How the UK can be a world leader in decarbonising aviation

The aviation industry needs government action and policy support to realise the potential of hydrogen as part of SAF, and the UK has the potential to lead the way

Aviation is a highly energy-intensive sector, accounting for around 2% of the world's CO_2 emissions and up to 4% of the EU's. It is also the second-biggest source of emissions in the transport sector, after road transport, generating 13.9% of emissions, according to the European Commission. To give context to the intensive nature of its energy use, a person flying from Lisbon to New York and back generates roughly the same level of emissions as an average person in Europe does heating their home for a year.

This is a stark reminder to all of us on a personal level of the responsibility we have as consumers. Government, industry and financiers are working hard to make adoption easier and cheaper for consumers, but if we are to accelerate towards a net-zero future, it is imperative we do all we can to reduce our own individual carbon footprints. Fighting climate change needs a change of behaviour, and we are clearly not doing enough, as highlighted by the International Civil Aviation Organisation's forecast that, by 2050, global aviation emissions could triple compared with 2015. And while new generations of aircraft will improve efficiency and smaller aircrafts will be electrified or use hydrogen with jet turbines or fuel cells, new fuels including sustainable aviation fuel (SAF) are required to substantially reduce carbon emissions in aviation.

How SAF works

SAF is chemically similar to conventional jet fuel, which means it can work with existing plane and engine design and refuelling structures. SAF is, unfortunately, not a decarbonising magic wand since greenhouse gases are emitted in its refining processes and when it is used to power the planes, but it can significantly reduce greenhouse emissions over its lifecycle through reusing harvested CO_2 in its production. Therefore, SAF is part of the solution between short-term, low-impact efficiency improvements and longer-term complete redesign of the aviation system.

There are several synthesis routes to produce SAF, broadly based on biomass or electrical energy 'e-fuels'. While SAF produced by biomass such as vegetable oils, animal fats and greases is the most established method and will play a key role, its use is ultimately restricted by the limited supply of feedstocks available, and so alternative methods for SAF such as power-to-liquid (eSAF), which combines green hydrogen and harvested CO_2 as feedstocks, need to be used to meet demand for aviation fuel, which is currently in the billions of tonnes per year.

This is highlighted in the IEA's Net Zero roadmap, where it is projected that hydrogen-based fuels and biomass will increase to 37% and 33% respectively of final energy consumption by 2050. The number for both currently stands at below 1%, according to the IEA.

There are certainly supportive signs coming from the industry. For example, One World Group—a body that includes airlines such as American, Qantas and Cathay Pacific—has targeted using SAF for 10% of combined fuel volumes by 2030. Yet there remains a long way to go in supplying the required amount of SAF to achieve these targets, and it will take a holistic approach to achieve it.

UK government leads the way

If we are to realise the potential of hydrogen as part of SAF, the industry cannot do it alone. Government action and policy support will go a long way to facilitating the momentum across the market that the industry can subsequently capitalise on.

To that end, it is encouraging to see the UK government mandate for change. Its target of SAF making up 10% of total UK jet fuel demand by 2030, and then up

By Caroline Hargrove, CTO, Ceres

to 22% in 2040, positions it as one of the more ambitious globally.

Policies and mandates such as these are a clear signal to the market and are crucial in stimulating the industry to decarbonise. They provide the market with much-needed confidence to make the change at a time when the industry needs support to contribute to the capex investments that are often seen as a barrier. This is the case in aviation, where an obstacle to demand growth for SAF produced via green hydrogen remains the cost. However, the appropriate incentives will act as a catalyst for investment, which will accelerate the development, maturation and related cost-down of the technologies we need to drive industrial decarbonisation more generally.

22%

UK mandate for proportion of SAF in jet fuel demand by 2040

Time for industry to deliver on the mandate

The UK is widely considered Europe's leading tech hub, with world-leading R&D infrastructure positioning it strongly on a global scale too.

Specific to the energy transition, the UK is a leader in innovative and proven technologies across the entire value chain. Moreover, any innovation technologies that are being developed today will inherently identify new applications and innovations that will further contribute to net-zero targets. For SAF, this technology leadership is complemented by the level of existing chemical engineering expertise and existing infrastructure in place in key locations in the UK, including increasingly good access to renewable energy as well as existing gas storage and refining.

The potential for the UK to be a global trailblazer in aviation has already been demonstrated, achieving a number of world-first advances in hydrogen-powered aircraft technology from hydrogen engine testing to the first flights of hydrogen-fuelled planes. However, to capitalise on this opportunity we need to act now. Industry, government and academia all need to come together to realise this opportunity for the UK, pull through and further mature some of these technologies, which will also accelerate the wider industrial decarbonisation. ■