Bio-based Sustainable Aviation Fuels as a decarbonization pathway

BLOG

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The global aviation industry has set a goal of carbon-neutral growth and aims to reduce net aviation carbon emissions by 50% by 2050. 2021

marks the first year of the pilot phase. While it remains uncertain what impact COVID-19 will have on future commercial aviation, and subsequent CO2 emissions, some important lessons can already be learned.

Many solutions are being explored yet it is increasingly evident that bio-based Sustainable Aviation Fuels (SAFs) will remain the key pathway allowing a decarbonization of the sector. Batteries for aviation are still out of reach, electro-fuels for heavy-duty and long distances in transport are also a far reality. Low Carbon Aviation Fuels (LCAF) are the only alternative being actively discussed even though there are important limitations in providing real emissions reductions.

Important advances in SAF are happening. The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), has mapped at least 26 bio-based SAF technological pathways that reach the minimum threshold of 10% GHG reductions compared to fossil counterparts (even when controversial iLUC emissions are considered). Besides the use of residues, that are considered a global solution, most of the successful analyzed pathways comes from the European Union, United States and Brazil.

The CORSIA analysis has also presented another important lesson with regards to iLUC emissions. These emissions were assessed by land use models develop by Purdue University (United States) in collaboration with the International Institute for Applied Systems Analysis IIASA (Austria) with a reconciliation process being established. The result is that, although some crops like palm in Indonesia and Malaysia have somewhat significant iLUC emissions, other pathways registered very small, or even negative iLUC emissions.

Sugarcane-based pathways distinguishes itself as a real word, ready-to-use pathway to be implemented for significant GHG emission reductions. Existing sugarcane pathways reduce GHG emissions by 65% when compared to fossil kerosene, with the bulk of emissions emanating from the upgrading process that requires additional hydrogen as an input. While additional GHG reductions can be achieved by technological improvements (for instance the development of green and/or blue hydrogen), recent research expands the benefits of pursuing such pathways. Sugarcane-based SAF is already competitive in comparison to fossil kerosene when carbon is priced at 100 USD/t, or even lower carbon prices depending on market conditions (oil prices, ethanol prices, taxes and exchange rate). According to the specific yields reported for the pathway based on

sugarcane ethanol, the total demand for fossil kerosene in Brazil could be supplied by around 1.0 Mha, considering the maximum blend "SAF:kerosene" of 50:50, already allowed for this pathway. The fuel demand related to international flights from Brazil, could be supplied by 0.4 Mha. In both cases, the area is significantly lower than what is currently used for sugarcane. It is worth mentioning that other fuels (such as diesel and naphtha) are typically co-produced with SAF, which can be potentially used as biofuels after specific regulation. Furthermore, existing sugarcane production in Brazil is optimal for the development of residue-based pathways considering the significant amount of bagasse tops and leaves that are available very close to processing units. A recent study from Roundtable on Sustainable Biomaterials (RSB), Agroicone, UNICAMP and UNIFEI revealed the technical potential to provide over 100% of SAF demand based uniquely on sugarcane residues.

As a summary, the technical potential of bio-based SAF is clear, global and safe if proper policies – based on life cycle analysis and multilateral participation – are in place. There is little or no scientific disagreement at all on the need of such solution. Time is running and, whereas the international aviation sector is actively defining its path to decarbonization, countries are lagging on the fight against climate change. We truly expect to see in additional effort in the EU, USA, Brazil, and other parts of the world to converge on policies to support faster development of this sector.

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