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Powerfuels

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Powerfuels in Aviation

The use of sustainable aviation fuels, notably powerfuels, is considered the only viable option for the aviation industry to meet its ambitious greenhouse gas reduction targets.

In 2017 the aviation sector worldwide accounted for 3 per cent of the global greenhouse gas (GHG) emissions[1]. If aviation were to be considered a country, its total amount of GHG emissions would make it into the world's top 10[2]. Thanks to increases in efficiency, it has been possible to decouple the increase in CO_2 emissions from traffic growth. However, following the current demand for air transport services, emissions will rise in the long term. Air transport in Europe has already been integrated into the Emission Trading System and from 2020 CORSIA (Carbon Offsetting a Reduction Scheme for International Aviation) will enter into force worldwide. As a consequence, air traffic is growing shall further grow CO_2-neutrally[3]. Due to high investment costs and long lifespans of airplanes, aviation requires a solution that also addresses carbon reduction for the current generation of fleets. High demand of energy combined with safety parameters, result in rigorous requirements for aviation fuels like high volumetric and gravimetric energy density and specific handling characteristics. Synthetic kerosene from electricity can be chemically identical to their respective fossil counterpart and meets all performance and safety specifications. Powerfuels kerosene can thus be both blended with conventional kerosene as drop-in fuel or replace it altogether.

3 % of global CO_2 emissions stem from Aviation, in 2017 a total of 859 Million tons[1]

50 % of the CO_2 emissions are to be reduced by 2050 compared to the 2005 level (IATA goals)[3]

Synthetic Kerosene

- Reduces greenhouse gases and pollutant emissions
- Allows sustainable, resource-friendly production in many regions globally
- Meets rigorous performance and safety fuel specifications (ASTM)
- Is usable as drop-in fuel for existing jet engines, refinery processes and distribution infrastructures

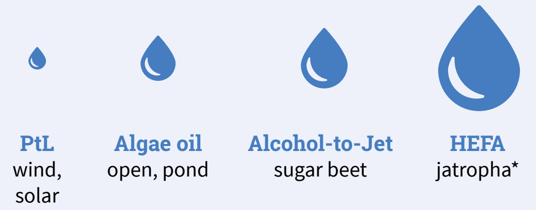
- Has still high overall costs: cost drivers are investment costs and cost of (renewable) electricity
- CO_2-neutrality depends on use of renewable electricity and renewable carbon sources

Comparison of sustainable aviation fuels

When comparing different options for production of sustainable aviation fuels (SAF), power-based kerosene (Power to Liquid, PtL) show significantly higher yields per hectare than biogenic SAF, whilst having a negligible specific water consumption. The International Council on Clean Transportation (ICCT) states that waste fats and oils are the most cost-effective SAF today. However, these sources for SAF are already widely used by the road sector and therefore their supply is limited. With about 800 to 900 Euro per ton of avoided CO_2, current carbon abatement costs of synthetic kerosene are about two times higher than that of second generation biofuels, but will strongly decrease with further market ramp-up of power-to-X production capacities.

Water demand per liter of jet fuel

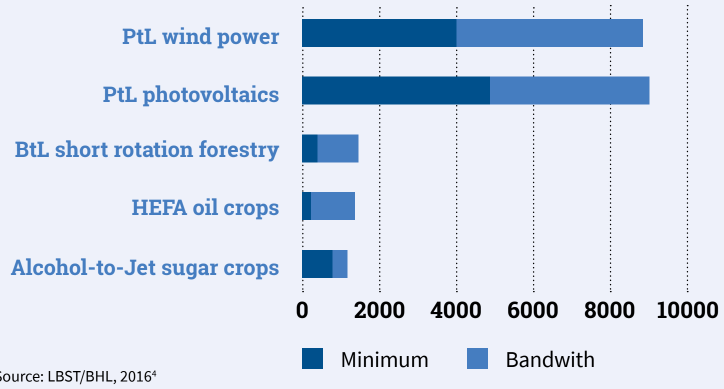
Powerfuels (PtL) water demand compared to selected biofuels
(volumes represetation, PtL water demand ~ 1.4 LH₂0/Ljetfuel)



Source: LBST/BHL, 2016[4]

*Hydro-processed Esters and Fatty Acid

Achievable air milage for an A320neo per ha of land (km/(ha-yr))

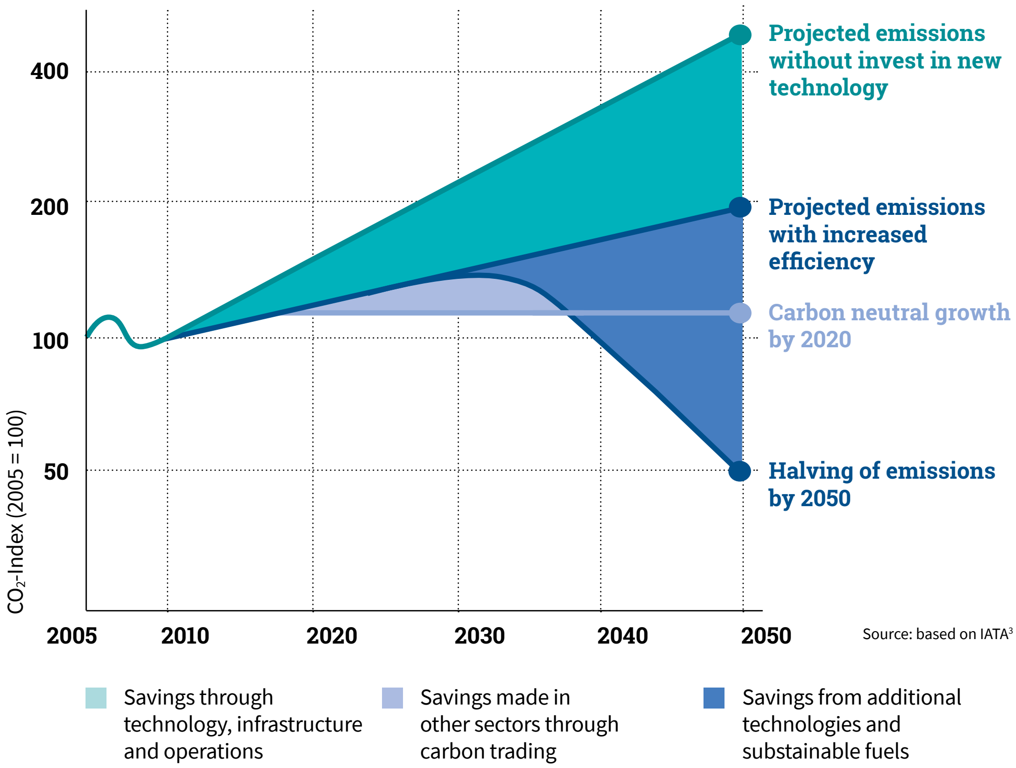


Source: LBST/BHL, 2016[4]

Self-commitment of the international aviation sector for CO_2 reduction

In 2009 various actors of the aviation sector agreed on a climate protection plan with the goal to halve the net CO_2 emissions by 2050 compared to 2005 levels. This will be achieved by incremental improvements by increasing engine efficiency, process and routes optimization, as well as the implementation of radical new technologies like new airplanes and alternative fuels[3].

In order to reach the goal of carbon-neutral growth from 2020, the aviation industry is expecting to use compensation as method of choice for the first years until new technologies show their carbon-reducing effect[3].



Source: based on IATA[3]

Legal Framework

Since the aviation sector is a highly competitive global market, the introduction of synthetic kerosene can only be achieved through international negotiations and agreements with binding GHG reduction targets. Currently there are no obligatory quotas for SAF usage or the abatement of emissions. Although the European air traffic is regulated in the European Trading System (ETS) since 2012, growing traffic demand avoided carbon reduction in the aviation sector[5]. In 2016 the ICAO implemented the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), aiming to stabilize net CO_2 emissions from international aviation at 2020 levels. From 2021 until 2026, flights between volunteering countries will participate in CORSIA – 80 States, representing nearly 80 per cent of international aviation activity – while from 2027 all international flights will be subject to offsetting requirements with 90 per cent[6].

1 International Energy Agency **2** Reducing emissions from aviation, European Commission (https://ec.europa.eu/clima/policies/transport/aviation_en) **3** IATA Technology Roadmap, International Air Transport Association (IATA) **4** Power-to-Liquids Potentials and Perspectives for the Future Supply of Renewable Aviation Fuel, Umweltbundesamt **5** DIRECTIVE 2003/87/EC, 2003; European Parliament and Council **6** Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)-Frequently Asked Questions (FAQs), International Civil Aviation Organization (ICAO)

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