



Don Gilstrap
Manager, Fuels Regulations

March 15, 2023

Cheryl Laskowski
Branch Chief
Air Resources Board
1001 I Street
Sacramento, CA 95814

Dear Dr. Laskowski:

Re: February 22, 2023 LCFS Workshop

Chevron appreciates the opportunity to review and comment on the subject Low Carbon Fuel Standard workshop.

Chevron is a major refiner and marketer of petroleum products and renewable fuels in the state of California and a regulated party under the Low Carbon Fuel Standard (LCFS). With the recent acquisition of Renewable Energy Group, Inc., Chevron is also an international producer of lower carbon intensity fuels with a global integrated procurement, distribution and logistics network, and 11 biorefineries in the U.S. and Europe. In 2021, Chevron Renewable Energy Group produced 480 million gallons of renewable fuels, resulting in 4.1 million metric tons of CO2 reduction, and is helping lead the energy transition to a lower carbon future.

Following are our comments on the topics discussed during the workshop.

Rulemaking Timeline

While work has progressed on the set of policy options that CARB staff is proposing, it seems increasingly likely that this rulemaking will extend into 2024 and miss the projected January 1st implementation date. There is considerable work remaining to specify the details of the proposals and draft regulatory text before soliciting feedback from stakeholders and presenting to the Board. What is most important is that the objectives of the administrative process are met by providing sufficient time for stakeholders to analyze and comment on the proposals (and for CARB to thoughtfully consider such comments). Additionally, stakeholders seek certainty and adequate lead time for planning and implementation, CARB should consider providing a new target date and detailed timeline.



Compliance Targets

Chevron supports accelerating the 2030 carbon intensity reduction target to 30%. There has been significant growth in biodiesel, renewable diesel, and renewable natural gas, enabling strong credit generation under the program. As part of this rulemaking, we would like to see robust and detailed compliance scenarios from CARB. While a 30% target may be achievable, it is only appropriate to present a comprehensive analysis of how the program will achieve this. The CATS model may be able to generate such a scenario, but its output needs to be clearly communicated in detail to the Board and stakeholders.

Regarding the CATS model, CARB should hold a full workshop dedicated to the model. If it is to be used to make decisions around material changes to LCFS targets, the operation of the model and the assumptions made within should be transparent and open to public discussion. We appreciate CARB's release of the model for review online, but it is our view that a public dialogue would be much more constructive.

Limits on Crop-Based Fuels

Chevron opposes any arbitrary limits on crop-based fuels. LCFS carbon intensity scores already include conservative indirect land use change (ILUC) factors which, by definition, account for food-vs-fuel concerns. Any sort of volumetric limitation is unnecessary and counterproductive.

The information on slides 38 and 40 of CARB's presentation show growth in low carbon fuels as intended under the LCFS. It has not been demonstrated that increasing use of these fuels is a threat to food security. Absent clear evidence that such speculative negative impacts would occur, CARB should continue to focus on monitoring and improving land-use change factors in carbon intensity scores rather than constraining that growth.

The chart on slide 39 does not present an accurate picture of the acreage needs of soybean growth for food and biomass-based diesel production. According to the National Oilseed Processors Association, when crushed to produce soybean oil, approximately 80% of soybeans become high-protein animal feed or a plant-based food ingredient in addition to other uses¹. This means that there is significant overlap between the "food market" and "biomass-based diesel production" columns on CARB's chart. There is no such thing as soybean acreage exclusively dedicated to biomass-based diesel production. Increased biomass-based diesel production results in increased, not decreased, food supply. This is also supported by a 2022

¹ Hammer, Thomas A., "Comments on Proposed Ruel for Renewable Fuel Standard Program." February 10, 2023. <https://www.regulations.gov/comment/EPA-HQ-OAR-2021-0427-0582>



Purdue University study reviewing the impact of soybean oil demand on food prices. The study found that, while wholesale soybean oil prices rise, retail prices for oil used in cooking rise only slightly and “retail prices for animal protein products fall as a result of rising demand for soy-based biofuels.”²

To answer the questions posed by CARB on slide 41, continued improvement in land-use change factors is the only regulatory mechanism that staff needs to consider. New technologies will develop and lower carbon feedstocks will emerge without any artificial limitations on crop-based fuels. Declining carbon intensity benchmarks and the absence of land-use change factors for cover crops and other emerging feedstocks will encourage these new investments regardless.

It is also worth noting that the Global Carbon Project's 2022 report continues to show that land-use change emissions have declined since the 1990s and are a small portion of global carbon emissions. While we understand indirect land use change is not observable, it does not appear to have materialized in the data over the past few decades. In fact, as data continues to be collected, it seems to point to much smaller impacts than previously predicted.³

Biomethane Crediting

The proposed changes to crediting for methane avoidance and book-and-claim treatment presented are similarly arbitrary and damaging to the LCFS Program. The credit for methane avoidance represents real and substantial reductions in greenhouse gas emissions and eliminating this credit is contrary to the goals of the LCFS. We share the concerns expressed during the workshop around the impact this would have on continued digester operations. The LCFS has proven to be a successful incentive for the capture and use of methane from dairies and landfills. Removing this incentive will drive carbon intensity scores higher (see table 1) and will lead to cancellations of future digester projects and shutdown of existing projects. It should also be noted that removing avoided methane crediting will also make RNG-to-hydrogen and RNG-to-electricity generation pathways uneconomic.

² Lusk, Jayson L. “Food and Fuel: Modeling Food System Wide Impacts of Increase in Demand for Soybean Oil.” November 10, 2022. https://ag.purdue.edu/cfdas/wp-content/uploads/2022/12/report_soymodel_revised13.pdf

³ Global Carbon Project (2022) Carbon budget and trends 2022. [\[www.globalcarbonproject.org/carbonbudget\]](http://www.globalcarbonproject.org/carbonbudget) published on 11 November 2022



Table 1: Avoided methane crediting impact on LCFS revenue.

	Dairy Gas (current program)	Dairy Gas Without Methane Abatement	Fossil Natural Gas
Carbon Intensity, gCO ₂ e/MJ ¹	-420	70-300 ²	79.9
LCFS Value, \$/MMBTU ³	\$31	(\$6.49)	\$0.02
LCFS Carbon Price, \$/MTCO ₂ e	\$65	\$65	\$65

¹ Illustration of CI increase with methane abatement crediting. While actual projects' LCA scores will vary, majority of dairy projects will result with scores greater than or equal to fossil natural gas.

² The CI of RNG from dairy manure varies depending on factors such as the power source for digestion and upgrading, transportation distance, and transportation mode.

³ At 03/06/2023 LCFS pricing, assuming 2023 Diesel Benchmark CI. Dairy Gas without Methane Abatement CI used was 185 gCO₂/MJ, the median of the CI range above.

CARB staff expressed a desire to see biogas move into sectors other than transportation and believe that complementary measures will be created to encourage that. Chevron supports market-based mechanisms, but we oppose converting the LCFS into an artificial barrier for its use in transportation. If the LCFS program does not allow for methane avoidance crediting, then there could be knock on effects to multiple programs across the country. Potential stationary market customers often point to CARB lifecycle analysis in lieu of alternative mechanisms. Without methane avoidance crediting, there is risk of stationary markets forgoing dairy origin RNG due to high carbon intensity scores. Any programs targeting emission reductions should be designed to work in tandem, allowing market participants to determine the most effective placement of alternative fuels. Further, methane avoidance crediting incentivizes manure management, which traps methane and particulate matter that would otherwise be released into the atmosphere.

The potential changes to book-and-claim treatment for biomethane are similarly concerning and would represent a step backward for the program. Currently, the LCFS encourages methane capture and digestion across the country and has seen considerable success on that front. The current design provides a market-based incentive that allows for the most efficient greenhouse gas reduction over a broad geographic range. Excluding some geographies does nothing but limit the effectiveness of the LCFS and will limit the development of new projects.

Hydrogen Book-and-Claim

Chevron supports the proposal to extend book-and-claim accounting to hydrogen transported by pipeline. We look forward to seeing a more detailed presentation on this topic.



Infrastructure Credits

We appreciate the progress made on drafting regulatory text related to extending infrastructure crediting to medium- and heavy-duty vehicles. However, it is critical that a solution is found for modeling hybrid stations that serve both vehicle types without requiring separate, wasteful storage and dispensing infrastructure. Also, limiting station HRI crediting to only 50% of the capacity of a station artificially penalizes Heavy Duty vehicle fueling infrastructure. These requirements threaten the viability of many projects and will hinder growth in this area.

Fuel Pathways

Reform of the fuel pathway approval process is critical to the success and exportability of the LCFS. Applications are currently taking months and often years just to get to provisional status. This not only creates considerable uncertainty and opportunity cost for regulated parties, it also misrepresents the carbon intensity reduction of fuels operating under a conservative temporary pathway.

CARB's intention to add credit "true ups" for pathway applications represents a good relief valve for addressing these issues. It is appropriate to reward low carbon fuel suppliers the full credit value of their fuel's carbon intensity once their application is finalized. Any such true ups should include all production back to the first quarter for which a temporary pathway was approved by CARB. Appendix 1 to this letter includes suggested regulatory text updates that would enable this.

While credit true ups partially repair the impact of an extended application review process, it is also important to consider restructuring the approval process overall, particularly for Tier 2 pathways. We appreciate the level of expertise that CARB staff have around lifecycle analysis, but that expertise is optimally applied in a governance role, overseeing the work of third parties empowered to conduct the detailed, technical review of pathway applications. The volume of work involved in reviewing pathway applications is too large regardless of staffing levels at CARB, a problem which will be more challenging for smaller state programs with fewer staff. A structure similar to the verification procedures under the LCFS that would certify engineering firms to review applications would create a much more flexible, efficient environment for both CARB (and other state agencies) and regulated parties. It would also make fuel producers responsible for funding the application review process by hiring the engineering firms. This would ensure accountability on behalf of the engineering firms to complete the review process in a timely manner.



Project-Related Credits

Chevron opposes the phaseout of project-related credits as described by staff during the workshop. This is the wrong approach to targeting greenhouse gas reduction in transportation. While recognizing that reduced reliance on fossil fuels is a stated goal of the state, eliminating credits for achieving emission reductions from their production misses an opportunity to further reduce greenhouse gas emissions during the transition period. Project-related crediting has not presented a threat to alternative fuel growth since its introduction but has incentivized a number of projects explicitly focused on emissions reduction.

Intrastate Jet

The proposed addition of deficits for intrastate jet fuel creates added complexity with negligible impact on the adoption of alternative jet fuel. While we appreciate CARB's recognition that the airlines would be the logical first fuel reporting entities for intrastate jet, this would simply make the airlines credit purchasers. It would not accelerate the adoption of alternative jet fuel, which is already occurring. That adoption is better influenced by the existing crediting under the LCFS and other positive incentives. We urge CARB to pursue other means of encouraging growth in this area.

Acceleration Mechanism Concepts

CARB requested feedback on the potential addition of a compliance target acceleration mechanism to the LCFS. We appreciate the need for continued policy support for low carbon fuel growth but would like to see a more comprehensive proposal. Regarding appropriate market indicators that might trigger increases in stringency, the size of the overall credit bank would be the most appropriate. This is the best indicator of "over compliance" with existing LCFS benchmarks and participants' ability to contribute to more stringent standards. Credit prices are not an appropriate trigger. It is conceivable that a situation could exist where credit prices are low and the credit bank remains low or negative. It would be dangerous to accelerate the program in such a situation, exacerbating the problem.

Tier 1 Calculators

Please see Appendix 2 for comments on the new Tier 1 hydrogen calculator.

If you have any questions regarding our comments, please contact me at (925) 842-8903 or DGilstrap@chevron.com.

Sincerely,



Appendix 1 –Regulatory Language Changes for Credit True-Ups (Added text is in red.)

§ 95486. Generating and Calculating Credits and Deficits.

(a) *Generation and Acquisition of Transferrable Credits.*

(2) *No Retroactive Credit Claim.* Unless expressly provided elsewhere in this subarticle, **in section 95488.9(b)(5), or in 95488.9(c)(3)**, no credit generator may generate or claim credits retroactively for a period for which the reporting deadline has passed. Similarly, no deficit generator may eliminate deficits retroactively for a period for which the reporting deadline has passed.

§ 95488.9

(b) *Temporary Fuel Pathways.*

- (1) Fuel reporting entities may petition the Executive Officer to use a Temporary fuel pathway carbon intensity value for reporting quantities of fuel to generate credits or deficits.
- (2) A Temporary pathway petition approved by the Executive Officer will allow the fuel reporting entity to use the pathway for LRT-CBTS reporting purposes for up to two quarters at a time. Reporting will be granted only for the quarter during which the Temporary pathway is approved for use and the subsequent full quarter. The Executive Officer may approve multiple subsequent petitions from the same fuel reporting entity, of up to two quarters each, but each approval will require a new petition.
- (3) A petition to use a Temporary pathway must be submitted online in the AFP.
- (4) *New Temporary Fuel Pathways.* An entity can apply for the use of a Temporary fuel pathway CI value if it appears in **Table 8** in this subarticle or if the Executive Officer approves a new Temporary pathway (for a fuel or feedstock-fuel combination not found in **Table 8**) and publishes it on the



LCFS web site. Any new Temporary pathway proposed by the Executive Officer will be posted for 45 days for public comment prior to certification. The posted information will include the rationale for assigning the CI to that particular Temporary pathway. If these comments require significant revision of the originally published pathway, a revised pathway will be posted for public comment. Upon certification of a new Temporary pathway created by the Executive Officer, the pathway will be available for reporting for the quarter in which it is certified.

- (5) **Adjustment After Certification.** When a provisional or permanent fuel pathway is certified by the Executive Officer for a facility for which volumes were reported with transaction types “Production in California”, “Production for Import”, and “Import” under a Temporary pathway for the same feedstock-fuel combination, the Executive Officer shall adjust the applicant’s credit balance in the LRT-CBTS to reflect the difference between the Temporary pathway carbon intensity and the Provisional or Permanent pathway carbon intensity for all production or import volumes reported under the Temporary pathway, beginning with the first quarter reported under the Temporary pathway. The number of credits added shall be based on the formula described in § 95486(a)(3)(B).

(A) If the pathway holder is not registered within the LRT, they shall designate one party in the LRT to receive the LCFS credits on their behalf.

(B) If there are more than one feedstock-fuel combinations at a production facility associated with the same temporary pathway, the Executive Officer shall request quarterly reports from the pathway holder for credit generation to quantify the volumes reported for the newly certified pathway.

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- (c) **Provisional Pathways.** As set forth in sections [95488.6\(a\)](#) and [95488.7\(a\)](#), LCFS fuel pathways are generally developed based on 24 months of operational data. The Executive Officer may consider Provisional pathway applications from 1) facilities that have been in operation for less than 24 months, or 2) existing facilities that can demonstrate a process change has been implemented, based on at



least three months of operational data. Based on timely reports, the fuel reporting entity may generate credits or deficits using a provisionally-certified CI.

- (1) *Application process.* Application requirements are the same as those for the applicable pathway classification, specified in sections [95488.6](#) and [95488.7](#) including validation of the data submitted in support of the provisional pathway application.
- (2) *Verification schedule.* The certified pathway is subject to periodic verification as described in [section 95500\(b\)\(2\)](#) as applicable for the fuel pathway classification.
- (3) *Adjusting CI and Credit Balance.* At any time during the 24 months following provisional certification, the Executive Officer may revise as appropriate the provisionally-certified CI. Until the Executive Officer has removed the provisional status pursuant to subsection (4) below, the Executive Officer may adjust the number of credits ~~or reverse any credit~~ in the fuel reporting entity's account using the provisional pathway without a hearing, notwithstanding the requirements of [section 95495](#). At the end of the provisional period, the certified CI will be determined on the basis of 24 months of operational data.
 - (A) If the verified operational CI is higher ~~or lower~~ than the provisionally-certified CI, the Executive Officer will replace the certified CI with the verified operational CI in the LRT-CBTS and will make any necessary credit adjustment in the fuel reporting entity's account using the provisional fuel pathway for reporting. Any credits generated using a provisionally-certified CI, across the entire period from original validation to completion of the periodic verification, are subject to adjustment.
 - (B) If the verified operational CI is lower than the provisionally-certified CI, the Executive Officer will certify the pathway with the lower CI, adding a conservative margin of safety per [section 95488.4\(a\)](#) if the applicant so desires. ~~The fuel reporting entity will not be eligible for any retroactive credit generation for any quarter for which the reporting deadline has passed, but the revised CI will be valid for future reporting periods.~~



- (4) *Removal of provisional status.* Positive or qualified positive verification statements covering at least 24 months of operational data will result in the removal of the provisional status for the certified pathway.



Appendix 2 - Comments on Tier1 Hydrogen Calculator:

1. The proposed Emission Factor for natural gas used as a process fuel combusted in boiler or CHP appears to be high.

Process Fuels	Natural Gas	Liquefaction	11.5	MMBtu, LHV
		Combusted in Boiler or CHP	72,680	

Looking at the emission factors for NG in GREET 2022 we find the following emission number:

NG Combusted in SMR = 59,617 gCO₂e/mmbTU

The same result applies to Utility/Industrial Boiler (>100 mmbTU/h input) and combined cycle gas turbine. The proposed value in the Tier1 calculator would be appropriate for a well-to-wheel (WTW) pathway, not well-to-gate (WTG).

2. The proposed compression and precooling emission factor value appears to be too high.

Compression and Precooling	12.41	gCO ₂ e/MJ H ₂ , LHV
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The current LCFS lookup table uses 10.51 gCO₂e/MJ, which assumes CAMX grid electricity is used for compression and dispensing at refueling stations:

HYER	Compressed H ₂ produced in California from electrolysis using solar- or wind-generated electricity	10.51
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According to [table F.3](#), this value also includes pre-cooling.

Given that the CAMX grid has only gotten cleaner, we suggest that we continue using 10.51 gCO₂e/MJ instead of the proposed 12.41 value.

3. The calculator does not have the ability to generate credits for steam from the SMR unit for cases in which steam is exported; this is included in the SMR 'default' in GREET2022.

Examples:

- A 2010 Praxair report estimates a ~15% reduction in carbon intensity. [Bonaquist, Dante. October 2010. Praxair.](#)
- See NETL report: ~26 MJ steam per kg H₂; GREET2022 has 213,343 BTU steam credit per mmbTU H₂. [DOE/NETL-2022/3241 - Comparison of Commercial, State-of-the-Art, Fossil-Based Hydrogen Production Technologies \(doe.gov\). April 2022](#)



This could easily be monitored and verified by the facility.

4. What is the basis for the transport losses for the gaseous H₂ pathway?
According to Argonne's LCA report on hydrogen for GREET2022 there are no T&D losses considered for gaseous H₂:

Additionally, in GREET 2022 there are no H₂ losses considered in the T&D or at H₂ refueling station HRS for GH₂. However, for LH₂ we assume 0.5% loss at liquefaction plant, 0.3% at LH₂ bulk terminal, 5% loss of unloaded amount at refueling station, and 4 kg loss per day per cryopump at HRS. More details are provided in Frank et al.³⁵ It worth noting that in GREET 2022, we did not incorporate a global warming potential for fugitive hydrogen emissions. This is planned for future releases of GREET.

If included, CARB should break out the H₂ losses during H₂ transport and refueling as a separate line-item in the 'Pathway Summary' tab. That way, it will be easier to determine well-to-gate emissions.

5. For gaseous H₂, the way site-specific inputs are described appears to result in double-counting of emissions associated with compression at the H₂ production facility.
- From the user's guide:

4.3 Grid Electricity (kWh)

Enter monthly total quantity of grid electricity used by the hydrogen production facility as a process energy for hydrogen production and processing, including electricity used for steam methane reforming, on site hydrogen liquefaction, compression, and storage.

- However, there is a hard-coded value for compression and pre-cooling on the CA-GREET4.0 tab (12.41 gCO₂e/MJ H₂, LHV).
- Based on a review of GREET2022 and the associated Argonne H₂ LCA report, the 12.41 gCO₂e/MJ H₂ value appears to include:
 - a) Compression to load tube trailers at the H₂ production facility (1.90 kWh/kg H₂),
 - b) Compression at the refueling facility (0.85 kWh/kg H₂), and
 - c) Pre-cooling at the refueling facility (0.39 kWh/kg H₂).
- Electricity for loading tube trailers at the H₂ production facility would likely be included in the site-specific electricity consumption value and therefore this parameter would double-count compression at the production facility.
- Additionally, this value should not be hard-coded as it is a direct function of the electricity emission factor and is therefore regionally specific.



6. For liquid H2, when liquid H2 is specified as the product, the 12.41 gCO2e/MJ H2 value for compression and pre-cooling is included in the Pathway Summary. This is incorrect; there would be substantial additional energy required for liquefaction at the H2 production site that would be captured in the user-inputs, but there would not be compression/pre-cooling at the refueling facility.

Including this parameter for liquified H2 over-states the GHG footprint for this pathway.

7. CARB should allow companies to use Book & Claim for both the fuel that is used in the SMR to generate steam and for the gas feed that is converted to H2.
8. No CCS options are included in the calculator, which will be important to generate LCFS credits. Even if a Tier 2 application is required for CCS, it would be helpful for project applicants to have a frame of reference for the LCA.
9. Under the "Pathway Summary" tab, it is hard to follow the logic in cells D15 and D16 to calculate NG that is either eligible or not eligible for B&C matching. We encourage CARB to produce an accompanying document explaining how the main calculations are generated.

