New Polices for Sustainable Aviation Fuel (SAF) Development

By Andrei Mungiu (European Commission), Nate Brown (USA Federal Aviation Administration)

SAF and the need for policy

The availability and use of substantial quantities of sustainable aviation fuels (SAF) is of critical importance for global aviation to meet the sustainability goals being put forward by both governments and industry. However, the necessary expansion of commercial production of SAF to meet these goals, remains a significant challenge due to a number of factors. The greatest challenge at present is the significantly higher costs of production for SAF in comparison to conventional kerosene. This renders the final selling price of SAF uncompetitive with the more widespread and cheaper kerosene. Although the recent spike in oil prices increased markedly the price of kerosene, this may not be a long-lived phenomenon, and regulators cannot rely on an organic bridging of the price gap between kerosene and SAF.

There are also challenges associated with the development of SAF supply chains, reaching economies of scale, accelerating technology development to reduce costs and enhance environmental benefits, and overcoming investment risk. SAF production has only been initiated in limited locations where supporting policy frameworks are in place. Global market penetration is necessary in order to achieve solid emissions reductions through SAF. There are many States and regions with high production potential, and this potential needs to be tapped into. To achieve an expanded and sustained global SAF production industry, additional policies and supporting actions will be necessary.

There is no single path to successful SAF policy implementation. Due to different climates, feedstock supply systems, resources, economic factors, political dynamics, and regulatory structures, policy approaches may differ in each State and region. Rather, a considered and customised strategy is needed. Recently there has been a dramatic acceleration in SAF policy activity and thought put forward by both States and public/private coalitions. This article details two examples of SAF policy approaches. Considerable additional information on potential policies to support SAF are available in the "Guidance on potential policies and coordinated approaches for the deployment of SAF document", available on the ICAO website[1].

RefuelEU Aviation

Part of the EU Green Deal package, which aims to make Europe a carbon-neutral continent by 2050, the European Commission brought forward the RefuelEU Aviation proposal, which transforms aviation, long seen as part of the problem into part of the solution to reach economy-wide decarbonisation.

Until the emergence of this proposal, the EU ETS was the only European policy tool addressing emissions from aviation, but that is a carbon-pricing policy, with potential side effects on connectivity.

Now, the EU proposes a mandate for suppliers to provide to all airports, bar the smallest or most remote ones, certain

1 https://www.icao.int/environmental-protection/pages/SAF.aspx

quantities of SAF (Table 1). The EU's vision is that SAF should be available at all EU airports, and that blended fuels would become naturally the only products available at EU airports.

The definition of SAF in the EU relies on sustainability criteria, very similar to those recently adopted by ICAO in the CORSIA framework, but slightly more restrictive from the point of view of emissions reductions, where the EU requires a higher threshold of decrease on a life-cycle basis, which limits the eligibility of some types of fuel.

The gradual increase in the minimum share of SAF blended in kerosene ensures that the industry will be given sufficient time to set up. The long-term horizon, up to 2050, aims to provide regulatory certainty, de-risk investment, and allow producer, suppliers and member states to plan their strategies accordingly.

TABLE 1: Proposed EU ramp up of SAF production

Total shares in the fuel mix (in %)	2025	2030	2035	2040	2045	2050
SAF ramp up out of which:	2	5	20	32	38	63
Specific sub-mandate on e-fuels	—	0.7	5	8	11	28

The EU proposal promotes the use of fuels with the greatest potential of decarbonisation, and this is why the ramp-up includes a sub-mandate for electro fuels (e-fuels) also known as power to liquid (PTL) fuels, which may be scaled up and from which massive economies of scale can be reaped. PTL fuels are a group of SAF-producing technologies where electricity is a main input to generate, extract, or purify (1) hydrogen; and/or (2) carbon-containing feedstocks from waste gases or the atmosphere, and therefore have the advantage of not competing with food sources, not relying on feedstocks which could be unreliable, and reaching very high life-cycle emissions reductions. Their prices, very high currently, may be decreased significantly through economies of scale.

Even if price predictions need to be revised in the light of the recent increases caused by a shifting geo-political situation, and the gaps might be smaller for a number of years, forecasts show that a price difference will remain between kerosene and SAF for the foreseeable future (Figure 1). Therefore, in the absence of binding policy tools, combined with generous incentives, the economic case for SAF will continue to remain illusory.

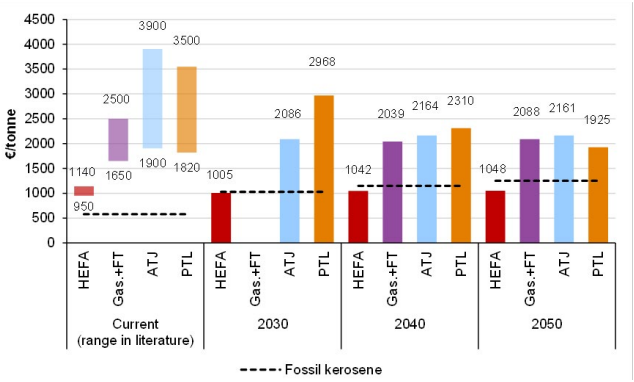

FIGURE 1: Forecast of prices of different fuel types in Europe[2]

The EU is bridging the gap through a number of pillars: firstly, the use of SAF on intra-European flights would exempt the emissions generated through combustion of SAF from the EU ETS. At current prices, the use of a tonne of SAF would reduce the ETS obligation by over 300 Euro. Secondly, any taxation of aviation fuel on intra-European flights would apply in a differentiated manner for kerosene and SAF. Thirdly, SAF used on CORSIA flights would benefit from reductions of offsetting requirements.

In order to facilitate overcoming obstacles in production of SAF and marketing it, the EU set up a Low Carbon Fuels Value Chain Alliance, involving stakeholders from production, supply, demand and regulatory side of the spectrum.

Especially in the flexibility period, it is likely that one side effect which will materialise is an excessive discrepancy between prices of fuel sold at different airports by suppliers. Some airports will not even have SAF at all.

In order to prevent that airlines circumvent the mandate by tanking at airports (in the EU or outside), where pure kerosene is available, and avoid tanking at airports where high blends are sold, the Commission proposes a clause whereby airlines must tank 90% of the necessary fuels for departing flights from each airport, on a yearly average basis.

2 https://ec.europa.eu/info/sites/default/files/refueleu_aviation_-_sustainable_aviation_fuels.pdf

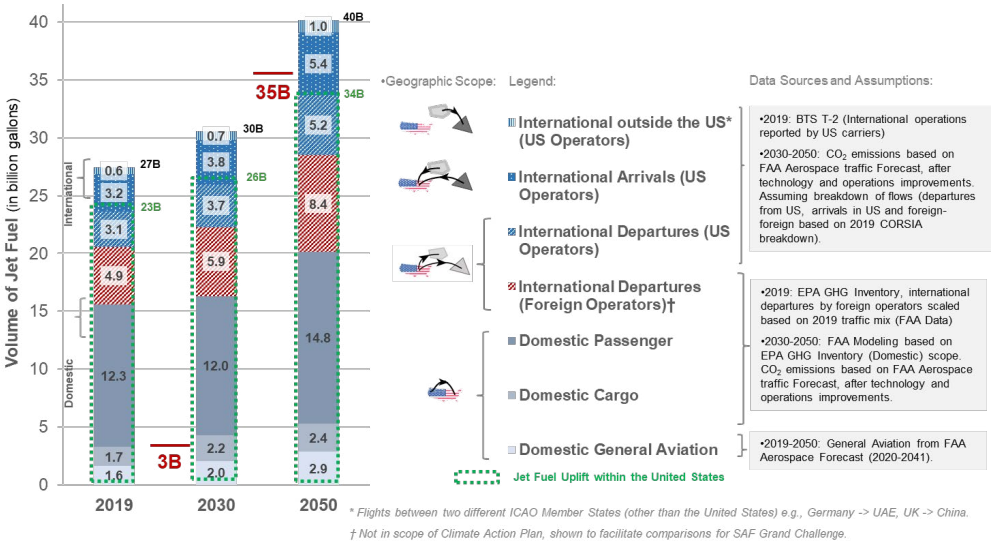

FIGURE 2: SAF Grand Challenge Goals Relative to Projected Jet Fuel Demand[3]

The Commission expects a very high compliance rate, and to ensure this, it proposes dissuasive, but proportional penalties for suppliers who do not market enough SAF.

USA SAF Grand Challenge

The United States 2021 Aviation Climate Action Plan[4] was announced in November 2021 and sets an overarching framework and approach to achieving the U.S. aviation climate goal of net-zero greenhouse gas emissions from the U.S. aviation sector by 2050. Alongside advances in efficiency of operations and new aircraft and engine technology, dramatically expanded supplies of SAF are a critical pillar of this aviation decarbonisation approach.

Through the SAF Grand Challenge[5], the U.S. government has committed to work with industry to rapidly scale up SAF production to meet the goals of at least 3 billion gallons per year of SAF by 2030 and meeting 100% of the fuel needs of all U.S. domestic and all international departures from the U.S. by 2050 (Figure 2). This approach emphasizes the role of U.S. executive branch agencies to take actions to support research, development, demonstration, deployment, and commercialisation of SAF. In addition, the approach recognises the need for well-designed economic incentives that could be legislated by the U.S. Congress to help bridge the cost gap between SAF and petroleum jet fuel.

The SAF Grand challenge defines SAF as “drop-in” liquid hydrocarbon fuels with the same performance and safety as conventional jet fuels produced from petroleum and are fully fungible with the existing fuel supply and can be used in today’s infrastructure, engines, and aircraft. SAF can be created from either renewable or waste materials and must reduce life cycle GHG emissions by at least 50% relative to conventional petroleum jet fuel. This definition includes a range of biofuels as well as power to liquid (PTL) fuels. SAF are also recognised for their potential to reduce emissions that degrade air quality and contribute to the formation of contrails.

The SAF Grand Challenge is being led by the United States Departments of Transportation (DOT), Energy (DOE), and Agriculture (USDA). To meet the goals of the SAF Grand Challenge DOT, DOE, and USDA are implementing a government-wide effort to address barriers to expand SAF production through critical themes including reducing the cost, enhancing the sustainability, and expanding production and end use of SAF.

3 From 2021 U.S. Aviation Climate Action Plan, page 20 available at https://www.faa.gov/sites/faa.gov/files/2021-11/Aviation_Climate_Action_Plan.pdf
4 https://www.faa.gov/sites/faa.gov/files/2021-11/Aviation_Climate_Action_Plan.pdf
5 https://www.energy.gov/eere/bioenergy/sustainable-aviation-fuel-grand-challenge

Reductions in the cost of SAF are possible through activities that drive down costs of production across the supply chain; expand the feedstock and conversion technology portfolio; leverage and repurpose existing production infrastructure; reduce risk to industry; and, provide economic support and incentives for production.

Enhancing sustainability of SAF can be accomplished by activities that include demonstrating sustainable feedstock production systems; developing and expanding low land-use change feedstock crops; reducing the carbon intensity of SAF supply chains; maximising the environmental co-benefits of production; ensuring robust standards that quantify and guarantee environmental integrity; and, enabling approvals of higher blend levels of SAF.

Expanding SAF supply and end use can be supported through activities including regional feedstock and fuel production development and demonstration; outreach, extension, and workforce development; direct infrastructure and commercialisation support; enabling approvals of diverse SAF pathways; and, continued outreach and coordination with military and industry end users.

In the near term the SAF Grand Challenge is developing a multi-agency roadmap to identify critical actions, agency roles and an implementation plan. This includes identification of existing SAF activities in research, development, demonstration, deployment, commercialisation support, and policy and consideration of new efforts to accelerate additional research, development, demonstration, and deployment (RDD&D) of innovative solutions and technologies. Outreach to industry is being coordinated with support from the the Commercial Aviation Alternative Fuel Initiative (CAAFI). Finally, implementation of a supporting incentive framework will be critical to address the cost disadvantage faced by SAF. Actions under consideration include use of existing federal regulations (e.g., Renewable Fuel Standard), and implementation of new supporting policies (e.g., tax incentives) that could be enacted by the U.S. Congress. SAF support incentives and regulations at both the federal and U.S. state level are necessary to help cut costs and rapidly scale domestic production of SAF.

Conclusion

SAF are critical to meeting aviation's environmental goals and have additional co-benefits beyond greenhouse gas emissions and air quality improvements, including energy security and resiliency and economic development. Expansion of the global supply of SAF to meet the needs of aviation will require supporting programs, policies, and incentives. There are a broad range of approaches that can be pursued. This article shares two approaches being taken in the European Union and the United States that are both aimed at addressing fundamental dynamics to support expanded supply and availability of SAF.