

The Ten Point Plan – An Opportunity for the Bioeconomy

In 2019, the UK made a legally binding pledge to reach net-zero greenhouse gas emissions by 2050.

The Ten Point Plan is the UK government's latest strategy for stimulating a green industrial revolution and working towards the goal of net-zero. It plans to bring together policy and investment, both public and private, to take advantage of a variety of low carbon technologies, while providing green jobs and securing economic growth.

As the name suggests, there are ten aspects to this plan.

1. Advancing Offshore Wind
2. Driving the Growth of Low Carbon Hydrogen
3. Delivering New and Advanced Nuclear Power
4. Accelerating the Shift to Zero-Emission Vehicles
5. Green Public Transport, Cycling and Walking
6. Jet Zero and Green Ships
7. Greener Buildings
8. Investing in Carbon Capture, Usage and Storage
9. Protecting Our Natural Environment
10. Green Finance and Innovation

In some way, the bioeconomy and the use of biobased techniques and processes can be incorporated across the whole plan but point 6 (Jet Zero and Green Ships) in particular offers increased opportunity for the bioeconomy to flourish.

Aviation – A Challenge

Aviation contributes to economic growth and wellbeing – it allows for the ease of trade, the movement of workers – linking businesses and people. However, the aviation sector is responsible for over 2% of global emissions. Although seemingly a small fraction of global emissions, this output is higher than many countries' entire carbon emissions. To reach net-zero, both in the UK and globally, the whole of the transport sector must be decarbonized.

Compared to the advances in greening automotive fuels, making switches for aviation fuel is somewhat harder. Aviation fuel has a more rigorous technical specification than fuel for cars, as well as being subject to more rigorous standards. Some progress in recent years reducing the carbon emissions of the aviation sector has come from the improvement of engine efficiencies, however, these improvements for emission reduction are tailing off.

Poor market conditions and the scale of alternative technologies mean competing with fossil-based fuels is a challenge. Airlines are hesitant to increase their uptake of biofuel due to costs, fuel accounts for about 30% of their running costs. Therefore policy support is needed to sustain the developing sector.

Promised support

The Jet Zero Council has been established, a partnership which will help to accelerate the uptake of low carbon technologies which will help to achieve net zero in the aviation industry.

Alternative aviation fuel is a crucial step towards this goal. Some of the main points from the plan include:

- A £15 million competition will be run to support the production of sustainable aviation fuels.
- An SAF clearing house will be established, which will have the ability to certify new fuels.
- The intention to consult on a Sustainable Aviation Fuel mandate.
- Investment into the R&D requirements of UK airports requiring infrastructure upgrades.

Aviation and the Bioeconomy

Biofuels provide a drop-in solution to mitigate aviation emissions. Zero-emission technology like electrification won't happen overnight, so in the meantime, biofuels provide a solution. They can be used without having to modify current infrastructure or aircraft engine systems.

The following different kinds of biofuel are currently legal for use in jet fuel according to ASTM standards.

- **Hydro-processed esters and fatty acids (HEFA).** These are pressed from biomass feedstock like oilseeds, or come from waste products as a result of food manufacture.
- **Fischer-Tropsch fuels.** Biomass is thermochemically gasified – converted to syngas and then converted into hydrocarbons.
- **Biogas.** Biomethane from anaerobic digestion (AD) is converted to a gas similar to syngas, which is then treated as a Fischer-Tropsch fuel.
- **Synthesised iso-paraffinic fuels.** Sugars are fermented into farnesene which is hydrogenated into farnasane and blended with conventional jet fuels.
- **Alcohol to jet.** This incorporates the use of mostly butanol/isobutanol, but can also include ethanol.

These technologies are at varying stages of developments, and each has their challenges.

Currently, there is a blend limit with the highest being 50% for HEFA and Fischer-Tropsch fuels. Alternative, more economically viable uses for the products is also a barrier. HEFA biofuels can be used as a biofuel for cars and tailoring production for the automotive sector works out cheaper. Farnesene, butanol and ethanol have established markets as chemicals in their own right. Biogas from AD is a widely deployed technology, however, the disparity in scale between farm AD and Fischer-Tropsch production presents a logistical challenge.

However, despite the difficulties the market faces, a handful of manufacturers are already producing sustainable aviation fuels or are making significant progress towards getting their technology to a commercial level.

Neste produces 'MY Sustainable Aviation Fuel' from waste fats and vegetable oils, which reduces greenhouse gas emissions by up to 80% over its lifetime. They currently have a capacity of 100,000 tonnes in the US and Europe but with an expansion in Singapore on the way, by 2022 they expect a capacity of 1 million tonnes. It is already used as a blend with fossil fuels by airlines Lufthansa and KLM used continuously for flights from Frankfurt and Schiphol.

Gevo produces alcohol-to-jet synthetic paraffinic kerosene. As another step in the development, Gevo has recently partnered with Praj to produce renewable isobutanol from the fermentation of feedstocks like cane molasses and straw, which will be refined and converted to SAF.

Velocys, with British Airways and Shell, are currently developing a plant in Immingham, UK, to make commercial sustainable jet fuel. It will process household and commercial waste that would otherwise go to landfill. It is expected that the project will be completed in 2022, with a capacity of 20 million gallons a year of jet fuel and naphtha, and a 70% reduction in greenhouse gas emissions compared to conventional jet fuels.

The aviation sector is slowly making progress towards decarbonisation, and this can't be done at present without the use of the bioeconomy. Sustainable aviation fuels are part of the mechanism to achieve net-zero and rely on the use of biomass and biobased technologies. The market for sustainable aviation fuels is young but will hopefully see more developments across the sector with increased support.

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