December 21, 2022

Dear Cheryl Laskowski and the LCFS Team,

I am writing these comments on my own behalf as a private citizen and am not being compensated in any way for these comments.

These comments are in reference to the LCFS workshop held on November 9, 2022, and the material posted for that workshop. First, I highly agree with and want to encourage LCFS staff to proceed with developing the following concepts identified in the staff presentation:

- Limit (and ultimately phase out) crop-based biofuels
- Phase out avoided methane crediting for RNG pathways by 2040
- Phase out book-and-claim accounting for landfill gas pathways
- Align deliverability requirements of biomethane with those for low-CI electricity
- Include a provision for medium and heavy-duty ZEV infrastructure crediting
- Remove crediting for forklifts
- Phase out crediting for petroleum projects

Second, I would like to further expand on some of the above concepts and discuss a few additional concepts and concerns relevant to LCFS target setting and credit generation that I believe CARB should consider.

Equity and the LCFS Pass-Through Cost: I would like to reinforce a stakeholder comment made at the November 9 workshop. The costs for any climate program must be borne by someone, and in the case of the LCFS the costs are largely borne by consumers of deficit generating fuels (i.e., fossil gasoline and diesel) through increased prices for these fuels at the pump. The maximum potential increase in pump prices, or maximum pass-through cost[1], can be readily estimated and is proportional to the percentage reduction in target CI and the value of LCFS credits. In the early years of the LCFS program, these pass-through costs are relatively low because the percent CI reduction is small. However, as the percent CI reduction increases over time, each gallon of fossil fuel generates more deficits and the potential cost pass-through increases proportionally. In other words, the LCFS program acts as both a carrot (through credit value generated by low carbon fuels) and a stick (through pass-through cost to high carbon fuels). Over time the program shifts from being more of a carrot to being more of a stick.

As part of the workshop presentation, LCFS staff laid out three alternative CI reduction scenarios with CI reduction targets ranging from 39 to 51% in 2035, 60 to 69% in 2040, and 90% for all three scenarios in 2045. At a fixed $100 credit price that is not indexed for inflation, I

[1] See page 48 of https://www.arb.ca.gov/regact/2018/lcfs18/appe.pdf?_ga=2.36118179.2096732623.1671474299-696531294.1659552010

estimate that these targets would result in maximum pass-through costs of approximately $0.50 per gallon in 2035, $0.75 per gallon in 2040, and $1 per gallon in 2045. These maximum pass-through costs are proportional to credit price, so if the credit price were instead $200, the cost would double. In the extreme at the LCFS credit price cap[2], which is indexed for inflation, the maximum pass-through cost is estimated to be approximately $1.50 per gallon in 2035, $2.50 per gallon in 2040, and $4 per gallon in 2045. As stated previously, this cost is likely to be borne primarily by consumers of gasoline and diesel, which over time are likely to be more and more heavily weighted toward low-income populations (e.g., individuals who cannot readily afford to purchase an EV or who own a single vehicle and are concerned about relying solely on an EV), unless low-income populations purchase EVs at a faster rate than higher income populations. As such, the LCFS has the potential to become more and more regressive over time.

To mitigate the potential regressive nature of the LCFS, I recommend considering the following changes to the program:

- Require all electricity credits generated by utilities (both holdback credits and credits allocated to the Clean Fuel Reward program) to be used for equity projects, thereby helping to ensure that all low-income residents can afford suitable electric mobility options. Based on quarterly reporting by CARB[3], over 2 million credits were generated by utilities for residential EV charging over the past year and this number is expected to grow sharply in response to the Advanced Clean Cars II requirements. Currently the value of these credits is in the hundreds of millions of dollars annually depending on credit price and will likely exceed a billion dollars annually well before 2030. This money could go a long way toward ensuring equitable access to zero emission transportation.
- Allow pre-2011 fixed guideway systems to generate full credits using the fixed guideway EER multiplier. Currently, transit programs generate approximately 240,000 credits annually, much of which is likely for pre-2011 systems. Allowing fixed guideway systems to earn full credits would increase credit generation for these pre-2011 systems by approximately a factor of four. This change will significantly increase LCFS value received by transit authorities and help to provide better and/or cheaper transit service. This regulatory change can also be designed to be approximately market neutral by incorporating the 2010 electricity consumption for fixed guideway systems in the 2010 Baseline CI for the diesel fuel pool, similar to how the 2010 Baseline CI for the gasoline fuel pool includes 2010 ethanol consumption.
- Include conventional jet fuel as a deficit generating fuel under the LCFS. By increasing the pool of deficits, the stringency of the LCFS program will not have to ramp up as quickly, thereby reducing the potential pass-through cost to low-income consumers of

[2] Estimated as $239 in 2022 and indexed for assumed inflation of 7% in 2022 and 2% for all subsequent years through 2045

[3] https://ww2.arb.ca.gov/sites/default/files/2022-10/quarterlysummary_103122_1.xlsx

fossil fuels. Moreover, since use of aviation is weighted toward wealthier populations, the pass-through cost to aviation by including conventional jet fuel as a deficit generator will be borne primarily by wealthier individuals.

- Limit, quickly phase-out, or simply eliminate credit generation that is no longer necessary to help California transition to zero emission fuels and achieve its long-term climate, air quality, and equity goals. By reducing the eligible pool of credit generation, the stringency of the program will not have to ramp up as quickly to achieve desired outcomes, thereby reducing the potential pass-through cost to remaining low-income consumers of fossil fuels. Credit generation opportunities that I would include in this category are direct air capture projects, petroleum projects, electric forklifts, book-and-claim accounting for landfill gas, and crediting for crop-based biofuels.

Remove Enhanced Oil Recovery (EOR) as an Eligible Sequestration Method: California SB 1314 prohibits the use of EOR as a sequestration method for CCS projects in California. Section 1 of SB 1314 reads "The Legislature finds and declares that the purpose of carbon capture technologies, and carbon capture and sequestration is to facilitate the transition to a carbon-neutral society and not to facilitate continued dependence upon fossil fuel production." Out of consistency, I highly encourage the LCFS team to remove EOR as an eligible sequestration method under the LCFS for out-of-state CCS projects. CO_2 EOR is a tertiary oil production method that is only used when oil field production has declined significantly using less costly production methods. As such, use of EOR results in the recovery of oil that otherwise would not be produced. The LCFS program should not be providing additional incentive to enable continued production of oil from these fields. Let's leave this oil in the ground!

Prohibit Double Counting of Emission Reductions where "Stacking" is not Explicitly Allowed in the LCFS Regulation: The LCFS program has traditionally allowed stacking of credit value with value from other programs such as the federal Renewable Fuel Standard, the Biodiesel Blenders Tax Credit and the California Cap and Trade program. Allowable stacking of value should be explicitly called out in the regulation, and if not specified should not be allowed. For example, developers of direct air capture (DAC) projects should not be allowed to generate LCFS credits for emission reductions that they have or intend to sell to companies in the voluntary market.[4] Similarly, developers of fuel pathways or DAC projects using EOR sequestration should not be allowed to generate LCFS credits if they also intend to market the crude oil produced using EOR as "low carbon or carbon neutral".[5] These are two obvious instances of potential double counting of emission reductions that should be prohibited. If CARB believes that double-counting or stacking should be allowed in certain circumstances (such as stacking of value with the Renewable Fuel Standard or with the Section 45Q tax credit for CCS), then this allowance

[4] 1PointFive announces agreement with Airbus for the purchase of 400,000 tonnes of carbon removal credits (oxy.com)

[5] Oxy Low Carbon Ventures, together with Macquarie, Deliver World's First Shipment of Carbon-Neutral Oil

should be discussed through the public rulemaking process and explicitly called out in the regulation.

Address the Elephant in the Room – Potential Credit Generation by DAC and BECCS Hydrogen Projects: The recently approved Scoping Plan relies upon significant quantities of carbon dioxide removal from DAC and BECCS hydrogen projects to achieve carbon neutrality. Modeling results released publicly for the Scoping Plan show 31, 57, and 73 MMT of CO_2 removal using DAC and BECCS in years 2035, 2040, and 2045 respectively.6 Since the LCFS program allows DAC and BECCS hydrogen projects to generate credit if the project sequesters the CO_2 using an approved method and the hydrogen is used in transportation, one should expect these projects to generate similar quantities of LCFS credits. However, credit generation of this magnitude would overwhelm the LCFS market. Using gasoline and diesel fuel demand data from the Scoping Plan modeling together with proposed LCFS compliance targets from this workshop, I estimate that the LCFS will generate less than 60 MMT of deficits annually in the year 2035 with declining deficits thereafter. Therefore, based on Scoping Plan assumptions, DAC and BECCS hydrogen projects could generate over 50% of credits necessary to achieve LCFS compliance in 2035 and well over 100% of credits necessary for compliance in 2040 and 2045. This must be addressed – either the LCFS CI targets must rapidly decline and even become negative prior to 2040 to accommodate expected credit generation from these projects or credit generation for these projects must be limited and/or phased out over time. I strongly recommend that CARB consider limiting credit generation from these projects and DAC projects in particular. While I am not opposed to using a limited quantity of LCFS credits to jump-start DAC technology, the long-term use of LCFS monetary value derived from the pocketbooks of California consumers should be focused on projects that transition California transportation away from fossil fuels, not on LCFS "offset credits" that are not tied to this transition and largely allow for continued fossil fuel use.

Limit crop-based biofuels: As mentioned in comments that I previously submitted as part of the draft 2022 Scoping Plan process[7], I highly encourage the LCFS team to restrict and ultimately phase-out the use of crop-based biofuels for several reasons. First, based on modeling conducted by the LCFS team as part of the 2015 rulemaking[8] as well as in more recent academic research[9], emissions associated with producing crop-based biofuels are highly uncertain and may, in fact, be greater than fossil fuels on a full life cycle basis. Second, when one considers the stacking of value from the federal Renewable Fuel Standard and Biodiesel Blenders Tax Credit with the LCFS value, these fuels are very expensive with a GHG cost effectiveness that can exceed $600 per metric ton of GHG emission reduction, a value greatly exceeding

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[6] https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-PATHWAYS-data-E3_0.xlsx

[7] I am submitting the following comments and associated references to the LCFS team https://www.arb.ca.gov/lists/com-attach/4303-scopingplan2022-VDdVPAZqVGoAY1U7.pdf as part of this comment letter.

[8] https://ww3.arb.ca.gov/regact/2015/lcfs2015/lcfs15appi.pdf

[9] Lark et al., Environmental outcomes of the US Renewable Fuel Standard, PNAS 2022 Vol. 119 No. 9.

reasonable estimates for the social cost of carbon. Third, the increase in agricultural commodity prices resulting from diverting crops to produce these fuels[10] [11] further exacerbates tropical deforestation[12] and global hunger[13] and results in increased application of fertilizers[14] (and the negative environmental impacts associated with producing and applying additional chemical fertilizers). Fourth, if the rest of the world follows California's example, the demand for virgin vegetable oil will be enormous, exceeding the current worldwide production of all vegetable oils several times. Because of these issues, the European Union has taken steps to restrict the use of biofuels produced from food and feed crops, and mainstream environmental organizations such as International Council on Clean Transportation and the Union of Concerned Scientists as well as UC Davis Institute for Transportation Studies are urging CARB to limit the use of vegetable oil-based biofuels under the LCFS. Promoting the use of these fuels is not in line with California's role as a global leader in environmental policy.

Several stakeholders speaking at the workshop wrongly pointed out that the land use change (LUC) CI penalty for crop-based biofuels in the LCFS addresses each of these issues and therefore CARB does not need to impose any additional limits. The modeling used by CARB to estimate LUC emissions predicts that diversion of crops to biofuels results in an increase in agricultural commodity prices (relative to the counterfactual without crop-based biofuel production), which in turn results in several market-mediated impacts including land use change, less worldwide food consumption, and improved agricultural yields resulting from among other things increased fertilizer use (again relative to the counterfactual without crop-based biofuel production). The LCFS LUC CI focuses entirely on the LUC component and does not account for emissions or other environmental problems associated with improving yields worldwide through increased fertilizer use, nor does it incorporate any disincentive to prevent negative food consumption impacts. According to Tom Hertel, professor at Purdue University and author of several studies on LUC impacts of biofuels (including original modeling work performed for CARB's LCFS), "reduced food consumption is an important market-mediated response to increased biofuels production. While lower food consumption may not translate directly into nutritional deficits among wealthy households, any decline in consumption will have a severe impact on households that are already malnourished".[15] Furthermore, Hertel et al. find that holding food consumption constant in the GTAP model (instead of allowing food consumption to decrease as is done in the LCFS modeling) results in twice as much forest conversion to agriculture and an increase in LUC emissions of more than 40%. In a more recent

[10] See Economics of Biofuels | US EPA

[11] See The impact of the U.S. Renewable Fuel Standard on food and feed prices (theicct.org)

[12] Feng, et al., Doubling of annual forest carbon loss over the tropics during the early twenty-first century, Nature Sustainability, 5, pages444–451 (2022)

[13] Hertel et al., Effects of US Maize Ethanol on Global Land Use and Greenhouse Gas Emissions: Estimating Market-mediated Responses, Bioscience, Vol. 60 No. 3, 2010.

[14] Lark et al., Environmental outcomes of the US Renewable Fuel Standard, PNAS 2022 Vol. 119 No. 9.

[15] Hertel et al., Effects of US Maize Ethanol on Global Land Use and Greenhouse Gas Emissions: Estimating Market-mediated Responses, Bioscience, Vol. 60 No. 3, 2010.

study, Lark et al. show that agricultural commodity prices increased by 20 to 30% and overall use of fertilizer in the United States alone increased by 3 to 8% in response to the corn ethanol mandate in the Renewable Fuel Standard. They did not attempt to estimate the increase in fertilizer use outside of the U.S., but international fertilizer use is expected to increase as well in response to increased agricultural commodity prices. Emissions associated with producing and applying this incremental quantity of fertilizer are not included in indirect effects modeling for the LCFS.

Because we have only one chance to address climate change, I highly encourage CARB to incorporate a risk-based framework into the LCFS and limit the use of crop-based feedstock for biofuel production. The LCFS mechanism currently assumes that CI values (and inputs used to estimate these values) can be determined accurately and precisely for all fuels and does not acknowledge that the CI values for some fuels, such as fuels produced from crop-based feedstocks, are much more uncertain than for other fuels, such as electricity. Moreover, the LCFS completely ignores non-GHG emissions impacts of fuel production and consumption, such as criteria pollutant emissions, biodiversity impacts, and food consumption impacts. Risk-based frameworks are used in many market-based programs including financial markets where different organizations, governments, and investment products receive quality ratings and are binned separately based on these ratings. A similar framework could be used under the LCFS to account for uncertainty in estimating GHG emissions as well as large differences in non-GHG impacts of different alternative fuels.

Thank you for this opportunity to comment!

Best regards and Happy Holidays!

Jim Duffy