



March 15, 2023

Cheryl Laskowski, Ph.D.
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: Comments on the February 22, 2023 Public Workshop to Discuss Potential Changes to the Low Carbon Fuel Standard

Dear Dr. Laskowski:

Thank you for the opportunity to comment on the February 22, 2023 Public Workshop to Discuss Potential Changes to the Low Carbon Fuel Standard (LCFS). The LCFS is one of the most powerful climate change policies in the world, and it uniquely supports a wide array of innovative low carbon fuel production pathways. This can include pathways that significantly reduce emissions of N₂O, such as projects that Ductor develops. We encourage you to strengthen the program through the amendment process to ensure it continues playing this unique role – delivering deep emission reductions from expected, and unexpected, sources. In particular, we offer the following recommendations:

- Strengthen carbon intensity reduction requirements to align with levels needed to achieve outcomes in the 2022 Final Scoping Plan, including a target of at least 35% carbon intensity reduction by 2030.
- Include a step-change in carbon intensity in 2024 to account for the current oversupply of credits and develop a one-way ratchet mechanism to provide certainty needed to develop new, low carbon fuel pathways, capture additional opportunities for carbon intensity reductions, and ensure the strength of the program on an ongoing basis.
- Avoid changes to biogas pathway crediting that lead to high credit price spikes, including reducing book-and-claim opportunities for out-of-state biogas, which provides an important source of fuel and credits under the program.
- Should CARB restrict book-and-claim of biogas, allow biogas to provide book-and-claim energy for all zero emission vehicle fuels equally (hydrogen production and electricity production) and as process energy to other fuel pathways.
- Ensure that avoided N₂O emissions are fully and completely valued in the program and calculators.
- Update the Tier 1 calculator for dairy and swine manure to apply to all manure pathways, including biogas from poultry manure, and ensure accounting includes avoided N₂O emissions and beneficial byproducts like organic and sustainable fertilizers.



About Ductor

Ductor started in 2009 with the ambitious aim to create a solution that would help solve today's environmental challenges in the energy and agriculture sector. Today we build, own, and operate microbiological turnkey facilities, turning waste from the agricultural sector into sustainable fertilizers and biogas. With two plants in Mexico and Germany and numerous projects in the pipeline, we are living up to our purpose, and unlocking bio-resources to make food sustainable, and energy clean.

Ductor's technology transforms nitrogen-rich organic waste streams from agriculture, aquaculture and other organic sources into energy and fertilizers. We specialize in wastes that cannot be used directly in conventional biogas production processes, such as anaerobic digestion. These wastes are fed into the Ductor reactor where a patented consortium of microorganisms converts them via fermentation into organic and sustainable, liquid nitrogen fertilizer and biogas. The remaining digestate is also upgraded into fertilizing and soil improving products.

Ductor's technology targets the poultry sector, which is growing globally to meet the increasing demand for poultry meat and egg products. Driven by population growth, urbanization and rising incomes, global per-capita consumption of poultry meat increased from 3.1 kg to 15 kg between 1964 and 2013, while global per-capita consumption of eggs grew from 4.7 kg to 9.2 kg. The poultry sector generates a large quantity of litter, which consists of a mixture of manure, waste bedding, waste food and feathers. The amount of litter depends on the frequency of the removal of litter, which varies from country to country. According to USDA, in the United States, as much as 1.4 billion tons of manure is produced by the 9.8 billion heads of livestock and poultry produced yearly. Due to growing environmental and social concerns associated with the storage and land spreading of poultry litter and its associated emissions, alternative treatment options are becoming attractive.

Strengthen carbon intensity reduction requirements to at least a 35% carbon intensity reduction by 2030.

We support proposals to strengthen the carbon intensity reduction targets in the near, mid and long-terms under the program, to ensure the LCFS continues to serve as a driver of innovation and necessary project development. In particular, we encourage CARB to fully evaluate carbon intensity reductions that align with levels needed to achieve the outcomes in the Final 2022 Climate Change Scoping Plan (Scoping Plan), both in 2030 and through 2045, and set carbon intensity reduction standards no lower than those necessary levels.



We have little doubt that such an analysis would suggest targets of greater than the 30% reduction by 2030 level modeled by staff. Given that transportation fuel pathways are responsible for more than half of the state's greenhouse gas emissions, we expect such an analysis would likely suggest targets in-line with California's 40-48% economy-wide reduction target for 2030. We also anticipate that such an analysis would suggest carbon intensity reductions of greater than 90% by 2045, and likely greater than 100% by 2045, given the significant levels of carbon removal identified as necessary to achieve carbon neutrality in California and the likely role the LCFS will play in supporting those projects.

We note that CARB staff has consistently stated its intent to align the LCFS amendments with the Final Scoping Plan, even delaying the rulemaking to do so, and we suggest the most important element to align are carbon intensity targets with carbon reduction targets in the Scoping Plan. If, for whatever reason, CARB is reluctant to set carbon intensity reduction targets at that 40-48% level to align with the Scoping Plan, we encourage adopting the 35% reduction target and other assumptions identified in Scenario C at the November workshop as the minimum required carbon intensity by 2030.

Maintain ongoing program strength with a step-change in carbon intensity reductions in 2024 and a one-way ratchet mechanism to strengthen carbon intensity targets as needed.

We were encouraged by recognition at the workshop that a step-change in program stringency in the near-term is needed to strengthen the program. We fully agree. We encourage CARB to include a step change in program stringency in 2024 to address the current credit bank and to encourage more rapid project development, including for biogas projects needed to deliver reductions in potent short-lived climate pollutant and N₂O emissions.

We also strongly support development of a one-way ratchet mechanism, to ensure the current challenges in the market do not reappear, account for ongoing innovation in the market and unforeseen pathways entering the program, such as those Ductor proposes, and to support compliance and alignment with the Scoping Plan – especially if baseline targets are set at levels less than those needed to achieve a 48% reduction in greenhouse gas emissions below 1990 levels by 2030.

Finally, we were surprised by the cost modeling presented at the workshop. We request that CARB provide more information on the modeling results, including marginal fuel pathways and their cost curves, and in an accessible way, besides the Python files. We expect such high prices in the 2030 timeframe could come from a number of factors, including those below, but the following is speculation without additional information:

- The model does not include all fuel pathways, including biogas from poultry manure, and therefore underestimates available credit supplies,



- The model may not include a complete representation of national – and as applicable, global – supplies of low carbon fuels that may be available for California and would be able to support consistent, expanding low carbon fuel markets across the country as others adopt programs similar to California’s LCFS,
- The model may not completely represent value from the federal Renewable Fuel Standards or other subsidies,
- The model may underestimate zero emission vehicle (ZEV) adoption, including current and near-term light-duty ZEV sales and expected vehicle deployment under the proposed Advanced Clean Fleets regulation,
- The model may not completely include opportunities for petroleum-based crediting, and may overestimate costs associated with those pathways,
- The model may underestimate carbon intensity reductions likely under the program:
 - For example, adjusted carbon intensities for electricity *increase* in the near term,
 - Negative-carbon electricity and hydrogen pathways may not be included in the modeling until 2040, and only appear to come from dairy biogas projects, rather than other potential negative carbon pathways like poultry manure or digestion of landfill-diverted organic waste,
 - Carbon capture and sequestration may not be represented on all pathways where it may apply and be attractive under federal 45Q incentives, including biogas pathways, and
 - Other innovations that will likely lead to continual incremental reductions in carbon intensity from all pathways, as has happened historically, and
- The model may assume certain pathways are unavailable before 2030 or include other constraints before 2031 that lead to a run-up in prices by 2030 that quickly dissipates afterwards.

Avoid changes to biogas pathway crediting that lead to high credit price spikes

While we are surprised by the cost results on an absolute basis, and encourage CARB to provide further information for stakeholders to evaluate and to support further understanding of the modeling, regardless – the modeling illuminates the potentially significant economic impact associated with proposals to restrict biogas pathways. In particular, the modeled costs show high price spikes spanning proposed restrictions on book-and-claim accounting of biomethane in 2028, and in the lead up to the proposed phase out of avoided methane crediting in 2040. Of course, these absolute prices would not materialize, given the price cap in the program, but relatively speaking, prices spike by about 67% from 2027-2030, right around when book-and-claim accounting is restricted in 2028, and by 40% in the runup to phasing out avoided methane and petroleum projects crediting in 2040.



Notably, biomethane appears to disappear from the transportation market between 2025 and 2030 (slides 50 and 51), while modeled credit prices *more than triple* over the same time period. New restrictions on book-and-claim accounting for biomethane in 2028 may not be entirely responsible for these results, but they are certainly an important contributing factor. Biomethane is responsible for a growing fraction of credits under the program, generating 14% of credits in 2021 (most recent data available).¹ Eliminating this significant source of credits to the program will certainly have important cost impacts on the market, potentially reaching several billion dollars annually, based on the modeling results presented.

Should restrictions be imposed on book-and-claim, provide equal treatment for ZEV fuels and allow book-and-claim for biomethane-to-electricity pathways

We strongly oppose any restrictions to book-and-claim accounting of biomethane pathways, especially in light of the potentially significant cost to the market that this would impose, as indicated by the modeling. However, we understand that this is something CARB appears to be considering.

Therefore, should restrictions on book-and-claim accounting for biomethane be imposed on CNG pathways, we support enabling book-and-claim for hydrogen pathways, as proposed. We also strongly urge CARB to allow book-and-claim accounting for biomethane used in power plants to generate electricity for electric vehicles, in order to maintain consistent treatment among zero emission vehicle (ZEV) fuels. This aligns with CARB practice to treat hydrogen fuel cell and electric vehicles equitably in vehicle regulations, and indeed in the LCFS itself, through provisions such as capacity crediting. We also encourage CARB to consider enabling book-and-claim eligibility for biomethane for process energy for all other transportation fuel pathways, which would help to align with Scoping Plan and other stated goals to increasingly shift biomethane use to the industrial sector.

Ensure avoided N₂O emissions are fully valued in the program and calculators

As you undoubtedly appreciate, the LCFS is one of the only – and the most powerful – policies in the world to reduce potent short-lived climate pollutant emissions from the agricultural and waste sectors. This has been clearly demonstrated through the success in the dairy industry in rapidly developing projects in response to the LCFS's strong market signal, delivering significant and rapid methane reductions from a source that would otherwise likely go unaddressed. The use of book and claim accounting magnifies these benefits and emissions reductions from these most potent pollutants – expanding the reach and benefits of California's LCFS. It also increases the availability and use of renewable natural gas in California and displaces fossil natural gas, which comes almost entirely from out-of-state sources itself.

¹ LCFS Data Dashboard, Figure 2. <https://ww2.arb.ca.gov/resources/documents/lcfs-data-dashboard>



Rather than making changes to this successful model, which would appear to impose significant costs as described above, CARB should build on it to achieve even greater emissions reductions from some of the hardest to reach sources and sectors, including N₂O from poultry waste. Like SCLPs, N₂O is a potent climate forcer, but as a long-lived gas, may pose even greater problems than methane, which dissipates from the atmosphere in about 12 years. N₂O has a 100-year global warming potential (GWP) of 273, meaning it is 273 times worse for climate over 100 years than CO₂ and about 10 worse than even methane.² Every molecule of N₂O emitted today will stay in the atmosphere for over 100 years, posing an ongoing, lingering climate change challenge.

The Scoping Plan acknowledges the challenge posed by N₂O, yet proposes little to address it. For example, the Scoping Plan notes:³

In addition to SLCP emissions, some remaining non-combustion emissions are anticipated to persist in the coming decade... These include CO₂ from industrial processes such as cement manufacturing, oil and gas extraction, and geothermal electric power; N₂O from wastewater treatment, fertilizers, and livestock manure applied to agricultural soils; and other industrial, non-HFC GHG emissions.

Per the Scoping Plan, CARB expects essentially zero reduction in N₂O emissions from agriculture through 2045, *meaning emissions from N₂O in agriculture could represent a bigger source of emissions than energy-related emissions from buildings, industry or the power sector.*⁴

Yet, these emissions can be addressed. Ductor and others are committed to developing projects to address agricultural N₂O, and the LCFS provides the best – and perhaps only – scalable program to support these projects. We strongly encourage CARB to maintain a strong market signal and rules that allow these projects to move forward and address emissions from this potent source.

That means continuing to allow book-and-claim accounting for biomethane and including avoided N₂O emissions accounting in biomethane pathways. We are opposed to proposals to limit book and claim accounting for biomethane and concerned that limiting accounting for avoided methane emissions could set a dangerous precedent that could limit investment in projects relying on avoided emissions accounting for N₂O, as well.

² <https://www.epa.gov/ghgemissions/understanding-global-warming-potentials>

³ Final Scoping Plan, pg. 240. <https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp.pdf>

⁴ Per Figure 4-19 in the Scoping Plan, agricultural N₂O accounts for about 7 MMTCO₂e/year now through 2045. By 2045, energy-related emissions in the electrical power, industrial and residential and commercial sectors are all less than 7 MMTCO₂e/year. <https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-PATHWAYS-data-E3.xlsx>



In order to avoid this perverse outcome, we encourage CARB to clarify that avoided N₂O emissions will be fully included in Tier 1 and Tier 2 pathway applications, and that any changes to avoided methane crediting will not impact crediting for avoided N₂O emissions.

Update the Tier 1 calculator for dairy and swine manure to apply to all manure pathways, including biogas from poultry manure.

Finally, while we plan to comment separately on the revised Tier 1 calculators, we encourage CARB to include all manure pathways in the Tier 1 calculator currently designed for dairy and swine manure. In particular, we encourage CARB to include biogas from poultry manure in the Tier 1 calculator, and to ensure the calculator accounting includes avoided N₂O emissions and the emissions benefits from beneficial byproducts like organic and sustainable fertilizers. This addition will make it straight forward to develop new, manure- and agricultural-based LCFS pathways, support improved greenhouse gas reductions and lower program costs, and help to align with the Scoping Plan.

Conclusion

Thank you again for the opportunity to comment on the workshop. We support CARB maintaining a strong LCFS program so that it may continue serving as a driver of innovation and greenhouse gas reductions, including from pathways that will serve to address one of the most potent and intractable climate change challenges – N₂O emissions.

We look forward to seeing additional information on the modeling and participating in future discussions regarding amendments to the LCFS and topics presented at the workshop. Please do not hesitate to reach out if you have any questions about Ductor or these comments.

Sincerely,

Bernard C. Fenner
CEO Ductor Corporation, President Ductor Americas, LLC

Ductor Americas, Inc
1200 18th Street NW
Suite 700
Washington, District of Columbia
20036