
SENATE COMMITTEE ON ENVIRONMENTAL QUALITY

Senator Allen, Chair

2021 - 2022 Regular

Bill No: AB 1322
Author: Robert Rivas
Version: 4/25/2022
Urgency: No
Consultant: Eric Walters

Hearing Date: 6/8/2022
Fiscal: Yes

SUBJECT: California Global Warming Solutions Act of 2006: scoping plan: sustainable aviation fuels

DIGEST: This bill requires the California Air Resources Board (ARB) to, on or before July 1, 2024, develop a plan to incentivize sustainable aviation fuel (SAF) in consultation with specified agencies and stakeholders. It also directs ARB to evaluate and increase the incentives that exist for the production of SAF, as well as numerous other specified inclusions in the plan, and ultimately implement the plan by December 31, 2025.

ANALYSIS:

Existing law:

- 1) Establishes the Air Resources Board (ARB) as the air pollution control agency in California and requires ARB, among other things, to control emissions from a wide array of mobile sources and coordinate, encourage, and review the efforts of all levels of government as they affect air quality. (Health and Safety Code (HSC) §39500 et seq.)
- 2) Requires ARB to ensure that statewide GHG emissions are reduced to at least 40% below the 1990 level by December 31, 2030 (i.e., SB 32); and allows ARB, until December 31, 2030, to adopt regulations that utilize market-based compliance mechanisms (i.e., the cap-and-trade program) to reduce GHG emissions. (HSC §§ 38566, 38562)
- 3) Establishes the Greenhouse Gas Reduction Fund (GGRF) in the State Treasury, requires all moneys, except for fines and penalties, collected pursuant to a market-based mechanism be deposited in the fund. (Government Code §16428.8)

This bill:

- 1) Requires ARB to, on or before July 1, 2024, develop a plan (Plan) to incentivize sustainable aviation fuel (SAF) production and use in order to reach 1.5 billion gallons per year by 2030.
- 2) Requires ARB to, on or before December 31, 2025, implement the Plan.
- 3) Stipulates that, in preparing the Plan, ARB shall:
 - a) Consult with the Natural Resources Agency, Department of Forestry and Fire Prevention, California Environmental Protection Agency, State Energy Resources Conservation and Development Commission, and the Governor's Office of Business and Economic Development;
 - b) Consult with state commercial airports, airlines, aircraft manufacturers, SAF producers, and infrastructure providers;
 - c) Evaluate, model, and create incentives to increase SAF production and import in the state;
 - d) Identify and prioritize incentives for SAF that achieve the most cost effective GHG emission reductions;
 - e) Closely examine the shortfall that exists in the state GHG emissions policy framework with respect to incentives for SAF and the decarbonization of the aviation sector, and seek to address that shortfall through new incentives;
 - f) Maximize reductions in wildfire risk by prioritizing and expediting review of SAF from certain feedstocks under the Low Carbon Fuel Standard (LCFS), and specifies considerations;
 - g) Evaluate the incentive amounts that would be required to encourage aircraft to voluntarily use cleaner fuels;
 - h) Evaluate the direct benefits and cobenefits of SAF, as specified; and
 - i) Identify the following:
 - i) Barriers and possible solutions to achieving the aviation GHG emission reduction goals stated above;
 - ii) Milestones towards achieving those goals;
 - iii) Actions that can be taken by the state to ensure that the state's policy incentives for SAF are comparable to those provided to renewable diesel and other on-road fuels to ensure that SAF production capacity is sufficiently expanded; and
 - iv) Tools for increasing the state's SAF supply and demand.
- 4) Makes numerous findings and declarations about aviation and aviation fuel in California, including but not limited to:
 - a) That the state is precluded from regulating the aviation sector in a manner that is federally preempted;

- b) That according to LCFS reporting, approximately 4,600,000 gallons of SAF were used in the state in 2020, which is 0.0025% of the jet fuel consumed in intrastate aviation in the state;
- c) That a coalition of aviation businesses have pledged to achieve net-zero carbon emissions by 2050, and also to support the development of SAF production to reach 3 billion gallons of cost-competitive SAF available in 2030; and
- d) A claim that it is likely that California will need to produce 1.5 billion gallons of SAF by 2030 in order to achieve a 3 billion gallon nationwide goal.

Background

- 1) *California's aviation emissions.* Aircraft jet engines emit a mixture of CO₂, water vapor, oxides of nitrogen (NO_x), particulate matter (PM), carbon monoxide, and other pollutants. Of these, 90% of the emissions from a flight occur at altitudes above 3,000', with only 10% being released during taxiing, takeoff, and landing. According to the U.S. Energy Information Administration, California's total 2020 jet fuel consumption was 59,442,000 barrels, or roughly 2.5 billion gallons.

According to ARB's GHG emission inventory, intrastate (that is, the origin and destination are both within California) flights account for roughly 1.1% of statewide covered GHG emissions. Given the small contribution to overall state GHG emissions, aviation was not mentioned in the 2017 scoping plan update.

Beyond the scoping plan, the 2020 Mobile Source Strategy (MSS) more significantly includes aviation, specifically emissions from piston, agricultural, and jet aircraft. The 2020 MSS proposes four strategies to reduce aviation GHG emissions: (1) improving the current air traffic operation, (2) transitioning toward zero-emission auxiliary power units (APU), (3) accelerating the turnover of old aircraft, and (4) technology advancement for future aircraft.

- 2) *Sustainable aviation fuel (SAF).* SAF is a "drop in" replacement for conventional jet fuels; it is blended with conventional jet fuel and handled with the same conventional jet fuel infrastructure. It can be produced from renewable, carbon-rich materials such as biomass, municipal solid waste (MSW), oils, fats, sugars, or alcohols. Given the technology is still relatively immature and being developed, SAF is currently much more expensive than conventional jet fuel (roughly five times more), a fact that remains even after

factoring in state and federal policy credits. However, on a life cycle basis it has roughly 80% lower associated emissions than conventional fuel. The majority of California's current and expected SAF supply comes from four facilities: World Energy in Paramount, CA (using mainly cooking oil as a feedstock), Neste in Singapore, Fulcrum Energy in Nevada (using mostly MSW and select organic waste), and Red Rock Energy in Oregon (using woody biomass).

According to a 2019 SAF feasibility study conducted for San Francisco International Airport (SFO) World Energy (stated to be the only commercial-scale SAF producer at the time) produced 10 million gallons of SAF annually (though it is unlikely this was all used in flights). For comparison, according to the federal Energy Information Administration, California (the country's largest consumer of jet fuel) consumed 106,201 thousand barrels of jet fuel in 2019, or 4.46 billion gallons. In other words, California made, at most, roughly 0.2% as much SAF as it consumed in jet fuel.

The same feasibility study suggested numerous pathways for SFO to improve the support for and commercial viability of SAF. Among these many strategies were to seek state grants (via the Air Quality Improvement Program, Carl Moyer Program, or Clean Transportation Program), advocate for a dedicated airport tract within GGRF, or to utilize "a less direct involvement whereby SFO would leverage its position at the intersection of all airport stakeholders to work towards increased adoption of SAF." Among the six specified roles SFO could play in that capacity was, "policy advocacy to address LCFS discrepancies." Said discrepancies appear to be that "California's current policy environment favors the production of renewable diesel over SAF."

- 3) *Federal and international efforts.* The International Civil Aviation Organization (ICAO) is a United Nations intergovernmental body responsible for worldwide planning, implementation, and coordination of civil Aviation & Emissions. The Committee on Aviation Environmental Protection (CAEP) within ICAO is taking a critical role in formulating emission standards and recommended practices. These are the basis of the Federal Aviation Administration's aircraft engine performance certification standards, established through U.S. EPA regulations. Historically, U.S. EPA has adopted the aircraft emission standards proposed by ICAO for harmonization with the global airline industry. The U.S. EPA has described those standards as "technology-following," meaning they will not require a technology response from manufacturers. ARB has urged the U.S. EPA to strengthen the proposed standard.

The Carbon Offset and Reduction Scheme for International Aviation (CORSA) is a carbon offset and carbon reduction scheme to lower CO₂ emissions for international flights which was developed by ICAO. As of January 2018, more than 70 countries representing more than 85% of international aviation activity have volunteered to participate. A 2019 agreement provided an update to CORSA which would allow the use of alternative fuels to reduce offset obligations. This would create greater demand for aviation biofuel.

There is concern that on the international stage the most mature and economical technology to make aviation biofuel derives it from palm oil. Palm oil collection is associated with rampant deforestation, causes biodiversity loss, and may even emit more CO₂ on a life cycle basis than the replaced fossil fuels. Neste, one of the largest biofuel producers in the world, established its aviation biofuel production in Singapore, the largest palm oil producing region.

In 2018, Norway became the first country to establish a SAF quota, which explicitly excluded fuel from palm oil. The quota began at 0.5% of airlines' annual fuel be SAF in 2020, and the goal is to have that reach 30% by 2030.

- 4) *Airports and airlines taking the lead.* San Francisco International Airport (SFO) and Los Angeles International Airport (LAX) have both attempted to increase their use of SAF. In 2016, United Airlines committed to purchasing 15 million gallons of SAF at LAX, becoming the first airline and airport in the world to use biofuel for continuous commercial aircraft operations. In 2017, SFO brought together a coalition of 150 airlines, conventional and alternative fuel providers, and other organizations to work collaboratively towards expanding the development and use of SAF at SFO and throughout California.
- 5) *Low Carbon Fuel Standard.* ARB adopted the LCFS regulation in 2009 and began implementing it in 2010. The primary purpose of LCFS is to reduce GHG emissions by reducing the carbon intensity (CI) of fuels used in California and to diversify the fuel mix to enable long term decarbonization of the transportation sector.

The program establishes statewide CI standards for transportation fuels supplied in California. Carbon intensity is measured as GHGs per unit of energy (technically, grams of carbon dioxide equivalent per megajoule). The standards become more stringent annually through 2030, thereby requiring a reduction in average statewide fuel CI.

ARB has approved hundreds of different fuel “pathways,” which assign an estimated CI to different fuels based on where they come from and how they are produced. For most fuels eligible under LCFS, their ability to generate credits is based on their reduction in CI from the conventional fuel of either gasoline or diesel, as appropriate.

Sustainable aviation fuel has an approved pathway under LCFS, despite the fact that aviation fuels do not generate deficits under the LCFS like gasoline and diesel do. In 2020, the SAF LCFS pathway generated 0.2% of all LCFS credits for that year.

- 6) *Other technologies.* While SAF is the most mature technology for decarbonizing aviation, it is neither carbon-free nor the only option.

Battery-electric planes struggle with the power-to-weight ratio of batteries, though a number of startups and researchers are developing the technology. It is likely that battery-electric planes could be a viable option for short- and medium-range flights in the near future.

Hydrogen, when compressed and stored as a liquid, can be much more energy dense than batteries, while both technologies are zero-emission in the aircraft. While the scale of jet fuel needed to be replaced would require a tremendous increase in the amount of available hydrogen, and that hydrogen would need to be sourced from a sustainable pathway, hydrogen-powered aircraft could play a major role in a fully-decarbonized aviation industry in the future.

One other option to reduce the use of fossil fuels in aviation is synthetic fuel. This, like SAF, is not zero-emission at point of use, but unlike SAF does not use biological materials as a feedstock. Instead, synthetic jet fuel is made directly from hydrogen and carbon—potentially even carbon captured from the atmosphere. This synthetic fuel is considerably too expensive to be viable today, but research is underway.

- 7) *Aviation in the 2022 scoping plan update.* In the latest public draft of the 2022 scoping plan update, released May 10, 2022, the proposed scenario does model aviation. Specifically, it predicts 10% of aviation fuel demand being met by electricity or hydrogen in 2045, and states that, “SAF meets most of the rest of the aviation fuel demand that has not already transitioned to hydrogen or batteries.”

Delving into the sectoral modeling in Appendix H of the scoping plan update, it appears that conclusion derives from an assumption that the state will

transition to 100% SAF by 2040, and all of the state's available fat, oil, and grease feedstocks will be used first for SAF, with the remainder going to renewable diesel. This assumption does not appear to be further explained or justified, and achieving it would represent a massive, unprecedented increase in SAF production. For comparison, by 2040 in the European Union's aggressive proposal for increasing SAF, airplane fuel will need to be a blend with 32% SAF in 2040. The draft scoping plan SAF assumptions have not, to staff's knowledge, been publically discussed or contemplated by this committee.

Comments

- 1) *Purpose of Bill.* According to the author, "Global greenhouse gas emissions (GHG) are already driving catastrophic climate change. In 2015, commercial aviation in California accounted for an estimated 36 million metric tons of carbon dioxide. Sustainable Aviation Fuel is a cleaner alternative to traditional jet fuel and is the most significant pathway for commercial aviation to reduce emissions. While California leads in sustainable aviation fuel deployment in the US, using approximately 99% of the nation's sustainable aviation fuel supply in 2020, this supply represents less than 0.0025% of the state's jet fuel use. To prevent and combat the most harmful impacts of climate change, we must leverage all possible options to minimize GHG emissions.

"The use and further production of sustainable aviation fuel can reduce lifecycle carbon by 80% compared to traditional petroleum-based jet fuel. AB 1322 will require the Air Resources Board to develop and implement a plan to identify incentive-based best practices that promote the use of SAF to help meet the state's goal of net-zero greenhouse gas emissions by 2045. AB 1322 takes bold, necessary steps to ensure that our aviation industry can join the fight against the devastating impacts of climate change and help California achieve our ambitious GHG reduction goals on time."

- 2) *Scrapping for scraps.* Typically, the most cost-effective, sustainable feedstock to use for SAF (or other biofuel) production is some sort of waste. By taking what would otherwise be a liability to be disposed of and converting it into a useful product, biofuel producers can turn trash to treasure, minimizing polluting wastes while maximizing profits. These waste streams can range from municipal solid waste (MSW) and waste oils to forest thinnings and non-food agricultural residues.

However, despite the fact that those sources of waste seem virtually limitless in our current society, they are not. At the volume of biofuel required to completely replace existing fossil fuels (be they diesel with biodiesel, natural

gas with renewable natural gas, or jet fuel with SAF), there will simply not be enough waste to go around.

Moreover, as demand for biofuels and supply of waste feedstocks reach the point that it becomes more economical to use purpose-grown crops (such as palm for palm oil), the issue of land-use changes becomes hugely important. Briefly, global demand for biofuels has already driven massive clearance of forests, which in turn has prompted the development of a new directive (called RED II) that aims to stop the use of crops that cause deforestation in transportation fuel by 2030.

Thus, charting the path for future biofuel use in California is not a question of backing any and all promising candidates, but rather one of allocating a limited resource for the greatest public benefit. Specifically, the question at hand with SAF and this bill seems to be: what use of biofuel feedstocks best advances the state's goals?

Although SAF is a promising technology that is already being used today to displace fossil fuel use, its production in California is in direct competition with renewable diesel for feedstocks. For context, intrastate aviation emissions account for roughly 1% of the state's regulated GHG emissions, while emissions from heavy vehicles account for 7.8%, to say nothing of the environmental justice and criteria air pollutant impacts of both sources. Approximately 90% of aviation emissions are released above 3,000', whereas Californians living near truck-dense freeways and ports have deeply troubling and unjustly elevated levels of asthma, heart attacks, strokes, and numerous other ailments.

To be clear, this is not to say that California should not produce SAF, nor that the state can only invest in one biofuel technology. But in deliberating on this bill specifically—and on the future of waste-derived biofuels in general—the committee should bear in mind the complex interplay of fuels and feedstocks, and prioritize support accordingly.

- 3) *Carrots only.* Given that California only has regulatory authority over intrastate aviation (as interstate and international flights are the sole jurisdiction of the federal government), the policy options available to the state to reduce aviation GHGs are somewhat limited. Regulatory “sticks” are not within the state's purview, but “carrots” can be used, as it were. In fact, AB 1322 exclusively directs ARB to evaluate and increase incentives for SAF production and use, prioritize certain investments, and further favor SAF in state policies.

In short, AB 1322 can (and does) only increase incentives regarding SAF, but does not propose requirements, fees, or mandates on airlines. Thus, the push towards lower-carbon fuels would come only through providing more benefit to SAF users, rather than any disincentive for non-users.

- 4) *Innovation needed.* Despite issues of jurisdiction and relatively low in-state contribution, the facts remain that worldwide aviation emissions are unsustainably high, and GHGs warm the planet the same despite state boundaries. California, in its role as a climate leader, would do well to bring its policy and technology efforts to bear on this issue, and create innovative, exportable solutions.

Emissions from the aviation industry have generally continued to climb year over year. Aviation emissions are considered “hard to abate,” and persist beyond most easier-to-decarbonize sectors in models. SAF will undoubtedly be a major part of the world’s lower-carbon aviation future. Unlike other, more nascent technologies, millions of gallons of SAF are already being used each year. The energy-to-weight ratios required for economical flight are extremely challenging to meet with batteries or other technologies as they exist today. The fact that California’s LCFS has supported SAF to reach its current readiness is laudable.

Despite this, and considering the issues stated above, it seems premature to say that SAF alone is the best path to decarbonizing California’s aviation sector while advancing the state’s emission and air quality goals.

- 5) *All-of-the-above.* With California’s current leadership in the field of SAF production and the readiness of the technology, it is likely that SAF will be the primary frontrunner for reducing the carbon intensity of the state’s aviation sector. However, SAF is not the only option, and it is not without its flaws.

The committee may wish to consider amending AB 1322 to expand the study tasked to ARB. Instead of requiring ARB to consider only SAF, and the role it can play in reducing GHG emissions, the report should assess all technologies that could help the state reach its goal of net-zero GHG emissions by 2045, including but not limited to battery- and hydrogen-powered aircraft.

- 6) *Committee amendments. Staff recommends that the committee adopt the bolded amendments in comment 5 above.*

SOURCE: Author

SUPPORT:

Alaska Airlines
Alder Fuels
Amazon.com
Boeing Company; the
Burbank-glendale-pasadena Airport Authority
California Airports Council
City of Long Beach
City of Los Angeles
City of San Jose
Coalition for Clean Air
Fulcrum Bioenergy INC.
General Aviation Manufacturers Association
Helicopter Association International
Lanzajet
Long Beach Area Chamber of Commerce
Los Angeles Area Chamber of Commerce
Los Angeles County Business Federation, Bizfed
Los Angeles World Airports - City of Los Angeles
Los Angeles World Airports Authority
National Air Transportation Association
National Business Aviation Association
Neste Us, INC.
Paramount Chamber of Commerce
San Diego County Regional Airport Authority
San Francisco International Airport
San Mateo County Economic Development Association (SAMCEDA)
Southwest Airlines
Sustainable Aviation Fuel Coalition (sponsor)
Sustainable Aviation Fuel Producer Group
United Airlines, INC.
Velocys, INC.
World Energy

OPPOSITION:

350 Humboldt: Grass Roots Climate Action
Biofuelwatch

ARGUMENTS IN SUPPORT: According to World Energy, “Passage of AB 1322 would represent the first time the Legislature has issued policy on incentivizing the reduction of GHG emissions and other climate forcing impacts from the aviation sector.

“World Energy’s SAF is a drop-in fuel. Our fuel is tested and certified at up to 50 percent blend levels. Today, our fuel is delivered into airplanes at both LAX and SFO via our contract with United Airlines. As a drop-in fuel, SAF offers the fastest and most cost-effective way to reduce GHG emissions from commercial aircraft because jet engines can be fueled by SAF without any technological changes. Because electrification of commercial aircraft is decades away, SAF is the solution to meaningfully reduce emissions in the aviation sector to help California achieve its climate goals. SAF can reduce GHG emissions by up to 80%, SOX by nearly 100% and Particulate Matter by about 50%. This is especially impactful in communities around airports.

“AB 1322 also presents California with the opportunity to solidify its position as the global leader in SAF production and use. While some SAF is currently produced at our Paramount plant, new SAF production facilities have recently been developed and commercialized in the adjacent states of Oregon and Nevada. This is a missed opportunity for California. However, if proper incentives are deployed, as are expected to result from AB 1322, the nascent SAF industry in California will gain its footing and evolve into a healthy green industry creating new high-quality jobs for local communities.

“Finally, AB 1322 can enable our state to “build back better” from both the compounding impacts of COVID and wildfires while boosting aviation’s progress towards cleaner flight.”

ARGUMENTS IN OPPOSITION: According to Biofuelwatch, “The following points articulate why this bill should not advance from committee:

“Inequitable and Unjust: ... This bill does nothing to address the inequities associated with the climate damage from aviation. What is more, the climate benefit claims of the bill are dubious, as there is substantial evidence that ‘sustainable aviation fuel’ can result in even more greenhouse gas emissions than just burning fossil fuel.

“A History of Failed Projects and Wasted Public Money: The promotion of making liquid aviation fuels from woody biomass, one of the signature bioenergy concepts promoted in this bill, has a long sordid history of broken promises and failed projects. As a prime example, one of the listed supporters of AB 1322, Red Rock

Biofuels, has received hundreds of millions of dollars of public money to build a plant in Lakeview, Oregon, to make liquid aviation biofuels from woody biomass. However, that plant has never been finished, the company is traversing irregular financial circumstances, and the company has failed completely to fulfill claims it has made to agencies like the California Air Resources Board that the company would already be bringing millions of gallons of fuel to market.

“Current Refinery Conversions in California are Controversial: ...

There are at least 3 refinery conversion projects in California that have been approved under irregular California Environmental Quality Act (CEQA) environmental review processes that have generated tremendous controversy at a local and a state level. At least one of these refinery conversion projects, the World Energy AltAir refinery project in Paramount, California, is currently being litigated for illegal certification of the CEQA review of the refinery conversion proposal.”

-- END --