Platinum-based proton exchange membrane technology will help airports and airlines transition to net zero from the ground to the sky

Air Liquide, the world-leading gas solutions and technologies business, believes that hydrogen could help decarbonise aviation from the ground to the sky, helping to halve CO2 emissions from both airports and aircraft by 2050. It believes that hydrogen fuelled aircraft will be in commercial operation by 2035.

In particular, it is using its expertise in the production and delivery of green hydrogen, as demonstrated at the Air Liquide Bécancour site in Quebec, Canada, to participate in a project to prepare for the arrival of hydrogen in airports as part of the development of hydrogen aircraft.

At Bécancour, Air Liquide has constructed the largest proton exchange membrane (PEM) electrolyser in the world. Powered by renewable energy, this 20 MW unit now produces up to 8.2 tonnes per day of green hydrogen for industrial and mobility uses, preventing the emission of nearly 27,000 tonnes of CO2 per year, or the combined annual emissions of around 10,000 cars.

PEM electrolyser technology, which uses a platinum-based catalyst as a component, is able to adapt better than other technologies to the intermittent nature of renewable energy. Platinum is especially suited for use in a PEM electrolyser due to its high resistance to oxidation, even at high temperatures.

As part of its aviation project, Air Liquide, together with its partners Airbus and Groupe ADP, is looking at how airports will need to adapt to support and integrate green hydrogen as an aviation fuel.

Similarly, in the UK, the Aerospace Technology Institute's (ATI) FlyZero project is exploring the feasibility of bringing hydrogen-powered planes into operation by the end of the decade. This includes assessing the practical and regulatory requirements for the safe and efficient ground operations needed to support hydrogen-powered aircraft, as well as the commercial implications of these requirements and future operations.

At Bécancour, Canada, Air Liquide has constructed the largest proton exchange membrane (PEM) electrolyser in the world. Picture credit: Air Liquide

FlyZero involves an assessment of the conditions required for storing hydrogen and the impact of its use on turnaround times of planes at airports. It will explore the role of technology in facilitating the safe and efficient use of hydrogen, including by identifying opportunities to automate aspects of the turnaround process. These findings will also provide a better understanding of the commercial drivers which would influence the uptake of hydrogen by airports and airlines.

Ground to sky

The use of hydrogen at airports is not limited to fuelling aircraft, either. Teesside Airport has recently been announced as one the UK's first pilot areas to test hydrogen ground service vehicles. The airport is situated in the Tees Valley, which has been designated the country's first-ever Hydrogen Transport Hub.

The £2.5m project will see the airport trial zero-emissions vehicles, including two Mirai hydrogen PEM fuel cell electric vehicles and a fuel cell forklift truck supplied by car manufacturer Toyota.

Meanwhile ZeroAvia – a leading innovator in decarbonising commercial aviation through the use of PEM fuel cells and hydrogen – has secured additional funding to accelerate the development of its 50-plus-seater zero-emission aircraft.

With investment from British Airways, amongst others, ZeroAvia says it could achieve commercialisation as early as 2024, with flights of up to 500-miles in a 20-seater aircraft. ZeroAvia expects to have its 50-plus-seat commercial aircraft in operation in five years' time, while its vision of powering a 100-seat single-aisle aircraft by 2030 remains a longer-term goal.

Earlier this month, Hyzon, a leading global supplier of zero-emission hydrogen fuel cell-powered heavy vehicles, announced that ZeroAvia has placed an order for its next generation, high-performance lightweight fuel cell to evaluate it for use in its zero-emission aircraft development programme.

Hyzon's fuel cell stack, which also relies on platinum-based PEM technology, is of especial interest to ZeroAvia due to its power density, achieving a volumetric power density above 6.0 kW/litre and a gravimetric power density of more than 5.5 kW/kg. These factors are critical in aviation to minimize weight while providing sufficient power for the desired performance.

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