December 21st, 2022

RE: International Council on Clean Transportation comments on the **November 2022 LCFS Workshop**

These comments are submitted by the International Council on Clean Transportation (ICCT). The ICCT is an independent nonprofit organization founded to provide unbiased research and technical analysis to environmental regulators. Our mission is to improve the environmental performance and energy efficiency of road, marine, and air transportation, in order to benefit public health and mitigate climate change. We promote best practices and comprehensive solutions to increase vehicle efficiency, increase the sustainability of alternative fuels, reduce pollution from the in-use fleet, and curtail emissions of local air pollutants and greenhouse gases (GHG) from international goods movement.

The ICCT welcomes the opportunity to provide comments on the Air Resources Board's November workshop to discuss potential changes to the Low-Carbon Fuel Standard. We commend the agency for its technical analysis and interest in continuing to improve the effectiveness of one of its flagship climate programs. Based on the content of the workshop, the comments below offer a number of technical observations and recommendations for ARB to consider in future changes to the Low-Carbon Fuel Standard.

We would be glad to clarify or elaborate on any points made in the below comments. If there are any questions, ARB staff can feel free to contact Nik Pavlenko (n.pavlenko@theicct.org) and Dr. Stephanie Searle (stephanie@theicct.org).

Stephanie Searle

Fuels Program Director

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Introduction

The ICCT commends ARB for reviewing the role of the LCFS in achieving California's broader climate targets and for exploring options to improve its stringency and implementation. ICCT strongly supports the long-term goal of implementing a 90% carbon intensity reduction target for the fuel mix by 2045, as this would create a stable, long-term signal for ultralow-carbon fuels. However, beyond the overall carbon intensity reduction target, differing eligibility rules can greatly impact the quantity and quality of greenhouse gas (GHG) reductions achieved under the LCFS, and therefore impact the effectiveness of the program. Therefore, our comments are focused on three issues raised in the November workshop, specifically: 1) a cap on the credits generated by crop-based biofuels, 2) the crediting of avoided methane for biomethane pathways, and 3) the obligation of aviation fuels. We summarize our recommendations here briefly and expand on each topic in the relevant sub-sections of these comments below.

The continued growth in the use of renewable diesel for the LCFS threatens to undermine the intended climate goals of the LCFS program. Though California has created a valuable incentive for the use of waste oils, the domestic availability of these materials is already largely utilized by 2022 and further growth in renewable diesel use for the LCFS would need to be met with either additional soy oil consumption or the import of waste oils from outside the U.S. The proposed limit on diesel-based fuels made from virgin vegetable oils explored in Scenarios A and B would reduce the risks associated with driving demand for soy, but does not address the issue of expanding demand for waste oil-derived biofuels. Therefore, **we recommend that ARB limits the contribution of all lipid-derived biofuels to the LCFS on an energy basis, based on 2020 consumption levels.**

Highly negative carbon intensity scores for some biomethane pathways in the LCFS have resulted in substantial credit generation from the contribution of a relatively small quantity of fuels. This is compounded by the the lack of deliverability requirements and the use of book-and-claim accounting for biomethane-derived LCFS pathways, which means that these credits are generated for fuel that is not even necessarily consumed in transportation or in California. Furthermore, forthcoming methane regulations as part of California's Short-Lived Climate Pollutant strategy call into question the accuracy of the attribution of avoided methane emissions to some biomethane pathways beyond 2024. **To more accurately align this pathway with its GHG savings and ability to reduce emissions in transportation, we recommend re-assessing the LCA emissions biomethane pathways to exclude avoided methane emissions starting in 2024, and limit new applications to in-state producers.**

Though the proposal to expand the LCFS obligation to intra-state flights is a step in the right direction for the future of the LCFS, this change would have a minimal impact on the program due to the small size of this fuel pool and fail to meaningfully promote aviation decarbonization. Intra-state aviation comprises only approximately 6% of California aviation emissions, and this obligation

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would have only a minor impact on total LCFS deficit generation. Therefore**, we recommend that, at a minimum, ARB obligates both inter-and intra-state aviation fuel consumption under the LCFS**.

Implement a Combined Cap on the Contribution of Unsustainable, Lipid-Derived Feedstocks to the LCFS

In the November workshop, ARB staff presented California Transportation Supply (CATS) modeling illustrating several different compliance trajectories towards 2045, including two scenarios where the overall contribution of credits from fuels made from virgin vegetable oils were limited. This proposal would align with the ARB scoping plan's principle that "a dramatic increase in alternative fuel production must not come at the expense of global deforestation, unsustainable land conversion, or adverse food supply impacts".[1] While we support this change to the LCFS, we note that 1) it could be more effective if set on an energy basis rather than by limiting credits, and 2) that the cap should apply to lipid-derived fuels generally, rather than solely to virgin vegetable oils.

Limiting the contribution of lipids as a feedstock category would support the diversification of California's fuel market and mitigate the shifting of BBD feedstocks from other states to California. In recent years, growth in alternative fuel consumption has not been distributed evenly across technologies and feedstocks.[2] Between 2011 and 2021, BBD fuel volumes (in GGE) grew from 1% to 50% of the state's alternative fuel pool while BBD credit generation grew from 8% to 45%.[3] Significant growth in BBD markets has not been exhibited by other U.S. states; rather, California has dramatically increased its share of the national BBD fuel pool, illustrated by the green line in Figure 1. The absolute volume of BD and RD consumed in California compared with the rest of the U.S. are converted to diesel gallon equivalent (DGE) and shown in the stacked bars.

[1] *Ibid*
[2] U.S. EIA, "U.S. Biomass-Based Diesel Tax Credit Renewed through 2022 in Government Spending Bill," January 28, 2020, https://www.eia.gov/todayinenergy/detail.php?id=42616; California Air Resources Board, "LCFS Data Dashboard," accessed June 16, 2022, https://ww3.arb.ca.gov/fuels/lcfs/dashboard/dashboard.htm.
[3] California Air Resources Board, "LCFS Data Dashboard."

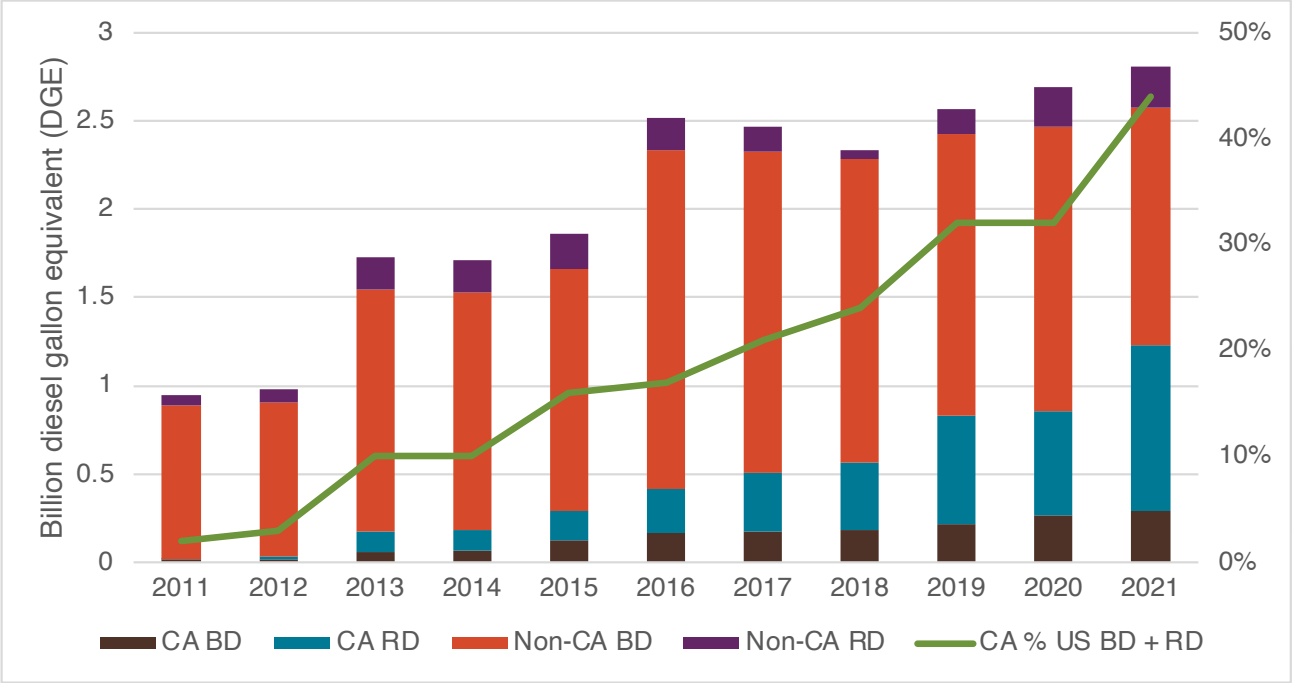

Figure 1. Biodiesel (BD) and renewable diesel (RD) usage trends within and outside California

In particular, California has driven the use of waste oils collected from other states, a limited resource with limited capacity for further collection.[4] Strong policy incentives for BBD could also shift the LCFS market from one that primarily generated waste oil feedstocks to one that could become increasingly reliant on vegetable oil feedstocks like soybean and canola. —a trend that is already emerging over the last two years. There are significant limitations on the availability of BBD feedstocks (i.e., vegetable and waste oils). This is due to strong demand for vegetable and waste oils in non-BBD markets such as food and livestock feed and in consumer products such as soaps and cosmetics.

Increasing BBD output amidst these supply constraints could exacerbate rising vegetable oil prices,[5] disrupt trade balances,[6] and cause unintended GHG emissions from substitute material production, including deforestation and other land use change from increased crop production.[7] Increased demand for

[4] Zhou, Yuanroung, Baldino, Chelsea, and Searle, Stephanie, "Potential Biomass-Based Diesel Production in the United States by 2032." (ICCT, 2020). https://theicct.org/publication/potential-biomass-based-diesel-production-in-the-united-states-by-2032/

[5] Food and Agriculture Organization of the United Nations, "FAO Food Price Index," accessed May 11, 2022, https://www.fao.org/worldfoodsituation/foodpricesindex/en/.

[6] "Soybean 2020 Export Highlights," USDA Foreign Agricultural Service, accessed May 11, 2022, https://www.fas.usda.gov/soybean-2020-export-highlights.

[7] Chris Malins and Cato Sandford, "Animal, Vegetable or Mineral (Oil)?" (Cerulogy, 2022).

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waste oil feedstocks could also lead to fraud from virgin vegetable oil that is falsely labeled as used cooking oil. Several cases of BBD fraud motivated by biofuels policy incentives have already been prosecuted in the U.S. and European Union.[8]

National LCFS credit market modeling developed by ICCT illustrates the potential downsides of a food-only cap. In a 2022 study, we find that a cap on crop-derived biofuels at 2020 levels was able to limit the contribution of first-generation crop-derived biofuels such as those made from corn and soy towards a hypothetical future National LCFS; however, we found that this was undermined by increased imports of cheaper used cooking oil-derived biofuels from abroad.[9] That study found that even with a crop-derived biofuel cap in place, total waste oil consumption continued to grow by 2030 and exceeded domestic waste oil availability, thus driving foreign imports of waste oils to produce renewable diesel. That study found that the strongest safeguard was a separate cap for waste oils alongside crop-based biofuels, resulting in the lowest indirect emissions and potential for waste oil fraud, leaving greater room for second-generation alternative fuels to contribute towards the program. A combined lipids cap would have a similar effect to separate food and waste oil caps, as it would limit the use of feedstocks used for renewable diesel production that pose the strongest economic and sustainability risks.

To improve upon the concept of the feedstock cap proposed in the November 2022 workshop, we therefore recommend setting an annual cap on the volume of all lipids eligible for crediting within the LCFS credit market, on an energy basis. By setting a cap on an energy basis, the LCFS would mitigate the various economic and sustainability risks associated with these feedstocks while preserving the incentive to improve their per-MJ carbon intensity. Furthermore, it would support a more balanced portfolio of near- zero carbon fuel pathways such as battery and hydrogen fuel cell electric vehicles and liquid fuel produced from second-generation biomass feedstocks. The annual cap could be based on California's current consumption of lipid-based feedstocks (and be revised annually based on the projected growth in BBD feedstock production. To ensure that California does not consume a disproportionate share of the growth of domestic lipid production, upward revisions to the lipid cap based on the the growth of domestic lipid availability could be adjusted by California's share of the national distillate fuel market, which is currently 7%.[10]

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[8] European Anti-Fraud Office, "The OLAF Report 2019," n.d.; U.S. Attorney's Office Eastern District of Pennsylvania, "Owners Of Lehigh Valley Companies And Their Engineer Charged In Green Energy Fraud Scheme," December 21, 2015, https://www.justice.gov/usao-edpa/pr/owners-lehigh-valley-companies-and-their-engineer-charged-green-energy-fraud-scheme.

[9] Pavlenko, Nikita, Searle, Stephanie, and Christensen, Adam. "Opportunities & Risks for a National Low-Carbon Fuel Standard". (ICCT, 2022). https://theicct.org/publication/low-carbon-fuels-us-mar22/

[10] U.S. EIA, "California Profile," accessed April 6, 2022, https://www.eia.gov/state/print.php?sid=CA.

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Reevaluate LCA Assumptions and Deliverability Requirements for Biomethane Pathways

Over the past five years, the consumption of biomethane has grown significantly in California and is now one of the largest sources of Low-Carbon Fuel Standard (LCFS) credits, generating approximately 14% of 2021 LCFS compliance.[11] This contribution could grow substantially, as some pathways such as dairy biogas are attributed substantial negative emissions under the LCFS for avoided methane. Due to book-and-claim accounting, low-carbon fuels can be produced anywhere in the U.S. and credited under the program without necessarily being used in California's transportation sector. The highly negative CI scores assigned to some pathways generate substantial credits on a per-unit basis, meaning that a relatively small amount of fuel injected into natural gas pipelines throughout the country could generate sufficient credits to crowd out the in-sector use of larger quantities of alternative fuels in-state. Though reducing methane emissions is a laudable goal, it is critical to ensure that the avoided emissions from methane are directly attributable to the LCFS program, not double-counted towards separate regulations, and that these fuels are actually consumed in the transportation sector.

A 2021 petition response from ARB states that the LCFS's avoided methane accounting is important for meeting California's methane targets; however, continuing to credit the deployment of digesters and methane capture outside of California dilutes the program's impact within the state and does not meaningfully reduce California's methane emissions.[12] A recent pathway up for certification provides an excellent illustrative example of the problems with the current LCA accounting and LCFS crediting for these pathways. A hydrogen producer in California has applied to produce hydrogen via steam methane reforming, using natural gas from the common gas grid, while purchasing environmental attributes from a dairy farm injecting biomethane into the Wisconsin gas grid, qualifying for a score below -250 gCO_2e/MJ.[13] However, the farm has been collecting methane on a digester since 2013—long before the application. In effect, the hydrogen producer in California would claim the avoided methane for existing behavior in Wisconsin and could qualify for a highly negative carbon intensity for grid-average natural gas reforming. This

[11] "LCFS Data Dashboard," accessed June 16, 2022, https://ww3.arb.ca.gov/fuels/lcfs/dashboard/dashboard.htm.
[12] Corey, Richard. 2021. "Petition to Exclude All Fuels Derived from Biomethane from Dairy and Swine Manure from the Low Carbon Fuel Standard Program". https://ww2.arb.ca.gov/sites/default/files/2022-01/LCFS%20Petition%20Response%202021.pdf
[13] ARB, 2021. "Staff Summary: FirstElement Fuel, Inc. Fuel Production Facility: Praxair SMR Facility Hydrogen Produced from Renewable Natural Gas" https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/fuelpathways/comments/tier2/B0392_summary.pdf

highlights the two key issues we would like to discuss in more detail below: additionality within the LCA of a fuel, and deliverability.

First, it is critical to re-evaluate the life-cycle assessment approach used to credit avoided methane for some biomethane fuel pathways. While the counterfactual approach (i.e., in the absence of the LCFS) is that the methane would be emitted into the atmosphere, other Californian policies will soon separately mandate a reduction in methane emissions from manure management. The Short-Lived Climate Pollutant (SLCP) Reduction Strategy (SB 1383) mandates a 40% reduction in manure management emissions below the livestock sector's 2013 emissions by 2030. The law requires California Air Resources Board (ARB) to implement regulations to reduce these emissions after 2024 and provides ARB with flexibility on the regulatory tools used to reduce dairy manure emissions, with the LCFS as one of multiple tools to achieve that goal.[14] Before binding regulations are implemented beginning in 2024, ARB's SLCP strategy indicates that agencies "will encourage and support near-term actions by dairies to reduce manure emissions through financial incentives, collaboration to overcome barriers, development of policies to encourage renewable natural gas production, and other market support." SB 1383 also requires that ARB ensures that dairy biogas projects developed prior to the implementation of any methane regulations receive LCFS crediting for at least ten years.

Since enteric fermentation emissions (i.e., methane emissions directly from livestock) is difficult to control, the bulk of the sectoral emissions reductions necessary to reach compliance with SB 1383 will need to come from changes in manure management practices.[15] "Baseline" management practices that may have been suitable prior to 2024 may fall outside what will be standard allowable practices, depending on which specific regulations CARB adopts. For example, one of the first projects to be approved under the LCFS was an open manure lagoon converted to a covered lagoon, with methane capture.[16] It is unlikely that an open lagoon releasing over ~1,000 metric tonnes of methane annually, as in that LCFS application, would be permissible after 2024 after binding methane regulations take effect. Thus, especially after 2024, it is very unlikely that the LCFS will drive the large reduction in methane emissions that manure biogas pathways are currently receiving credit for.

The proposed phaseout date for avoided methane crediting for 2030 presented at the November 2022 LCFS workshop will lock-in substantially more dairy biogas over the lifetime of the program, crowding out other fuel pathways

[14] California Code, Health & Safety Code § 39730.7
[15] California Air Resources Board (ARB), 2017. "Short-Lived Climate Pollutant Strategy." https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf
[16] California Air Resources Board (ARB), 2015. "Method 2B Application CalBio LLC, Dallas Texas Dairy Digester Biogas (Bakersfield, CA) to CNG (Pathway Code: CNG056) "https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/2a2b/apps/calbio-rpt-122115.pdf

necessary for transport fuel decarbonization over the next decade and preserving a large role for biomethane through 2040. The highly negative scores assigned to these pathways will reduce the efficacy of the LCFS and blunt the impact of the proposed 90% CI reduction for 2045. Instead, we recommend phasing out avoided methane emissions within the LCA for newly certified pathways starting in 2024, consistent with the implementation of methane regulations under the SLCP. Starting in 2024, we recommend that newly certified biomethane pathways are assessed based on the regulatory requirements and assumptions of manure management practices consistent with the methane reductions required under outside regulations. We note that phasing out avoided methane emissions for dairy producers in California based on in-state regulations, but not for manure biogas producers in other states, may place Californian dairy producers at a competitive disadvantage with out-of-state producers. To mitigate the economic risks to in-state producers, and align with SB 1383's provision to include "provisions to minimize and mitigate potential leakage", we therefore recommend applying a uniform phase out of the avoided methane leakage to all dairy biogas producers certified under the LCFS.

Re-evaluating the carbon intensity of dairy manure biogas can have a large impact on its estimated GHG savings and value within the LCFS. In a previous working paper on the development of the SLCP regulations, CARB estimates the post-methane regulation emissions of dairy manure-derived biogas to be 13 gCO_2e/MJ.[17] Based on an evaluation of ARB's Tier 1 Calculator for dairy manure-biogas, we estimate its emissions to be range from 30-40 gCO_2e/MJ of fuel when excluding avoided methane emissions.[18] This still represents an approximately 60-70% GHG reduction relative to conventional, petroleum-derived fuels but more accurately reflects the emissions reductions from displacing fossil fuels.

A 2024 phaseout of avoided methane crediting for new projects would balance the commitments to existing biomethane producers with the long-term need to promote second-generation fuels and electrification within the transport sector. A recent ICCT assessment of the California biomethane market estimates that, of the cost-viable dairy biogas producers in-state, 70% are already generating fuel within the LCFS program, as illustrated below in Figure 2.[19] Thus, the largest group of in-state biomethane producers likely to be affected by a reevaluation of avoided methane would be insulated from the change by the 10-year value guarantee under SB 1383. The largest impact of a re-evaluation of the avoided

[17] California Air Resources Board (ARB), 2017. "Short-Lived Climate Pollutant Strategy." https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf

[18] O'Malley, Jane, Pavlenko, Nikita, and Kim, Yi Hyun. "2030 California renewable natural gas (RNG) outlook: resource assessment, market opportunities and environmental performance" (ICCT, In Press)

[19] O'Malley, Jane, Pavlenko, Nikita, and Kim, Yi Hyun. "2030 California renewable natural gas (RNG) outlook: resource assessment, market opportunities and environmental performance" (ICCT, In Press)

methane emissions would fall on out-of-state dairy farms, which have a far larger resource potential than in-state producers, but who would generate credits via book-and-claim without a guarantee that the fuel would be used in California's transport sector.

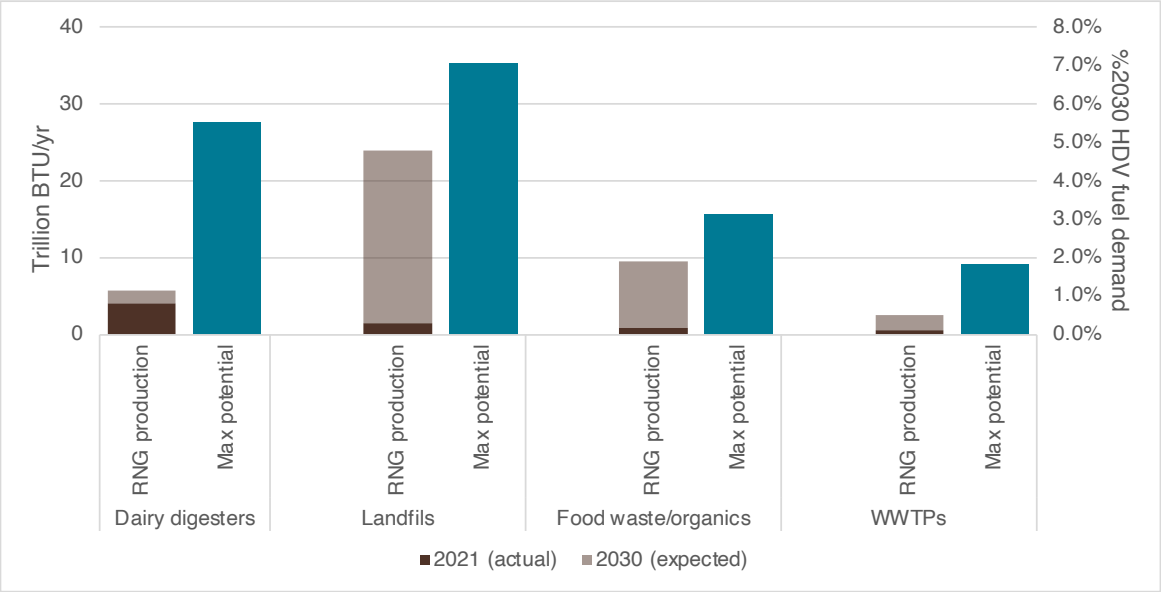

Figure 2. RNG production and maximum potential relative to heavy-duty vehicle fuel demand in California

The proposed alternative explored in scenarios A and B at the November 2022 LCFS workshop to limit the contribution of biomethane produced via book-and-claim accounting to the Western Natural Gas network would improve the effectiveness of the LCFS and better align the deliverability requirements for these pathways with other fuels. However, this would still retain the core problem that the LCFS would be crediting fuels injected into the gas grid in other states without an assurance that the fuels are consumed in the transportation sector. The continued growth of biomethane crediting under the LCFS, driven by fuels produced out-of-state and credited via book-and-claim, could greatly exceed the quantity of natural gas that could be feasibly consumed by California's natural gas vehicle fleet. Already, biomethane consumption credited under the LCFS is already equivalent to 80% of California's transport sector natural gas consumption.[20] If it continues to grow at recent rates, biomethane consumption credited under the LCFS may soon exceed the total quantity of natural gas consumed in California's vehicle fleet, further stretching the credibility of these pathways. Therefore, we recommend limiting further book-and-claim crediting to in-state production only, to better

[20] O'Malley, Jane, Pavlenko, Nikita, and Kim, Yi Hyun. "2030 California renewable natural gas (RNG) outlook: resource assessment, market opportunities and environmental performance" (ICCT, In Press)

align the deliverability of the fuel with other pathways, and to more closely match crediting the LCFS with in-state transport sector natural gas consumption.

Limiting the contribution of landfill biomethane book-and-claim, unless it is used for hydrogen production, as proposed at the November 2022 LCFS workshop, would limit the potential diversion impacts of existing landfill gas electricity generation. ICCT's market assessment of California's RNG resources suggests that landfill biomethane could be the largest source of cost-effective biomethane in the state (See Figure 2 above), but is largely already already utilized for electricity production.[21] Diverting this biomethane to produce RNG for LCFS credits would not only be inefficient and produce a fuel with a higher carbon intensity than electricity, but the emissions reductions under the LCFS would not be truly additional. As with other biomethane pathways, we recommend limiting book-and-claim for landfill biomethane geographically to in-state production.

Expanding the LCFS Obligation to Intra-State Flights

The inclusion of intra-state aviation as an obligated sector in the CATS modeling presented at the November 2022 LCFS workshop could begin to incentivize aviation to reduce its climate impacts, but is too small a share of aviation fuel to drive meaningful changes in the sector. To assess the scale of this obligation, we used ICCT's Global Aviation Carbon Assessment (GACA) model to determine the airport origin, destination, and route distance, as well as emissions attributable to each route, we estimated the composition of California's aviation routes and its 2019 aviation emissions for commercial passenger aviation. Intra-state emissions are approximately 2 million tonnes CO_2, with the bulk of these emissions attributable to flights from 400 to 800 km. However, flights leaving the state comprise approximately 94% of the state's aviation emissions.[22] Depending on emission factors used and the inclusion of non-commercial and freight aviation, approximately 6-12% of emissions attributable to California aviation fall within the intra-state aviation category. In contrast, inter-state domestic aviation emissions contribute approximately 45% of California aviation emissions, a much higher share.

To evaluate the potential future impacts of aviation decarbonization technologies in California, we also assess the potential growth in aviation demand and emissions in California up to 2030. This analysis does not factor in a demand disruption associated with the Covid-19 pandemic. Starting from a 2019 baseline, this analysis assumes a 1.7% annual increase in aviation demand in conjunction with a 0.5% annual efficiency improvement consistent with the

[21] Ibid.

[22] In its GHG Emission Inventory, the California Air Resources Board (CARB) attributes 4.4 million tonnes of CO_2-equivalent emissions (Mt CO_2e) to intrastate aviation. These numbers are based on the sale of aviation fuels and so include non-commercial aviation and freight operations.

Projection of Aviation Carbon Emissions (PACE) model.[23] Assuming that this growth is evenly distributed across routes, we therefore assume that emissions from intra-state flights increase to approximately 2.5 Mtonnes CO_2 and the statewide total increases to approximately 39.3 Mtonnes. Assuming that the demand is met solely through fossil jet fuel, this would be equivalent to approximately 1 and 15.7 billion liters of fossil jet, respectively.

To assess the scale of expanding the LCFS to aviation fuels, we evaluate the potential obligation on fuel suppliers of intra-state fuel volumes through 2035. As shown in Figure 3, starting from a fossil fuel baseline of 89.37 gCO2e/MJ of fuel, the GHG intensity standard for jet fuel (orange line) aligns with the declining standard for diesel (blue line) starting in 2023 and declines to 80.36 gCO2e/MJ in 2030 in the LCFS regulation (assuming the present-day 20% GHG intensity reduction target for 2030). The total deficits for aviation fuels in the program, in units of thousand tonnes CO_2e, are shown in the blue bars.

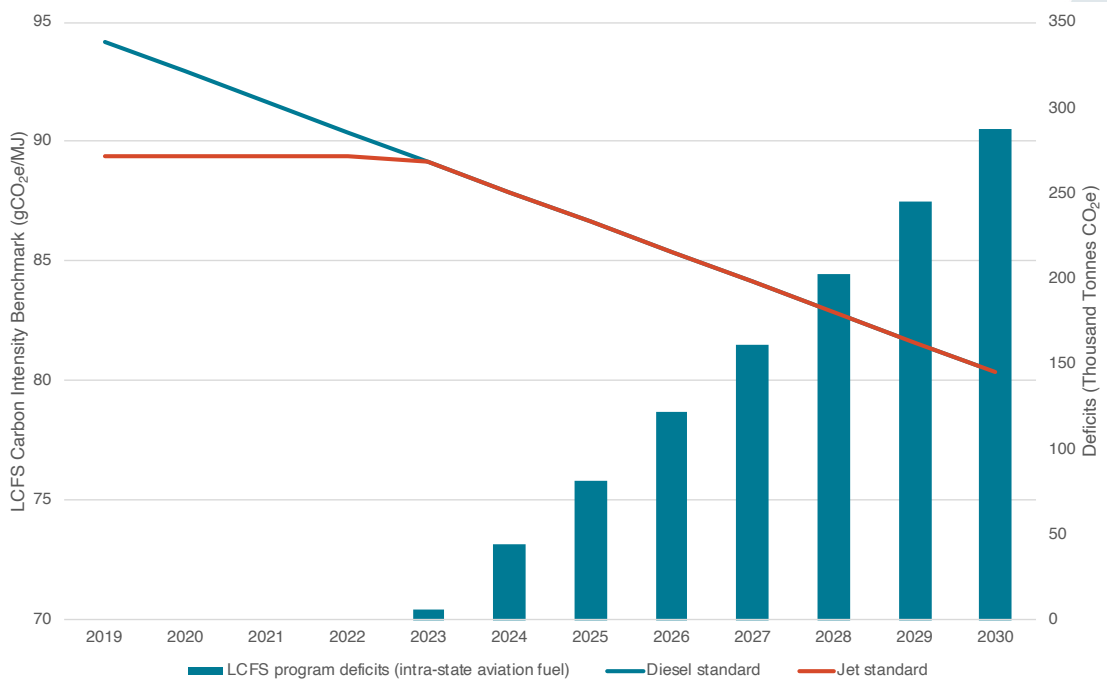

Figure 3. Projected carbon intensity standard for jet fuel and total obligation from fuel consumed for intra-state flights in the California LCFS

We estimate that the LCFS deficits generated by aviation fuel consumed on intra-state flights would grow from approximately 6 thousand tonnes CO_2e in 2023 to over 280 thousand tonnes by 2035, as shown by the blue bars in Figure 3. This would comprise a miniscule share of overall LCFS program obligations in

[23] International Council on Clean Transportation, "Projection of Aviation Carbon Emissions (PACE) Model," https://theicct.github.io/PACE-doc/.

2021, which in total reached 18 million tonnes CO_2e of deficits. Based on 2021 SAF consumption data reported to CARB, the total compliance already achieved from blending SAFs in 2021 would greatly exceed the deficits from expanding the obligation in 2023.[24] By 2025, however, the continued decline in the carbon intensity benchmark, in conjunction with projected growth in intra-state fuel consumption, would necessitate additional fuel blending. Assuming the average carbon intensity of SAFs remains the same as in 2021, the deficits from intra-state aviation in 2030 would necessitate blending approximately 60 million gallons of SAF's, based on the 2021 average certified SAF carbon intensity. However, we note that the deficits may also be offset via other compliance pathways outside the aviation sector, such as those from road biofuel blending or electric vehicle charging. Therefore, the actual delivered volumes of SAF could be lower than the quantity of deficits implies.

Expanding the program to obligate only fuels consumed for intra-state flights would therefore only have a minor impact on the deployment of SAFs from 2023 to 2030. The maximum 60 million gallons of SAF required to offset deficits in 2030 falls far short of the 1.5-billion-gallon target envisioned by California's legislature under AB 1322 or the 20% SAF blending target proposed by the Governor. Greater quantities of SAFs could be generated through either a higher GHG reduction target for the LCFS, or an expansion of the program's obligation to cover a larger share of California's aviation sector. By contrast, we estimate that by expanding the obligation to inter-state flights as well would greatly increase the necessary quantity of SAF to meet the program deficits, generating approximately 2.3 million deficits in 2030, and requiring up to 450 million gallons of SAF to offset—approximately 20% of projected 2030 domestic fuel consumption.

[24] Based on the LCFS dashboard, the average CI of alternative jet fuel was 36.2 gCO2e/MJ and 8.1 million gallons gasoline-equivalents were consumed in 2021, generating approximately 51,000 tonnes CO_2e of LCFS credits.

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