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October 22, 2021

Rajinder Sahota
Industrial Strategies Division Chief
Air Resources Board
1001 I Street
Sacramento, CA 95812

(Letter submitted electronically as Comment to Scoping Plan Workshop)

Sustainable Aviation Fuel Producer Comment RE:
Draft Scenario Inputs Technical Workshop for 2022 Scoping Plan

Dear Rajinder,

This letter is submitted on behalf of the sustainable aviation fuel (SAF) producer group. The SAF Producer Group is composed of some of the world's leading companies producing SAF or developing SAF production facilities including Alder Fuels, Fulcrum BioEnergy, Gevo, LanzaJet, Red Rock Biofuels, Velocys, and World Energy. Many of these companies participated in the last major Low Carbon Fuel Standard (LCFS) rulemaking and supported the inclusion of alternative jet fuel (AJF)[1] in the LCFS on an opt-in basis. The SAF Producer Group would like to commend the California Air Resources Board (CARB) for CARB's decision in that rulemaking to integrate AJF uplifted in California into the LCFS effective January 1, 2018. CARB's policy leadership regarding SAF has firmly established California as the leading SAF state in the country from both a supply and demand standpoint and has placed California in the top tier of locations globally supporting the expansion of SAF.

We appreciate the opportunity to provide comments to the 2022 Scoping Plan pertaining to the aviation sector and of major import to the SAF industry.

Background

On September 30, 2021, CARB held the Draft Scenario Inputs Technical Workshop. We recognize and support CARB's efforts to conduct a thorough, transparent, and inclusive public process to inform the 2022 Scoping Plan. While labor intensive, active engagement with stakeholders in the development of the 2022 Scoping Plan will provide CARB with a wide

[1] The LCFS defines the term "Alternative Jet Fuel" at 17 CCR §95481(a)(6) to mean: "a drop-in fuel, made from petroleum or non-petroleum sources, which can be blended and used with conventional petroleum jet fuels without the need to modify aircraft engines and existing fuel distribution infrastructure." While there are nuanced distinctions between the LCFS defined term "alternative jet fuel" and "sustainable aviation fuel," this comment letter uses the terms interchangeably. Note that all further regulatory references are to 17 California Code of Regulations.

401 Spring Street, Suite 205
Nevada City, CA 95959
(530)264-7157
FUELANDCARBONLAW.COM

spectrum of perspectives and insights and thereby contribute to a more robust, balanced, and efficacious 2022 Scoping Plan.

This comment focuses on the aviation sector portion of the technical workshop only. CARB included these four alternatives for the aviation sector in the Proposed PATHWAYS Scenario Modeling Assumptions Table:[2]

Sector	Alternative 1 Carbon Neutral by 2035	Alternative 2 Carbon Neutral by 2035	Alternative 3 Carbon Neutral by 2045	Alternative 4 Carbon Neutral by 2045
Aviation	25% of aviation fuel demand is met by electricity (batteries) or hydrogen (fuel cells) in 2030 and 50% in 2035 50% of aviation fuel demand not met in 2035 because non-combustion alternative not available	25% of aviation fuel demand is met by electricity (batteries) or hydrogen (fuel cells) in 2045	10% of aviation fuel demand is met by electricity (batteries) or hydrogen (fuel cells) in 2045	0% of aviation fuel demand is met by electricity (batteries) or hydrogen (fuel cells) in 2045

These same scenarios are found at slide 18 of the presentation that CARB gave at the workshop as the range of scenarios relating to aviation fuel:[3]

Alternative 1 - Carbon Neutrality by 2035	Alternative 2 - Carbon Neutrality by 2035
• No biofuels consumption by 2035 • 25% of aviation fuel demand is met by electricity (batteries) or hydrogen (fuel cells) in 2030 and 50% in 2035 • 50% of aviation fuel demand not met in 2035 because non-combustion alternative not available	• Biomass supply used to produce conventional and advanced biofuels as well as hydrogen • 25% of aviation fuel demand is met by electricity (batteries) or hydrogen (fuel cells) in 2045
Alternative 3 - Carbon Neutrality by 2045	**Alternative 4 - Carbon Neutrality by 2045**
• Biomass supply used to produce conventional and advanced biofuels as well as hydrogen • 10% of aviation fuel demand is met by electricity (batteries) or hydrogen (fuel cells) in 2045	• Biomass supply used to produce conventional and advanced biofuels as well as hydrogen • 0% of aviation fuel demand is met by electricity (batteries) or hydrogen (fuel cells) in 2045

Alternative 1 is remarkable in two respects: 1) the scenario eliminates from consideration the use of SAF in aviation, the decarbonization strategy that is widely recognized by transportation sector experts as the only viable strategy for the extremely hard to decarbonize sector of aviation

[2] CARB Proposed PATHWAYS Scenario Modeling Assumptions, from Draft Scenario Inputs Technical Workshop (September 30, 2021), at https://ww2.arb.ca.gov/sites/default/files/2021-09/Draft_2022SP_ScenarioAssumptions_30Sept.pdf , at p. 2.

[3] CARB Presentation from Draft Scenario Inputs Technical Workshop (September 30, 2021), at https://ww2.arb.ca.gov/sites/default/files/2021-09/carb_presentation_sp_scenarioinputs_september2021.pdf

between now and 2050, and 2) the scenario results in a draconian outcome of fuel rationing that would severely impact the California economy and result in massive leakage of greenhouse gas (GHG) emissions as the various sectors of the aviation industry relocate to surrounding states and countries, California airport activity is severely curtailed, and businesses that depend on air travel relocate out of the state.

The recent Lawrence Livermore National Laboratory report entitled "Getting to Neutral: Options for Negative Carbon Emissions in California" was developed to examine the following central issue:

> *This report is an assessment of negative emissions pathways—ones that physically remove CO2 from the atmosphere—that can help California achieve carbon neutrality by 2045, or sooner. It integrates original research findings with current published research on three main pillars of negative emissions: natural and working lands, carbon capture from biomass conversion to fuels, and direct air capture.* [4]

The Getting to Neutral report recognizes the extraordinary challenge of decarbonizing the aviation sector at the very outset,

> ***Background***
> *California has established itself as a worldwide climate leader through several landmark climate policies and targets, and has made considerable progress in top-priority emission reductions: using energy more efficiently, reducing the on the road, reducing emissions from transportation fuels, and more.*
>
> *Despite this progress, substantial challenges remain in rapidly decarbonizing the transportation, agriculture, and industrial sectors, and delays are possible. Certain greenhouse gas emissions (such as methane and nitrous oxide) are difficult to eliminate. Some fossil fuel uses, such as in aviation, cannot yet be eliminated in a straightforward way.*[5]

Also relating to the Scoping Plan goal of achieving California's goal of carbon neutrality, the California Legislature commissioned a report by the Institute for Transportation Studies (ITS) with the objective of obtaining a research-driven analysis of options that can put California on a pathway to achieve carbon-neutral transportation by 2045. The ITS report states, "SAF demands were satisfied first. This was based on the assumption that, as the sector with the fewest viable alternatives to liquid hydrocarbons as fuel, SAF producers would have the greatest long-

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[4] Sarah E. Baker, Joshuah K. Stolaroff, George Peridas, Simon H. Pang, Hannah M. Goldstein, Felicia R. Lucci, Wenqin Li, Eric W. Slessarev, Jennifer Pett-Ridge, Frederick J. Ryerson, Jeff L. Wagoner, Whitney Kirkendall, Roger D. Aines, Daniel L. Sanchez, Bodie Cabiyo, Joffre Baker, Sean McCoy, Sam Uden, Ron Runnebaum, Jennifer Wilcox, Peter C. Psarras, Hélène Pilorgé, Noah McQueen, Daniel Maynard, Colin McCormick, Getting to Neutral: Options for Negative Carbon Emissions in California, January, 2020, Lawrence Livermore National Laboratory, LLNL-TR-796100, at p. 1-3, available at https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf (footnotes omitted).

[5] Id.

term need and likely the highest ability to pay, especially after more cost-effective alternatives are developed for on-road transportation."[6]

SAF Technical Approvals and Market Acceptance

SAF is a viable solution that enables the decarbonization of aviation because of the industry's remarkable achievements relating to development and standards certification of SAF fuel types fit for the demanding application of flying aircraft carrying passengers or cargo at 30,000-50,000 feet above the earth's surface. SAF fuel types have achieved remarkable levels of technical approval as well as overwhelming airline and consumer acceptance. ASTM International, the standards body that approves new fuels, has approved seven different fuel processing technologies that utilize a wide range of sustainable feedstocks pursuant to ASTM's D7566 Annex standard. This specification allows blending of approved SAF fuels to 50% blend levels with conventional Jet-A fuel to be used in standard commercial aircraft with no modifications required.[7] Test flights have been undertaken and technical work is underway to remove the 50% barrier and obtain approvals and certifications of 100% SAF usage for use in commercial aviation.

The International Air Transport Association's website states the following regarding the development of SAF:

> *IATA member airlines and the wider aviation industry are collectively committed to ambitious emissions reduction goals. Sustainable Aviation Fuels (SAF) have been identified as one of the key elements in helping achieve these goals. Governmental support is essential to using sustainable aviation fuels to achieve the industry's climate goals.*
>
> - ***Over 370,000 flights have taken to the skies using SAF since 2016***
> - ***Seven technical pathways exist***
> - ***100 million litres of SAF will be produced in 2021***
> - ***SAF can reduce emissions by up to 80% during its full lifecycle***
> - ***Around 14 billion litres of SAF are in forward purchase agreements***

[6] Institute for Transportation Studies, "Driving California's Transportation Emissions to Zero" https://escholarship.org/uc/item/3np3p2t0, at p. 394.

[7] Commercial Aviation Alternative Fuels Initiative, " Approved Fuels further described in Fuel Qualification Page" include **Annex A1**: Fischer-Tropsch Synthetic Paraffinic Kerosene (FT-SPK) (2009 certification, synthesis gas as feedstock); **Annex A2**: Hydroprocessed Esters and Fatty Acids Synthetic Paraffinic Kerosene (HEFA-SPK)(2011 certification; fats, oils and greases are feedstocks); **Annex A3**: Hydroprocessed Fermented Sugars to Synthetic Isoparaffins (HFS-SIP)(2014 certification, sugars as feedstock); **Annex A4**: Fischer-Tropsch Synthetic Paraffinic Kerosene with Aromatics (FT-SPK/A) (2015 certification, synthesis gas as feedstock); **Annex A5**: Alcohol to Jet Synthetic Paraffinic Kerosene (ATJ-SPK)(certified 2016, ethanol and isobutanol as feedstocks); **Annex A6**: Catalytic Hydrothermolysis Synthesized Kerosene (CH-SK, or CHJ)(certified 2020; fats, oils and greases as feedstock); **Annex A7**: Hydroprocessed Hydrocarbons, Esters and Fatty Acids Synthetic Paraffinic Kerosene (HHC-SPK or HC-HEFA-SPK) (certified 2020; bio-derived hydrocarbons, fatty acid esters and free fatty acids as feedstock). http://www.caafi.org/focus_areas/fuel_qualification.html#approved (last viewed September 17, 2020. See also United States Department of Energy, "Sustainable Aviation Fuel, Review of Technical Pathways," at https://www.energy.gov/sites/prod/files/2020/09/f78/beto-sust-aviation-fuel-sep-2020.pdf (2020).

- ***More than 45 airlines now have experience with SAF[8]***

On a global basis, commercial airlines, business aviation and consumers have embraced SAF and supported market expansion through demonstration flights, public education campaigns, investment in companies developing SAF facilities and companies, and support for SAF policy.[9] Indeed, the US commercial airlines' trade association, Airlines for America, was the original proponent for including AJF in California's LCFS and was an active participant in the LCFS AJF effort along with United Airlines, SFO Airport, other airlines and airports, and the SAF producers. Since CARB's approval of AJF, the business aviation community has also broadly embraced SAF expansion. Many of the major airlines actively promote their use of SAF to their customers, and United Airlines has developed videos about the importance of SAF that are available for in-flight viewing. There has been no significant concern or opposition to SAF expressed in the US by the millions of customers who fly on commercial airlines, and SAF in a low percentage blend has been supplied via the common hydrant system in Los Angeles International Airport for over two years now.

CARB Should Focus its Resources on an Analysis of SAF Policy and Market Issues

Instead of evaluating a scenario that excludes the most viable decarbonization strategy for aviation, CARB should instead dedicate its considerable acumen and resources toward understanding the factors impeding the rapid expansion of SAF supply and looking for solutions to these hurdles. A4A and its membership in a press release of September 9, 2021, have expressed strong support for the expansion of SAF:

> *"Airlines for America (A4A), the industry trade organization representing the leading U.S. airlines, announced that our member carriers have pledged to work with government leaders and other stakeholders to make 3 billion gallons of cost-competitive sustainable aviation fuel (SAF) available to U.S. aircraft operators in 2030."*

The press release went on to state:

> *"We are proud of our record on climate change, but we know the climate change challenge has only continued to intensify. Accordingly, A4A member carriers have embraced the need to take even bolder, more significant steps to address the climate crisis," Airlines for America President and CEO Nicholas E. Calio said at a White House roundtable on sustainable aviation. "Today, I am pleased to announce that we are increasing our SAF 'challenge goal' by an additional 50 percent."*
>
> *Calio highlighted the need for positive government policy support – including a $1.50-$2.00 per gallon SAF blender's tax credit; public-private SAF research, development and*

[8] See International Air Transport Association, "Developing Sustainable Aviation Fuel (SAF)" at https://www.iata.org/en/programs/environment/sustainable-aviation-fuels/#tab-2

[9] See e.g. Intelligent Partnership, "Aviation biofuels: which airlines are doing what, with whom?" Blog of June 6, 2020 lists airline activities and links to airline announcements at https://intelligent-partnership.com/aviation-biofuels-which-airlines-are-doing-what-with-whom/. See also National Business Aviation Association, "Work on Sustainable Aviation Fuels Continues Unabated," July/August 2020, at https://nbaa.org/news/business-aviation-insider/2020-july-aug/work-sustainable-aviation-fuels-continues-unabated/

deployment programs, such as a new SAF and low emissions technology grant program under consideration by Congress; and other collaborative initiatives – to help enable the U.S. aviation industry to reach its ambitious new 2030 SAF goal and its 2050 net-zero emissions goal.

"To get there, we must work together – industry and government," he said. "These goals are important, but they are meaningless without action. A4A and our members are taking and are committed to action, and we are committed to working together, across this industry and with Congress and the Administration, to make these goals a reality."[10]

The key factor limiting SAF growth, as one might expect with a fuel commodity, is the total monetary value that producers of SAF receive. The essential solution necessary to drive rapid SAF expansion is robust policy. The total monetary value for SAF encompasses the wholesale price of conventional jet fuel supplemented by the value of policy programs. SAF is disadvantaged at the outset compared to on-road renewable diesel in that conventional jet fuel consistently sells at a discount compared to conventional on-road diesel in the US wholesale market.[11] In addition, SAF is disadvantaged as compared to renewable diesel under federal policy in that SAF receives less RINs per gallon under the Renewable Fuel Standard than renewable diesel. SAF is also disadvantaged from a blending and logistics standpoint in that conventional jet simply flows through the system to airports whereas SAF must be trucked or railed to a terminal for blending and certification. In the current nascent market of SAF, these costs are estimated at 10-20 cents per gallon.

California's GHG Policy Framework as applied to Conventional Jet Fuel and SAF

As previously noted, California has taken the leading role in the development of SAF policy in the US. However, in addition to the federal and market factors discussed above, SAF supply is currently limited because while SAF is included in the LCFS program, SAF is not yet fully integrated into the California greenhouse gas (GHG) policy framework. This is not to suggest that CARB deliberately disadvantaged SAF in designing California's GHG policy framework. Instead, the policy gap is a natural consequence of states being preempted from regulating aviation fuel. As a result of preemption, conventional jet fuel is purposefully excluded from California's Mandatory Greenhouse Gas Emissions Reporting, Cap-and-Trade, and the Low Carbon Fuel Standard.[12] Similarly, the California Sustainable Freight Action Plan does not address aviation fuel and the only California GHG program that does seek to reduce GHG emissions from aviation fuel is the LCFS.

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[10] Airlines for America, U.S. Airlines Announce 3-Billion-Gallon Sustainable Aviation Fuel Production Goal (September 9, 2021), at https://www.airlines.org/news/u-s-airlines-announce-3-billion-gallon-sustainable-aviation-fuel-production-goal/

[11] United States Bureau of Transportation Statistics, "Diesel and Jet Fuel Prices," note that chart depicts 20 years of diesel and jet fuel prices with jet fuel always at a discount to diesel fuel ranging from a few cents to full dollar, at https://www.bts.gov/diesel-and-jet-fuel-prices

[12] See e.g. Mandatory Reporting Regulation, "Suppliers of Transportation Fuels" provision at 17 CCR §95121(a)(2) stating that emissions reporting is not required for fuel where a use exclusively in aviation can be demonstrated.

The specific market consequence of jet fuel being excluding from California's GHG policy framework is that fossil jet fuel is not receiving the same clear market signals that the fossil on-road diesel market is receiving. This is best illustrated by examining California's two most important market-based programs for transportation fuels: Cap-and-Trade and the LCFS.

Under Cap-and-Trade, on-road diesel fuel triggers an allowance obligation when the fuel is sold or transferred over the rack. The obligated party incurs a cost per gallon of diesel fuel received over the rack that is based on the price of the Cap-and-Trade allowances that must be purchased and retired for that fuel. This cost is estimated and reported by a petroleum market service such as the Oil Price Information Service (OPIS) and is typically referred to as the "Cap-at-the-Rack Cost." In 2020, the Cap-at-the-Rack Cost for diesel was estimated by OPIS and other sources as in the range of $0.18 per gallon.[13]

While the LCFS has a distinctly different policy structure than Cap-and-Trade, it has a similar impact on petroleum market participants. Because the LCFS sets a carbon intensity that is lower than petroleum diesel, market participants that sell only diesel fuel must buy LCFS credits sufficient to meet their obligations. OPIS reports an imputed LCFS cost based on an estimate of how much the LCFS credits required will cost for each gallon of unblended fossil diesel delivered into the California market. For January 2020, the LCFS cost was estimated by OPIS and other sources in the range of $0.20 per gallon.[14] Because diesel market participants must comply with both the Cap-and-Trade and the LCFS program requirements, the programs together add about $0.40 per gallon to each gallon of on-road diesel sold from a petroleum market participant's perspective. These petroleum market participants therefore would be expected to increase their selling price for on-road fossil diesel approximately forty cents per gallon to cover both of these costs.

In contrast, petroleum jet fuel market participants do not add a surcharge to conventional jet fuel to cover the cost of Cap-and-Trade and LCFS compliance costs. As a result, strictly on a California policy basis, petroleum jet fuel is discounted about forty cents per gallon compared to on-road petroleum diesel fuel. When these costs are combined with the federal and market cost factors discussed previously, the anticipated selling price disadvantage for SAF compared to on-road renewable diesel is in the range of $0.50-$0.60/ gallon. For a production facility that must decide whether to produce and sell renewable diesel to the on-road market or SAF to the aviation market, fifty to sixty cents per gallon is a powerful economic motivation to produce and sell into the on-road market.

Despite this policy gap that results in a selling price disadvantage for SAF, companies like World Energy and United Airlines have partnered in SAF deals to overcome the economic hurdle the policy disparity presents because they recognize the long-term importance of building the SAF market. However, due to the urgent need to rapidly expand SAF supply to meet California's and the world's decarbonization goals, this policy disparity must be addressed.

[13] OPIS Blog, "Carbon Credit Costs for California Gasoline & Diesel: A Heads Up for US Suppliers," (May 4, 2020), at http://blog.opisnet.com/california-gasoline-carbon-credit-costs
[14] Id.

Comments and Recommendations

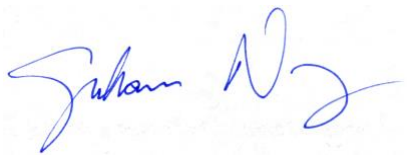
The SAF Producer Group respectfully submits the following comments and recommendations regarding the scenarios proposed at the technical workshop for the aviation sector:

- Evaluating a scenario that excludes SAF, the single most important decarbonization strategy in the aviation sector, runs counter to the achievement of California's AB 32 and Carbon Neutrality goals.
- Evaluating a scenario that implicitly proposes the rationing of fuels runs counter to California's interests because fuel rationing will inevitably will lead to leakage that nullifies any GHG reduction benefit and causes damage to California's economy.
- If the Scoping Plan includes Alternative 1 in its present form, CARB should also evaluate the profound leakage and other unintended consequences that would follow.
- CARB should instead focus its staff resources on analyzing the current aviation fuel market, examining factors and policies that are limiting SAF expansion, and developing new policy strategies to overcome these challenges.

Conclusion

Thank you for your consideration of our input to 2022 Scoping Plan.

Sincerely,



Graham Noyes
on behalf of the SAF Producer Group