

October 16, 2024

**RE:** International Council on Clean Transportation comments on the Second Notice of 15-day changes to the Proposed Regulation Order

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 second notice of 15-day changes to the Low Carbon Fuel Standard amendments. We commend the agency for its technical analysis and interest in continuing to improve the effectiveness of one of its flagship climate programs. The comments below offer a number of technical observations and recommendations for ARB to consider in aligning the program with the goals of the 2022 Scoping Plan, restoring stable credit prices, and maintaining the environmental integrity of the program.

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](mailto:n.pavlenko@theicct.org)) and Dr. Stephanie Searle ([stephanie@theicct.org](mailto:stephanie@theicct.org)).

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## Summary of comments

CARB made additional changes to its proposed LCFS amendments in its second 15-day comment package. The largest changes include increased flexibility for fossil hydrogen producers to qualify for LCFS crediting until 2035, an additional 20 year lock-in of biomethane carbon intensity values for projects that break ground before 2030 regardless of whether binding methane regulations take effect, and a delay of the vegetable oil crediting restriction for all facilities, now with sunflower oil included. CARB also specified feedstock sustainability certification requirements for forestry biomass and adjusted the reporting period to determine whether the auto-acceleration mechanism (AAM) should be triggered.

We find that these changes will do little to address CARB's current aim to stabilize the credit market and, in some cases, may be counterproductive. Timely fixes are required to address upstream environmental risks associated with crop-based fuel production and inflated carbon intensity values for livestock manure derived biomethane that are compounded by book-and-claim crediting.

### Biomass-based diesel crediting restriction is insufficient to address upstream risks

CARB now proposes to delay the proposed crediting restriction on vegetable oils until 2028 for all biomass-based diesel (BBD) facilities that are currently in operation. According to CARB quarterly reporting data, at least 19% of feedstock processed by certified BBD fuel producers in 2023 consisted of vegetable oils.<sup>1</sup> If we include renewable diesel that was designated as "Other" in our totals, this share increases to 32%. "Other" renewable diesel is likely sourced from canola oil which has the largest number of approved renewable diesel pathways in California of all non-specified feedstocks.<sup>2</sup>

Although both the current and previous 15-day proposals would do little to shift BBD capacity expansion trends,<sup>3</sup> the loosening of the crediting restriction in the September package further weakens the efficacy of the proposed safeguards to prevent rapid expansion of crop-based BBD fuel. Crop-based fuel is associated with uncertain and significant upstream

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<sup>1</sup> <https://ww2.arb.ca.gov/resources/documents/low-carbon-fuel-standard-reporting-tool-quarterly-summaries>

<sup>2</sup> <https://ww2.arb.ca.gov/resources/documents/lcfs-pathway-certified-carbon-intensities>

<sup>3</sup> <https://www.arb.ca.gov/lists/com-attach/7554-lcfs2024-Bm8BZAZkAyQCWwBj.pdf>

environmental risks including conversion of primary forestland and price volatility of food and feed commodities.<sup>4</sup>

As we have noted in our comments for the previous 15-day rulemaking,<sup>5</sup> the proposed crediting restriction on vegetable oils in the LCFS has significant gaps that undermine its intent. The grandfathering provision alone could allow a significant increase in volumes of vegetable oil-derived biomass-based diesel beyond 2023 consumption levels until 2028, while the exclusion of SAF from the crediting restriction effectively creates a loophole for vegetable oils entirely. Given these major issues, further delaying and weakening the proposed safeguard is not justified. We reiterate that a more effective and enduring safeguard would be a volume or energy-based cap on the quantity of virgin vegetable oils or ideally, lipid-based fuels in the LCFS, set at 2023 levels. A combined lipids cap would set a much stronger signal than the 20%, per-facility limitation, which still allows for significant growth in vegetable oil and does not address the use of other lipid-based feedstocks. This approach would incentive additional waste oil imports from international markets that poses fraud risks, a major issue currently being investigated by EPA<sup>6</sup> as well as criticized by the domestic biofuel industry.<sup>7</sup>

If a volume or energy-based cap is not feasible in the short-term, we recommend that CARB reassess the indirect land use change (ILUC) values for all feedstocks listed in Table 6 including additional feedstocks if deemed appropriate by an expert working group in its next rulemaking. Performing an updated ILUC assessment would offer several advantages to the existing proposal as it could both be readily implemented within the program's existing framework and act as a buffer for global land-use emissions that are not well accounted for in current models.

ICCT and others including a team of trade economists from Yale University that participated in CARB's 2015 ILUC workgroup have commented on the shortcomings of the 2015 GTAP-BIO model that was used to develop values in Table 6 of the regulation. These include the model's representation of afforestation rates and misapplication of correlational behavior across different geographic regions.<sup>8</sup> EPA assessed the structure of five ILUC models and their sensitivity to input parameters in a modeling exercise published last year and found significant variation across modeling results,

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<sup>4</sup> <https://theicct.org/wp-content/uploads/2022/08/lipids-cap-ca-lcfs-aug22.pdf>

<sup>5</sup> <https://www.arb.ca.gov/lists/com-attach/6886-lcfs2024-AmsCZwFjACcAWQJu.pdf>

<sup>6</sup> <https://farmpolicynews.illinois.edu/2024/08/epa-investigating-used-cooking-oil-import-authenticity/>

<sup>7</sup> <https://www.usnews.com/news/us/articles/2024-06-27/us-lawmakers-seek-crackdown-on-chinese-used-cooking-oil-imports-over-fraud-concerns>

<sup>8</sup> <https://www.arb.ca.gov/lists/com-attach/6987-lcfs2024-AXVUPQNgUWsDa1AP.pdf>

particularly for soybean oil due to its fungibility with other vegetable oils in different markets.<sup>9</sup> CORSIA experts have similarly found significant variation in results between its two ILUC models, particularly for oilseed crops that have the highest ILUC risk.<sup>10</sup>

If a crediting restriction is retained in the adopted amendments, it is critical that any BBD that exceeds the 20% vegetable oil volume limit is assigned the carbon intensity (CI) of fossil diesel rather than the annual CI benchmark. As explained in our previous comments, we also recommend that a crediting restriction be extended to fuel consumed in the aviation sector to avoid feedstock diversion in new applications that remains exempt from the proposed safeguard.<sup>11</sup>

Under the current proposal, excess BBD would only incur program deficits between 2028 and 2033 if and when the LCFS benchmark falls below the average CI of crop-based BBD. If the auto-acceleration mechanism (AAM) is triggered at least two times and the annual benchmark falls below the CI of crop-based before 2028, the crediting restriction would effectively be moot. We illustrate this behavior under the proposed CI trajectory and proposed CI trajectory with an AAM triggered in 2026 and 2028 in Figure 1 below. We assume a constant LCFS credit price of \$100 per tonne CO<sub>2</sub>e and average BBD CI of 60 gCO<sub>2</sub>e/MJ.

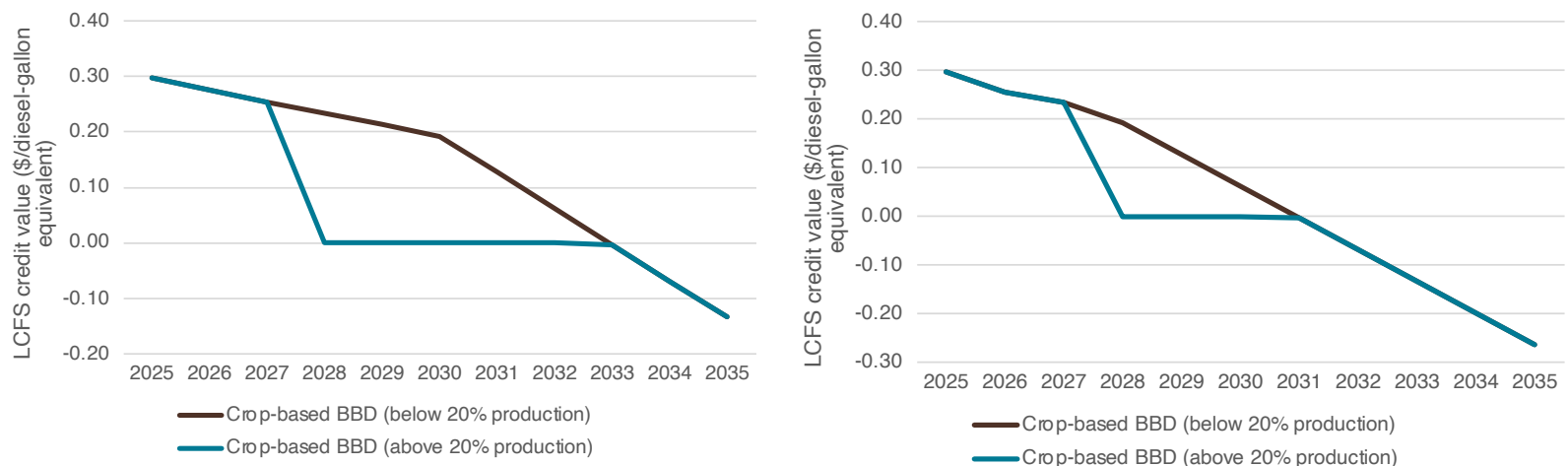


Figure 1. Left: Vegetable oil BBD crediting under August proposal. Right: Vegetable oil BBD crediting under August proposal with AAM triggered in 2026 and 2028

<sup>9</sup> <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1017P9B.pdf>

<sup>10</sup> [https://www.icao.int/environmental-protection/CORSIA/Documents/CORSIA\\_Eligible\\_Fuels/CORSIA\\_Supporting\\_Document\\_CORSIA%20Eligible%20Fuels\\_LCA\\_Methodology\\_V5.pdf](https://www.icao.int/environmental-protection/CORSIA/Documents/CORSIA_Eligible_Fuels/CORSIA_Supporting_Document_CORSIA%20Eligible%20Fuels_LCA_Methodology_V5.pdf)

<sup>11</sup> <https://www.arb.ca.gov/lists/com-attach/7554-lcfs2024-Bm8BZAZkAyQCWwBj.pdf>

The *de facto* penalty for exceeding the crediting limit ranges from approximately \$0.06 to \$0.23 per diesel-gallon equivalent (DGE) depending on the year, before going away entirely. If these fuels were treated as having a CI of the fossil baseline, their effective penalty would be \$0.55 per DGE, creating a stronger disincentive for exceeding the limit. In short, this small penalty is not expected to meaningfully change producer behavior given that it is far lower than the sum of incentives renewable diesel sold in California receives. We estimate this total incentive to be \$2.33 per gallon of soybean oil-based BBD including LCFS credits, federal RINs, 45Z tax credits, and avoided cap-and-trade penalties.<sup>12</sup>

### Biomethane crediting proposal will contribute to credit market oversupply

Changes made in the second 15-day package now propose that the certified carbon intensity of biomethane projects that break ground before 2030 are eligible for up to two additional crediting periods (equivalent to 20 years) regardless of whether binding methane capture regulations take effect. The Notice of Public Availability document indicates that this leniency was granted to assist farmers in complying with California's Short-Lived Climate Pollutant (SLCP) reduction strategy.<sup>13</sup> We recognize that anaerobic digesters are a strategy to meet statewide methane reduction targets; however, locking in crediting incentives despite regulatory capture requirements is a departure from sound life-cycle assessment methodology and misapplies policy incentives designed for transportation fuels to the agricultural sector.

On their own, extended timelines for biomethane crediting will not help stabilize the LCFS credit market and address the current oversupply of credits in the market. Historical trends indicate that lenient compliance mechanisms for biomethane will lead to continuous excess crediting and a triggering of the AAM and compliance trajectory step-downs. As stated in previous comments, we recommend that biomethane remain subject to more stringent sourcing requirements consistent with other pathways and to remove avoided methane emissions crediting that does not pass an additionality test.<sup>14</sup> Biomethane and derivative fuels can remain a viable LCFS compliance pathway, without a reliance on out-of-state and out-of-sector emissions offsets and use of inflated carbon intensity factors. We provide evidence to support these arguments below.

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<sup>12</sup> <https://www.arb.ca.gov/lists/com-attach/7554-lcfs2024-Bm8BZAZkAyQCWwBj.pdf>

<sup>13</sup> [https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/2nd\\_15day\\_notice.pdf](https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/2nd_15day_notice.pdf)

<sup>14</sup> <https://www.arb.ca.gov/lists/com-attach/7554-lcfs2024-Bm8BZAZkAyQCWwBj.pdf>.

## Biomethane crediting proposal is a departure from sound life-cycle assessment methodology

Manure-derived biomethane is the most lucrative fuel of all LCFS pathways on a \$ per MJ basis due to the use of avoided methane crediting within Tier 1 and 2 calculators. When biomethane is processed into hydrogen or converted into electricity to power electric vehicles its economic value is even higher, further benefitting from energy economy ratios (EERs) that correct for the higher efficiency of battery and fuel cell powertrains. Organic waste processed at landfills similarly benefits from avoided methane crediting, although to a lesser degree.

We illustrate the expected credit value of common heavy-duty fuel pathways consumed in 2025. We compare the incentive value granted to dairy biomethane-derived renewable natural gas (RNG), electricity and hydrogen relative to renewable diesel (RD) and green hydrogen in Figure 2. Our calculations assume the average CI by pathway of currently certified facilities in the LCFS certified pathways spreadsheet and an LCFS credit price of \$100/mt.<sup>15</sup>

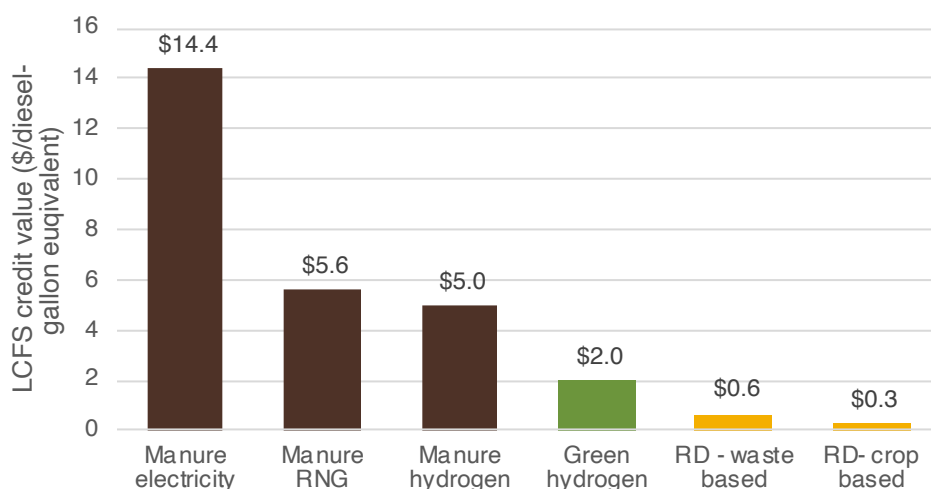


Figure 2. Average LCFS credit value for common heavy-duty fuel pathways in 2025

Manure-derived biomethane pathways receive more than seven times the LCFS credit value as green hydrogen sourced from zero-CI electricity and up to 50 times the credit value of renewable diesel. This is due to highly negative carbon intensity values for certified manure-based fuel pathways; for example, the average CI for manure-derived electricity sold in the California transport sector is -643 gCO<sub>2</sub>e/MJ.

<sup>15</sup> <https://ww2.arb.ca.gov/resources/documents/lcfs-pathway-certified-carbon-intensities>

The emissions benefits of manure-derived biomethane are highly subjective and likely overstated due to the assumption that manure is vented to the atmosphere in absence of LCFS policy. Often, baseline operating conditions at livestock farms do not pass an additionality test nor are they required to under the program. We previously commented on the Yellow Jacket farm pathway application that receives avoided methane credits despite the farm previously operating an electricity generator to convert biogas into electricity sold to the local distribution grid.<sup>16</sup> In absence of a policy adjustment that more accurately reflects whether consuming biomethane as a transport fuel delivers avoided emissions, digester projects will continue to be overcredited for the quantity of emissions reductions they deliver. If avoided methane credits are instead removed from Tier 1 calculations, we estimate that the average CI of dairy-derived RNG raises to 36.4 gCO<sub>2</sub>e/MJ.<sup>17</sup> This corresponds to a credit value of \$0.62 per diesel gallon equivalent (DGE) in 2025 that is comparable to the current credit value for waste-based RD (Figure 2).

Environmental justice groups have emphasized the adverse impacts of this accounting practice including a 2021 petition that called on CARB to remove dairy and swine manure eligibility from the LCFS.<sup>18</sup> In the petition, the groups also identified the state's obligation to accurately assess localized pollution impacts associated with alternative fuels and existence of numerous other public funding streams that benefit farmers for installing digester operations such as the Dairy Digester Research & Development Program (DDRDP). Subsequent comments from ICCT and others have underscored the need to update the carbon intensity of biomethane-derived fuel in Tier 1 and 2 emission calculators to "right size" its contribution towards state-wide emission reductions.<sup>19</sup>

Installing anaerobic digesters at livestock farms is one strategy to comply with the state's SLCP reduction strategy that sets a 40% methane emissions reduction target by 2030 alongside other organic waste diversion requirements.<sup>20</sup> Compared to alternative manure management strategies, digesters are costly to build and have higher methane production rates than

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<sup>16</sup> <https://www.arb.ca.gov/lists/com-attach/980-tier2lcfspathways-ws-Vj8GY1c1ACcLUlc0.pdf>

<sup>17</sup> <https://theicct.org/wp-content/uploads/2023/05/california-rng-outlook-2030-may23.pdf>

<sup>18</sup> Lazenby, Ruthie, Phoebe Seaton, Tarah Heinzen, Tyler Lobdell, Brent Newell, Tom Frantz, Cristina Stella, and Christine Ball-Blakely. "Petition for Rulemaking to Exclude All Fuels Derived from Biomethane from Dairy and Swine Manure from the Low Carbon Fuel Standard Program," October 27, 2021. <https://food.publicjustice.net/wp-content/uploads/sites/3/2021/10/Factory-Farm-Gas-Petition-FINAL.pdf>.

<sup>19</sup> <https://www.arb.ca.gov/lists/com-attach/6955-lcfs2024-Wi8CZ1MhUFwHYgFu.pdf>;

<https://www.arb.ca.gov/lists/com-attach/6886-lcfs2024-AmsCZwFjACcAWQJu.pdf>;

<https://www.arb.ca.gov/lists/com-attach/7077-lcfs2024-Wz4BZgd0BCNVOWJo.pdf>

<sup>20</sup> [https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill\\_id=201520160SB1383](https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB1383)



practices that utilize solid treatment.<sup>21</sup> We compare the average methane emissions per livestock head by management type in 2022 using data from the California GHG emissions inventory and U.S. Census in Figure 3.<sup>22</sup>

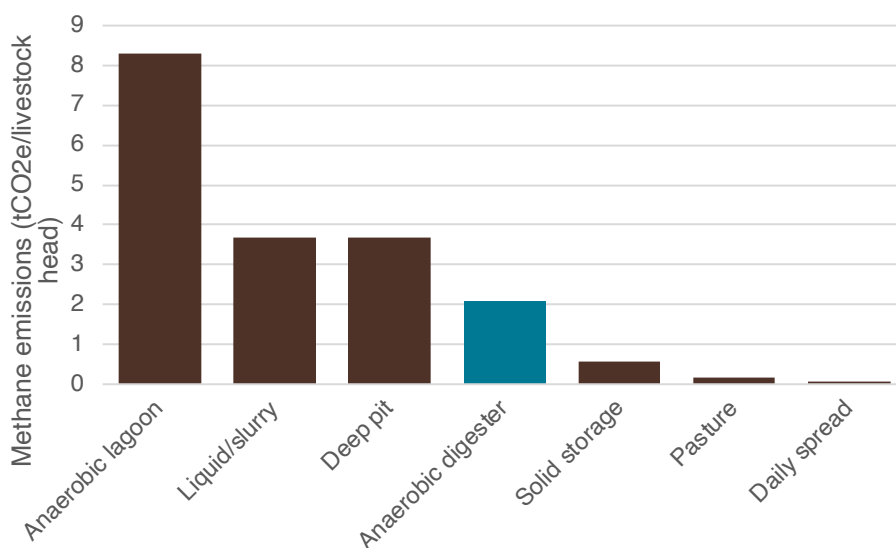


Figure 3. Methane emissions per manure management strategy for California dairy cattle in 2022

Rather than subsidizing anaerobic digesters via transportation fuel credit incentives, CARB and partner agencies can pursue methane reduction strategies that operate independent of the LCFS program to meet SLCP targets. These strategies include incentivizing farmers to implement alternative cattle diets to reduce enteric methane emissions, mandating methane flaring, and providing financial support to the California Department of Food and Agriculture’s Alternative Manure Management Program (AAMP).<sup>23</sup> Though alternative manure strategies such as solid storage and daily spread may not be feasible to implement at all farms, solid management emits the lowest quantity of methane per dairy cattle head.

CARB’s proposal to lock-in avoided methane crediting for 20 years beyond the end of the crediting period in which binding methane regulations take effect does not appear to support the implementation of alternative manure management strategies as an SLCP reduction strategy. It instead exacerbates existing problems with LCA accounting at livestock digesters with contested localized environmental benefits.

<sup>21</sup> Wakeman, D. and Fingerman, K. (2023). Waste stream to revenue stream: calculating the costs and climate impact of California’s investments in dairy digester infrastructure. Arcata, CA.

<sup>22</sup> [https://ww2.arb.ca.gov/sites/default/files/ghg-inventory-doc/docs2024/docs3/3a2ai\\_manuremanagement\\_anaerobicdigester\\_livestockpopulation\\_dairyows\\_ch4\\_2022.htm](https://ww2.arb.ca.gov/sites/default/files/ghg-inventory-doc/docs2024/docs3/3a2ai_manuremanagement_anaerobicdigester_livestockpopulation_dairyows_ch4_2022.htm)

<sup>23</sup> <https://www.cdfa.ca.gov/oefi/AMMP/>



## Crediting practices for bio-hydrogen may already be crowding out investment in alternative technology pathways

The impacts of overstated emissions from locked-in avoided methane credits are compounded by the practice of book-and-claim crediting. Today, approximately 70% biomethane credited under the LCFS comes from livestock farms located out of state that do not have to adhere to a traceability or deliverability requirement.<sup>24</sup> Further, according to LCFS pathways data, all certified bio-hydrogen projects source methane inputs from out-of-state farms.<sup>25</sup> We present the locations of dairy digesters that indirectly supply in-state hydrogen projects as of early 2024 in Figure 4.

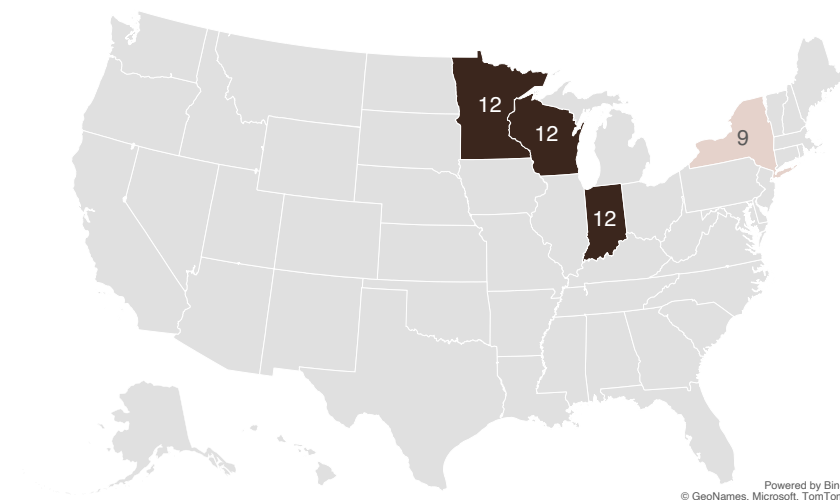


Figure 4. Number of projects and geographic source of dairy biomethane for certified hydrogen pathways in California

This trend is only expected to grow as ongoing book-and-claim crediting attracts out-of-state applicants. In the previous 15-day package, CARB proposed that deliverability requirements take effect in 2041 for biomethane-derived RNG and 2046 for biomethane-derived hydrogen consumed as a process input at refineries or in a fuel cell vehicle. The second package introduced a modification that if the number of registered Class 3-8 zero-emission vehicles exceeds a threshold of 132,000 vehicles by the end of 2029, deliverability requirements are pushed up to 2038 for RNG pathways and remain the same for biomethane-derived hydrogen. CARB's proposal to delay action for the next 15 years fails to address the misapplication of program revenue to heavily subsidize changes to manure

<sup>24</sup> <https://theicct.org/wp-content/uploads/2023/05/california-rng-outlook-2030-may23.pdf>

<sup>25</sup> <https://ww2.arb.ca.gov/resources/documents/lcfs-pathway-certified-carbon-intensities>

management in out-of-state farms rather than support in-state transportation decarbonization.

Importantly, the continuation of book-and-claim crediting to offset fossil fuel consumption can crowd out investment for alternative technologies. Nearly all of fossil natural gas consumed in the California transport sector has been replaced by an equivalent volume of RNG, so biomethane producers have looked toward alternative fuel markets such as hydrogen.<sup>26</sup>

Dairy manure can receive up to \$8.8/kg H<sub>2</sub> in LCFS credits, nearly three times the quantity of the federal hydrogen tax credit (45V) for hydrogen that has a certified CI between 0 and 0.45 kg CO<sub>2</sub>e/kg H<sub>2</sub>.<sup>27</sup> Fossil and blue hydrogen producers that source biomethane as an input feedstock do not have to adhere to more rigorous sourcing requirements that apply to electrolytic hydrogen that require electricity producers to be located within the Western Interconnection system. This sourcing flexibility may already be crowding out room for development of electrolytic “green” hydrogen produced from grid-supplied electricity running counter to CARB’s recognition that it will take time for non-fossil hydrogen to scale up.<sup>28</sup>

We calculate that a fossil SMR plant sourcing dairy manure biomethane offsite pays approximately \$47.9 per MMBTU of biomethane based on the citygate natural gas sale price in California and average value of LCFS credits for manure RNG.<sup>29</sup> This corresponds to \$5.03 per kg H<sub>2</sub>, assuming a hydrogen conversion efficiency of 0.42 kg per kg of biomethane. When combined with the conventional SMR hydrogen production cost of \$0.3 per kg H<sub>2</sub>, we calculate fossil SMR plants that purchase RNG produced offsite have a levelized production cost of \$5.33 per kg H<sub>2</sub>.<sup>30</sup> In comparison, we estimate the average cost of electrolytic hydrogen produced from grid-connected electricity in California in 2025 to be \$9.06 per kg H<sub>2</sub>. This includes the levelized cost of electrolysis over a 30 year project lifetime and renewable electricity sale price. We present this comparison in Figure 5.

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<sup>26</sup> <https://ww2.arb.ca.gov/resources/documents/low-carbon-fuel-standard-reporting-tool-quarterly-summaries>

<sup>27</sup> <https://www.congress.gov/117/plaws/publ169/PLAW-117publ169.pdf>

<sup>28</sup> [https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/2nd\\_15day\\_notice.pdf](https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/2nd_15day_notice.pdf)

<sup>29</sup> <https://www.eia.gov/dnav/ng/hist/n3050ca3m.htm>

<sup>30</sup> <https://netl.doe.gov/research/carbon-management/energy-systems/gasification/gasifipedia/technologies-hydrogen/with-carbon>

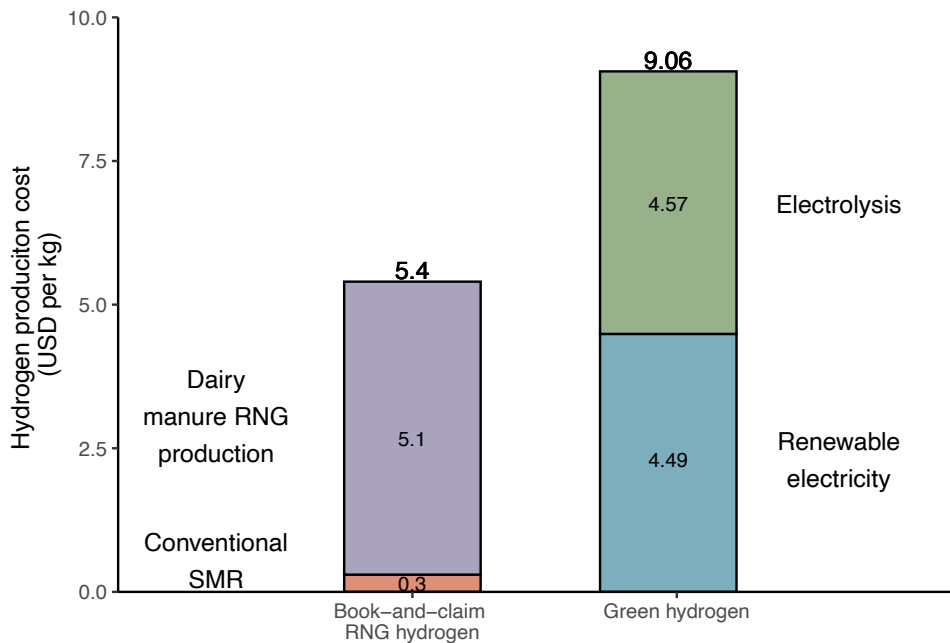


Figure 5. Fossil SMR and electrolytic hydrogen production cost comparison in California

As demonstrated in Figure 5, electrolytic hydrogen currently operates at a \$3.96 price premium relative to fossil SMR producers that offset fossil natural gas with manure biomethane purchased offsite. Though the costs of electrolysis are expected to decline in the future, this rate will not keep pace with high-value manure biomethane that remains exempt from a deliverability requirement through at least 2046. As stated in previous comments, we recommend that deliverability be put in place before 2030 to prioritize in-state and in-sector emissions reductions and that projects that fail to pass a legal or financial additionality test do not receive avoided methane crediting.