



February 16, 2024

Matthew Botill  
California Air Resources Board  
1011 I Street  
Sacramento, CA 95814

**Subject: Comments on the Proposed Low Carbon Fuel Standard Amendments**

Dear Mr. Botill:

Thank you for the opportunity to comment on the Proposed Low Carbon Fuel Standard (LCFS) Amendments and updated Life Cycle Analysis (LCA) and Documentation. The LCFS is one of the most powerful climate change policies in the world, uniquely supporting a wide array of innovative, low-carbon fuel production pathways. Its success has proven a model for similar programs that are emerging in other states and countries. We strongly encourage the California Air Resources Board (CARB) to amend the program in a manner that protects and builds on its successful, technology-neutral and science-based approach to ensure the program continues to drive innovation and greenhouse gas reductions for decades into the future.

Ductor offers the following high level comments, which are elaborated on further below. Additionally, we appreciate the opportunity to comment on the updated lifecycle analysis models and documentation, including revised Tier 1 calculators, which we will comment on separately.

- The LCFS has proven one of the most powerful programs in the world for reducing potent short-lived climate pollutants. It can similarly be applied to reduce even more potent nitrous oxide (N<sub>2</sub>O) emissions, which have yet to be addressed in California's otherwise comprehensive climate change framework. **We encourage CARB to leverage the LCFS to account for avoided N<sub>2</sub>O emissions and enable reductions from this potent source of greenhouse gas emissions.**
- Protecting technology neutrality and enabling innovation is central to the success of the LCFS. **We recommend minor changes to clarify provisions related to biogas pathways from poultry litter.** This includes:
  - **Creating a definition of "waste" that includes poultry litter,** including from layer, broiler, and turkey operations.
  - **Clarifying language related to crediting for avoided methane emissions** from manure and organic waste pathways.
  - **Adding language to clarify applicability of crediting for avoided N<sub>2</sub>O emissions for organic waste pathways.**

- Avoided methane crediting and book-and-claim access for biogas projects are central to enabling biogas projects and associated emissions reductions. **We urge CARB to avoid restricting avoided methane crediting or biogas book-and-claim accounting in the program.**
- The proposed targets and structure of the auto acceleration mechanism (AAM) are insufficient to reverse the accumulation of credits in the market. We urge 15-day changes that would:
  - **Increase the stringency of the step down** to levels needed to restore healthy market conditions,
  - **Apply the step down as soon as the regulation takes effect** (e.g., Q3 2024),
  - **Increase the 2030 target to levels needed to achieve the state's climate change goals, and no less than 40%**, and
  - **Move the AAM forward a year and remove the restriction against applying it in consecutive years.**

## About Ductor

Ductor was founded in 2009 with the ambitious aim of creating a solution that would help solve today's environmental challenges in the energy and agriculture sectors. Today, we build, own, and operate turnkey microbiological facilities, turning organic resources 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 resources from agriculture, aquaculture, and other organic sources into energy and fertilizers. We specialize in feedstock that cannot be used directly in conventional anaerobic digestion and biogas facilities. This feedstock is fed into the Ductor pre-process, where an IP-protected consortium of microorganisms and the IP-protected Ductor process converts them via fermentation and subsequent ammonia recovery into organic and sustainable liquid nitrogen fertilizer. The feedstock is further processed via anaerobic digestion to generate biogas, which is upgraded to pipeline quality. The digestate is further processed into additional fertilizing and soil-improving products.

Ductor's technology targets the poultry sector, which is growing globally to meet the increasing demand for 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 consisting of manure, egg wash water, 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 the USDA, as much as 1.4 billion tons of manure is produced annually by the 9.8 billion head of livestock and poultry in the United States. Sustainable and alternative treatment options for this growing waste stream are needed to address environmental and emissions impacts associated with poultry litter management, storage, and land application.

## **Reducing N<sub>2</sub>O emissions a missing piece of California’s climate framework, should be supported through LCFS**

California has correctly emphasized targeted efforts to reduce emissions of methane and other potent short-lived climate pollutants,<sup>1</sup> and has recognized the LCFS as a critical element to achieving these reductions in the agricultural sector.<sup>2</sup> Yet very little has been done to address even more potent N<sub>2</sub>O emissions. While methane is about 30 times more potent than CO<sub>2</sub> over 100 years,<sup>3</sup> for example, N<sub>2</sub>O is about 10 times worse still – about 300 times more potent than CO<sub>2</sub> over 100 years. Methane, as a short-lived climate pollutant, dissipates from the atmosphere in about a decade, but N<sub>2</sub>O is a long-lived gas whose potent warming impacts will persist for over a century once it reaches the atmosphere.

The majority of N<sub>2</sub>O emissions in California comes from the agricultural sector (specifically, fertilizer use/soils and manure management),<sup>4</sup> and according to the 2022 Climate Change Scoping Plan, CARB envisions few if any N<sub>2</sub>O emissions reductions through mid-Century.<sup>5</sup> In fact, the Scoping Plan modeling shows agricultural N<sub>2</sub>O becoming one of the largest sources of greenhouse gas emissions in the state in the future.<sup>6</sup> Fortunately, agricultural N<sub>2</sub>O emissions can be readily addressed through improved manure management practices (especially at egg laying and poultry farms) and greater use of sustainable agricultural practices, including the use of renewable fertilizers, organic farming, and other strategies.

The state can enable significant reductions in agricultural N<sub>2</sub>O emissions by accounting for avoided N<sub>2</sub>O emissions in LCFS pathways and taking additional steps to support markets for renewable fertilizers and organic agriculture.

There is already a precedent for considering N<sub>2</sub>O emissions within LCFS pathways. CARB currently accounts for avoided N<sub>2</sub>O emissions associated with composting food scraps in their Tier 1 Organic Waste (OW) calculator. Excluding similar considerations for agricultural feedstocks appears arbitrary, especially given the critical role N<sub>2</sub>O emissions play in the agricultural sector.

## **Clearly support poultry-based pathways in the LCFS**

California has more than 10 times as many head of poultry (egg laying hens, broiler chickens and turkeys) than dairy cows and more than 200 times more poultry head than swine.<sup>7,8</sup> Yet, while the LCFS acknowledges dairy and swine pathways, it does not currently reference poultry-based pathways. Biogas pathways from poultry litter provide significant opportunity to support additional biogas supplies, while serving to improve nitrogen management associated with

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<sup>1</sup> CARB (2017) Final Short-Lived Climate Pollutant Reduction Strategy, California Air Resources Board, March.

<sup>2</sup> CARB (2022) Analysis of Progress toward Achieving the 2030 Dairy and Livestock Sector Methane Emissions Target, California Air Resources Board, March.

<sup>3</sup> And more than 80 times worse than CO<sub>2</sub> over 20 years.

<sup>4</sup> [https://ww2.arb.ca.gov/sites/default/files/2023-12/ghg\\_inventory\\_scopingplan\\_2000-21n2o.pdf](https://ww2.arb.ca.gov/sites/default/files/2023-12/ghg_inventory_scopingplan_2000-21n2o.pdf)

<sup>5</sup> CARB (2022) 2022 Scoping Plan for Achieving Carbon Neutrality, California Air Resources Board, December.

<sup>6</sup> For example, compare Figures 2-5 and 4-19 in the 2022 Scoping Plan.

<sup>7</sup> <https://www.statista.com/statistics/196085/top-us-states-by-number-of-chickens/>

<sup>8</sup> [https://www.nass.usda.gov/Quick\\_Stats/Ag\\_Overview/stateOverview.php?state=CALIFORNIA](https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=CALIFORNIA)

poultry operations. These pathways support efforts to address water quality issues and reduce potent N<sub>2</sub>O emissions, while also reducing methane and creating new supplies of renewable fertilizers to support organic farming, broader sustainable agricultural practices, and additional N<sub>2</sub>O reductions from crop management and soils.

While poultry-based pathways (Figure 1) and avoided N<sub>2</sub>O emissions are included in the GREET 4.0 model,<sup>9</sup> they are not referenced in the regulation or regulatory documents. Directly incorporating poultry litter-based pathways, avoided N<sub>2</sub>O emissions, and renewable fertilizer co-products into the regulation will clarify the opportunity for poultry-based pathways and allow these projects to come on-line more quickly in support of the state’s climate change and environmental goals. Specifically highlighting N<sub>2</sub>O emissions will provide an important signal that the state is committed to reducing these emissions, alongside other greenhouse gas emissions.

1.3) Assumptions for Anaerobic Digestion of Animal Waste  
Source of Assumptions: U.S.

U.S.	Beef	Dairy Cow	Dairy Heifer	Swine	Layer	Broiler and Turkey
Share of Livestocks	0.0%	0.0%	0.0%	0.0%	75.0%	25.0%

**Figure 1.** Snapshot of CA GREET4.0 RNG Tab. The yellow cells indicate inputs. A red box is drawn around “Layer” (poultry), and “Broiler and Turkey” livestock categories.

Accordingly, we urge CARB to consider minor changes to clarify and elevate opportunities for these pathways, including the following:

- Create a definition of “waste” to clarify the new definition of “organic waste.”<sup>10</sup> The definition of waste should be broad enough to include animal wastes and manures. Waste could refer to materials with limited immediate use, requiring disposal, originating from forestry, agriculture, livestock, municipalities, or industries.
- Ensure equal treatment for all organic waste pathways as it relates to avoided methane crediting and align the regulation with the organic waste Tier 1 calculator, which includes credit for avoided N<sub>2</sub>O, with the following changes to § 95488.9:

(f) Carbon Intensities that Reflect Avoided Methane and Nitrous Oxide Emissions from Dairy and Swine Animal Manure or Organic Waste ~~Diverted from Landfill Disposal~~.

(1) A fuel pathway that utilizes biomethane from ~~dairy cattle or swine animal~~ animal manure digestion may be certified with a CI that reflects the reduction of greenhouse gas emissions achieved by the voluntary capture of methane, provided that:

<sup>9</sup> CARB (2023). Biomethane from Anaerobic Digestion of Organic Waste (Calculator). Avoided N<sub>2</sub>O emissions are included for Food Scrap pathways.

<sup>10</sup> “Organic Waste” is defined as material that meets both the LCFS definitions of “biomass” and “waste.” However, there is no definition in the regulation for “waste.”

(A) A biogas control system, or digester, is used to capture biomethane from manure management on ~~dairy cattle and swine~~ farms that would otherwise be vented to the atmosphere as a result of livestock operations from those farms.

(B) The baseline quantity of avoided methane reflected in the CI calculation is additional to any legal requirement for the capture and destruction of biomethane.

(2) A fuel pathway that utilizes an organic waste material may be certified with a CI that reflects the reduction of greenhouse gas emissions achieved by the voluntary diversion from decomposition in a landfill or other reference case and the associated fugitive methane and nitrous oxide emissions, provided that:

(A) The organic waste material that is used as a feedstock would otherwise have been disposed of by landfilling or in a manner in which decomposition emissions in the reference case can be quantified and verified, and the diversion is additional to any legal requirements for management of the organic waste, including ~~for~~ the diversion of organics from landfill disposal.

(B) Any degradable carbon that is not converted to fuel is subsequently treated in an aerobic system or otherwise is prevented from release as fugitive methane. Upon request, the applicant must demonstrate that emissions are not significant beyond the system boundary of the fuel pathway.

(C) The baseline quantity of avoided methane reflected in the CI calculation is additional to any legal requirement for the avoidance or capture and destruction of biomethane.

(D) Credit for avoided nitrous oxide reflected in the CI calculation shall reflect the quantity of avoided nitrous oxide emissions, including decomposition emissions in the reference case, and is subject to approval by the Executive Officer and verification requirements in §95500.

- Update the reference in § 95488.1(d)(2) as follows:
  - Biomethane from sources other than those listed under the Tier 1 classification in (c)~~(5)~~(4), above;

### **Avoid restricting avoided emissions crediting or biogas book-and-claim accounting**

We strongly oppose any restrictions to avoided emissions crediting, including avoided methane or N<sub>2</sub>O, or book-and-claim accounting of biomethane pathways. These elements are critical to supporting biomethane projects from manure and organic waste resources and emissions

reductions from the most potent climate forcers, including methane and N<sub>2</sub>O. Additionally, book-and-claim accounting of biomethane is necessary to bring additional volumes of biomethane to California and displace fossil-based natural gas, almost all of which comes from outside the State, and is itself acquired and delivered via similar book-and-claim procedures.

We urge CARB to maintain existing provisions for book-and-claim accounting of biomethane and avoided emissions, with the minor amendments proposed above, to support a growing organic waste biomethane market with the associated carbon, SLCP and N<sub>2</sub>O emissions benefits. Additionally, we urge CARB to allow book-and-claim accounting of biomethane to power plants to generate LCFS credits for electric vehicle charging, in order to advance the State's zero emission vehicle (ZEV) goals, provide equitable treatment between electricity and hydrogen-based fuel pathways, and support a shift of biomethane from CNG vehicles to ZEVs and stationary sources.

### **Strengthen targets to restore the health of the program and ensure its ongoing success**

In previous comments, we have consistently supported the following elements of a strengthened program:

- An immediate step-down in carbon intensity sufficient to reverse the trend of an accumulating bank of excess credits that is serving to dampen credit prices and restrict investment in new clean fuel pathways,
- A strengthened 2030 target, in-line with Scoping Plan targets and the ICF analysis, of at least 40%, and
- A responsive AAM that would automatically strengthen the program should the market continue to out-perform regulatory requirements, and therefore support additional low carbon fuel volumes and emissions reductions.

We appreciate that the regulatory proposal includes elements of these objectives. However, we note that based on external analysis from ICF and others, and as indicated by the market response following release of the regulatory proposal (credits are now trading at their lowest level since the regulation was last amended), the targets appear insufficient to achieve these outcomes. We encourage changes that would align with the objectives listed above, including (1) strengthening the step-down and applying it as soon as the regulation takes effect, (2) strengthening the 2030 target, to at least 40% in-line with the Scoping Plan and ICF analysis, and (3) allowing the AAM to be more responsive to the market, including allowing it to be triggered based on 2025 market data and to be triggered in consecutive years if needed.

### **Conclusion**

We very much appreciate your work, and the work of other CARB staff, to engage stakeholders throughout this process. We understand the wide array of issues related to the LCFS program that are under consideration for amendments, and we appreciate your efforts to strengthen the program and advance California's climate change and related objectives.

Thank you for your consideration of these comments, and please do not hesitate to reach out with any questions.

Sincerely,



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