

SAF: The Market Realities

In recent months, market interest in sustainable aviation fuel (SAF) has risen dramatically. This chart can help explain why.



As reflected in this chart (which is available as part of recent research into the global SAF market), the global market is set to skyrocket over the next eight years.¹ But trying to understand *why* the market is suddenly poised for massive growth is worth some investigation.

The sudden bull market in SAF is at least in part due to actions by the Democratic Party, which presently controls the White House and Congress. In September 2021, the Biden Administration announced the Sustainable Aviation Fuel Grand Challenge, a series of executive actions intended to coordinate joint actions on the part of the DOE, DOT, USDA and other federal agencies to scale SAF.² The initial goal is to achieve annual production of 3 billion gallons of SAF by 2030; the long-term goal is to produce enough SAF to meet 100% of aviation

¹ <https://www.researchandmarkets.com/reports/5178303/global-sustainable-aviation-fuel-market-by-fuel>

² <https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/09/fact-sheet-biden-administration-advances-the-future-of-sustainable-fuels-in-american-aviation/>

fuel demand by 2050.³ And U.S. airlines have gotten behind the proposal, saying they'll ramp up purchases of the product if it is on the market.⁴

At first glance, this would seem to be market demand driven largely by presidential politics, and any market that is a function of the party in the Oval Office hardly seems like a market worth pursuing. But there are several reasons that global demand for SAF may have momentum even when Biden leaves office.

- The UN's Race to Zero campaign. This initiative on the part of the United Nations has a goal to cut carbon emissions by half by 2030,⁵ and achieve net zero carbon emissions by 2050.⁶ Given the dates listed, it's pretty obvious that Biden is trying to align his administration's goals to those of the UN, which helps to underscore the argument that there's interest in this beyond the U.S.
- The European Union and several European governments are adopting or proposing mandates that will require an increase in SAF production. The European Climate Law was adopted in June 2021, setting an EU target of reducing greenhouse gas (GHG) emissions by at least 55% compared to 1990 levels by 2030.⁷ France, Germany, Finland, the Netherlands, Norway, Spain and Sweden all have or are considering SAF mandates.⁸ While the UK is no longer an EU member, it is also looking at an SAF plan of its own, saying it could require flights departing the country to use a minimum SAF blend as early as 2025.⁹
- India is also getting interested in SAF. In early December, Indian airline IndiGo announced it had partnered with CSIR-Indian Institute of Petroleum to begin use of SAF as a fuel source.¹⁰
- Domestically, California and Oregon may also be sources of pressure. The Golden State began recognizing SAF as an acceptable source of carbon credits in 2019.¹¹ Oregon's Department of Environmental Quality also recognizes SAF for carbon credit purposes.¹²

³ <https://www.energy.gov/eere/bioenergy/sustainable-aviation-fuel-grand-challenge>

⁴ <https://www.fastmarkets.com/insights/us-airlines-pledge-huge-increase-in-use-of-sustainable-aviation-fuel-by-2030>

⁵ <https://racetozero.unfccc.int/join-the-race/>

⁶ <https://unfccc.int/climate-action/race-to-zero-campaign>

⁷ <https://epthinktank.eu/2022/02/02/refueleu-aviation-initiative-sustainable-aviation-fuels-and-the-fit-for-55-package-eu-legislation-in-progress/>

⁸ https://www.transportenvironment.org/wp-content/uploads/2021/07/2020_12_Aviation_SAF_mandates_rating_final.pdf

⁹ <https://cleanenergynews.ihsmarkit.com/research-analysis/uk-proposes-plan-to-reach-75-sustainable-aviation-fuel-by-2050.html>

¹⁰ <http://timesofindia.indiatimes.com/articleshow/88168710.cms>

¹¹ <https://www.iata.org/contentassets/d13875e9ed784f75bac90f000760e998/fact-sheet---us-and-eu-saf-policies.pdf>

¹² <https://www.oregon.gov/deq/ghgp/Documents/PathwayAltJetFuel.pdf>

Neither of these represent mandates, of course, but should either state decide to start mandating the use of SAF in their airports – and California is known for having some of the most stringent car emissions laws on the books – this could change at some point in the future.

- The behavior of aerospace giant Boeing and its partner, turbine provider Rolls-Royce, are worth taking into consideration. Both have been aggressive about testing SAF in Boeing passenger jets. In October, Boeing performed a four-hour test flight in the Southwest with a 747 running Rolls-Royce turbines. Three of the engines ran off of conventional jet fuel while the fourth engine ran entirely off of SAF.¹³ Of course, it stands to reason that Rolls-Royce would have incentive to manufacture engines capable of using SAF to comply with the array of present and forthcoming European regulations. But it's worth pointing out that Boeing, whose commercial aviation business is predicated on understanding airlines' future plans, is also working hard to embrace SAF. In January 2021 – months before the Biden Administration's announcement – Boeing has announced that its commercial airplanes will be capable of running entirely off of SAF by 2030. And just a few weeks ago, on February 2, it announced a purchase of two million gallons of SAF for its commercial operations.¹⁴
- Airlines' behavior is helping to inform Boeing's and Rolls-Royce's behavior with respect to SAF. Nine members of the 14-member Oneworld airline alliance have committed to buying 1.3 billion liters of SAF from California-based Aemetis for flights out of San Francisco International over a seven-year period starting in 2024.¹⁵ And Willie Walsh, the director general of the International Air Transport Association, said in an interview that airlines have ordered 14 billion liters of SAF. Separately, Southwest Airlines and IAG, the parent company of British Airways, agreed in November to purchase nearly 300 million gallons of SAF from a Mississippi biorefinery.¹⁶

At a bare minimum, this is a market with some staying power.

¹³ <https://www.rolls-royce.com/media/press-releases/2021/19-10-2021-rr-joins-boeing-and-world-energy-for-successful-100percentage-sustainable-aviation-fuel.aspx>

¹⁴ <https://boeing.mediaroom.com/2022-02-07-Boeing-Buys-Two-Million-Gallons-of-Sustainable-Aviation-Fuel-for-its-Commercial-Operations>

¹⁵ <https://www.greenairnews.com/?p=2232>

¹⁶ <https://www.reuters.com/business/aerospace-defense/southwest-iag-agree-buy-sustainable-aviation-fuel-made-wood-waste-2021-11-10/>

SAF: Supply Chain Considerations

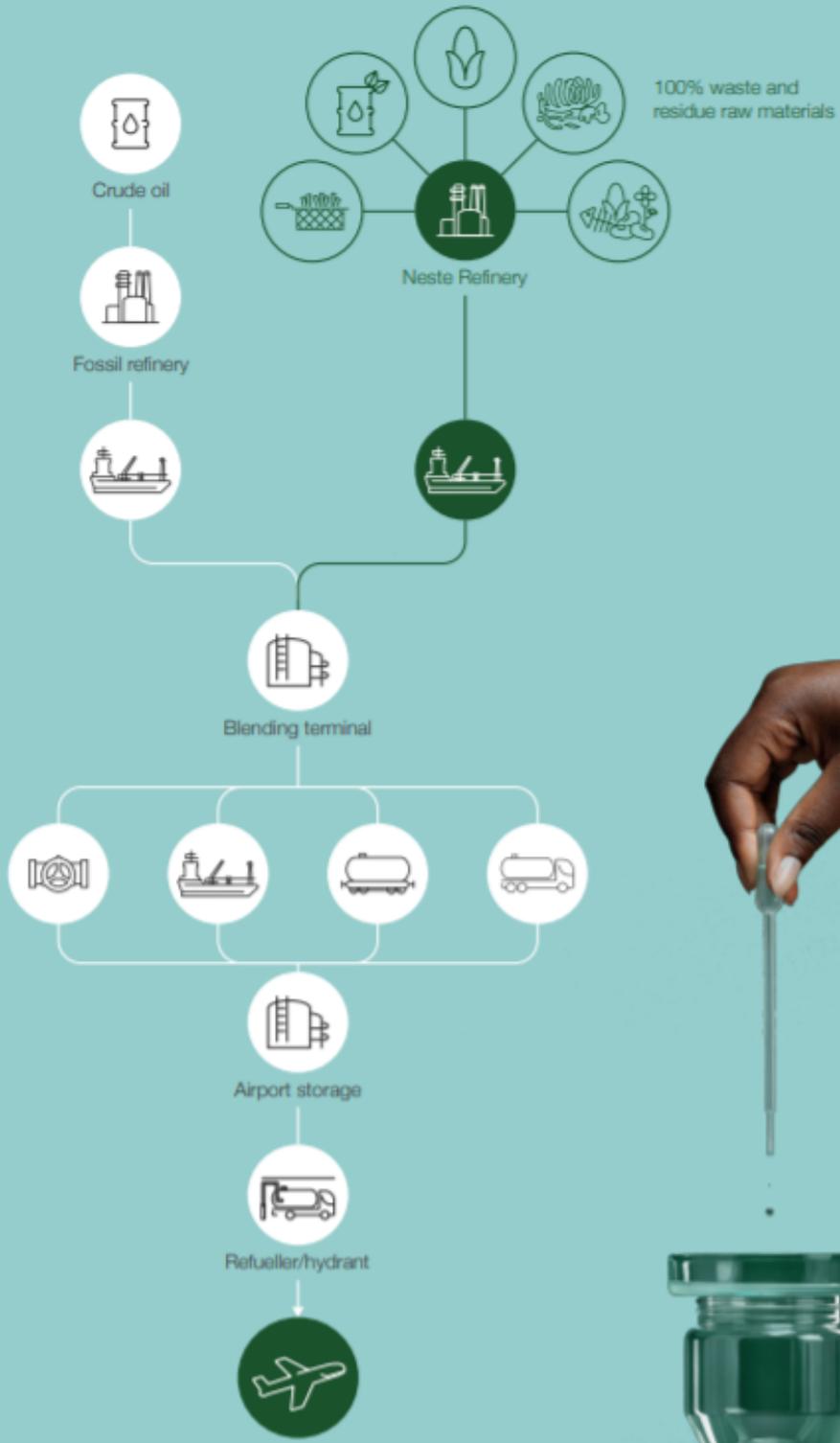
Among the alternatives to conventional jet fuel, SAF holds a number of distinct advantages.

- It can result in up to an 80% reduction in CO₂ emissions.
- It is a “drop-in fuel” – it can be easily and directly incorporated into existing airport fuel systems.
- It can use a range of different feedstocks. Used cooking oil, forest residue, algae, crops with high oil content, and even municipal solid waste (i.e. just about anything that goes into a landfill) can be used to manufacture SAF.¹⁷

Neste, a major SAF producer based in Finland, illustrates their position in the overall supply chain as follows.¹⁸

¹⁷ https://aviationbenefits.org/media/166152/beginners-guide-to-saf_web.pdf

¹⁸ <https://www.neste.com/products/all-products/neste-my-sustainable-aviation-fuel/supply-chain>



Of interest to Company X is the projected growth in biofuels, the SAF feedstock component projected to grow fastest.

The greatest potential of biofuel lies in its ability to significantly reduce GHG emissions in the aviation sector and positively impact climate change. The strong and ongoing commitment of the aviation sector and the active involvement of an increasing number of stakeholders such as airlines and many aviation organizations to develop biofuel through voluntary initiatives have been a major driving force behind biofuel development and consumption. The production of biofuel is expected to scale up rapidly in the coming decade due to rapid developments in technological pathways to commercialize the use of alternative jet fuel.¹⁹

The reason that airlines are so slow to adopt it is its price. Since fuel costs amount to 20%-30% of airlines' cost structure, airlines are exceptionally sensitive to fuel prices,²⁰ and SAF costs anywhere from five times²¹ to eight times²² the price for regular jet fuel. Until the price comes down appreciably, airlines are unlikely to adopt it. The government programs in the U.S. and elsewhere are trying to address this through a combination of industry subsidies to develop the technology to produce SAF more affordably and tax breaks to help subsidize the cost. When the Biden administration's Build Back Better proposal was under debate, the administration has proposed a Blender's Tax Credit of \$1.25 per gallon of SAF sold if the fuel achieved the 50% carbon emissions reduction – and for every percentage point reduction above 50%, the tax credit would increase to a ceiling of \$1.75.

Another challenge with its pricing structure – and one that will be of particular interest to Company X – is the tug of war between jet fuel and diesel, and by extension, the tension between SAF and biodiesel. The processes required to manufacture jet fuel are almost identical to manufacturing diesel fuel, which leaves refiners exceptionally sensitive to market forces. In addition, the logistics to gather used cooking oil for recycling into biodiesel are well established and easily adapted for processing into SAF. If diesel would yield higher profits than jet fuel, then a refiner would naturally be incentivized to manufacture diesel rather than jet fuel; this tension holds true for SAF and biodiesel as well.²³

¹⁹ Research and Markets report referenced at beginning of this report.

²⁰ <https://www.energy.gov/sites/prod/files/2020/09/f78/beto-sust-aviation-fuel-sep-2020.pdf>

²¹ <https://cleanenergynews.ihsmarkit.com/research-analysis/sustainable-aviation-fuel-market-still-in-infancy-due-to-cost-.html>

²² <https://www.reuters.com/business/sustainable-business/oil-giant-shell-sets-sights-sustainable-aviation-fuel-take-off-2021-09-19/>

²³ Energy.gov report referenced above.

Finally, there's one other tension unique to biofuels that would be of interest to Company X: the tug of war between recycled oils and virgin oils. Crop prices tend to track crude oil prices fairly closely, and if the price of crops like soybeans and oilseeds declines sufficiently, it's more advantageous for producers to select virgin oils over recycled oils.

Recommendations

With all that as a backdrop, here are three key recommendations.

First, figure out how to transfer your custom blending capability from onboard ships to the mainland – assuming it will transfer at all. You've thoroughly proven your ability to take liquid cargo onboard a barge or tanker and transform it into nearly anything a client would want. But those are, by and large, fossil fuels. Doing the same with biofuels of all different quantities and blends may be a radically different scenario. It might be worth doing some sort of test run as a proof of concept, just to make sure you really understand the business you're trying to get into and that you can serve those clients properly.

Secondly, make sure you have the flexibility to pivot easily between biodiesel and SAF. In my research, it was pretty obvious that SAF is far more closely aligned to biodiesel than I had previously understood. It's a safe bet that the refiners getting into this will be doing biodiesel and SAF as dictated by market conditions. You need to have the ability to alternate between the two as well.

Thirdly, leverage your location in Houston for strategic advantage. In the energy.gov report on SAF, some time was spent drawing similarities and distinctions between the gasoline market and the jet fuel market. Unlike gasoline, which is characterized by hundreds of thousands of small fueling stations and hundreds of millions of customers, the jet fuel market is mostly comprised of a few dozen airlines that negotiate massive year-long contracts and fuel their vehicles at common locations at airports. In fact, airports are directly served by jet fuel pipelines that run through various locations across the country as follows:



Figure 2. Major U.S. refined products pipelines carrying jet fuels (Airlines for America 2018) and the 10 largest airports by traffic volume

Look closely at this map, and it becomes obvious very quickly that Houston is a major hub for the jet fuel industry. The city is the starting point for the two longest jet fuel pipelines that feed into five of the top ten airports in the country, and another twelve smaller airports. For a company looking to break into the jet fuel industry, you could do a lot worse.