Public Hearing to Consider Amendments to the Low Carbon Fuel Standard

Addendum to the Final Statement of Reasons for Rulemaking, Including Summary of Comments and Agency Response

Attachment 1 - Third 15-Day Comments

Public Hearing Date: November 8, 2024

Agenda Item No.: 24-6-2

Comment Log Display

Here is the comment you selected to display.

Comment for Proposed Low Carbon Fuel Standard Amendments (lcfs2024) - 15-3.

First Name Al

Last Name Pimentel

Email Address the4pimentels@comcast.net

Affiliation

Subject Request for an EO for aftermarket exhaust on 20+ year old car

Comment

Subject: Request for Assistance in Obtaining CARB Executive Order for Aftermarket Part for 2004-2005 Mazdaspeed MX-5 Miata

I am writing as a constituent and as someone seeking your assistance in

obtaining a California Air Resources Board (CARB) Executive Order (EO) for an aftermarket part

designed specifically for the 2004-2005 Mazdaspeed MX-5 Miata. As you may know, CARB

requires an EO to certify that add-on or modified parts do not increase vehicle emissions.

However, the process to obtain this exemption presents unique challenges for vehicles with low

production numbers--fewer than 6,000 units of this model were sold in North America and they

are all 20+ years old now.

The part in question is a downpipe and catalytic converter, SKU# 06-58300, produced by Flyin'

Miata, a highly respected manufacturer and retailer of quality aftermarket components. The

catalytic converter meets California emissions standards and will pass the sniffer test. Flyin' Miata

is well known for their commitment to engineering excellence and emissions compliance, yet the

complexity, cost, and delays of the CARB approval process make it extremely difficult for them to

justify pursuing certification for niche vehicles like the Mazdaspeed MX-5.

While I fully support California's efforts to reduce vehicle

emissions, the current EO process is unnecessarily burdensome for small manufacturers and enthusiasts trying to bring compliant parts

to market. The extensive testing requirements, high costs, and bureaucratic roadblocks

discourage compliance and push people toward off-the-books modifications or simply abandoning

efforts altogether. This kind of government inefficiency is exactly why voters become frustrated

with the system, leading to electoral outcomes like Donald Trump's victories. People want

practical governance, not red tape that makes life harder for those who are trying to follow the rules.

I respectfully request your help in addressing these issues:

- 1. **Advocacy for Streamlined Processes:** Encourage CARB to develop alternative approval pathways for low-production vehicles, such as reduced testing
- requirements or lower fees.
- 2. **Support for Small Manufacturers:** Promote initiatives that provide financial or technical
- assistance for small businesses seeking EO certification.
- 3. **Policy Development:** Support legislative or regulatory reforms that account for the challenges of certifying parts for low-production vehicles without compromising environmental goals.

I appreciate your time and your service to our community. Your leadership is crucial in ensuring

that California's regulatory framework remains fair, practical, and accessible to businesses and

consumers alike. Please let me know how I can assist in advancing this discussion.

Sincerely,

Alex Pimentel

2005 Mazdaspeed Miata Owner

3739 Painted Pony Road

Richmond CA 94803

the4pimentels@comcast.net

510-813-0479

Attachment

Original File Name

Date and Time Comment Was

Submitted

2025-04-08 21:12:01

If you have any questions or comments please contact Clerk of the Board at (916) 322-5594.

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Comment 2 for Proposed Low Carbon Fuel Standard Amendments (lcfs2024) - 15-3.

First Name Cheri

Last Name Keisner

Email Address c144p@outlook.com

Affiliation

Subject The Breath of Life

Comment

Growing up in the 1960's in Los Angeles, there were several days were we not allowed outside on the playground due to "smog alerts." I had bronchial asthma with my mother making a tent above my bed with Vick's in a vaporizer and rubbed on my chest so I would not wheeze. Now I live in Northern California near the coast in the Redwood rain forest. Here the air is pure, rather than brown with sulfuric odors. No amount money extracted from polluting the earth can buy a healthy life. Only living in a healthy environment will bring that to a reality.

Attachment

Original File Name

Date and Time Comment Was Submitted

2025-04-08 21:19:53

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Comment 3 for Proposed Low Carbon Fuel Standard Amendments (lcfs2024) - 15-3.

First Name Alec

Last Name Orozco

Email AlecJOrozco@Gmail.com

Address

Affiliation

Subject Raising Costs on California Tradesmen

Comment

I'm a young tradesman, a cell tower climber, relying on my gas truck to chase work across California. The LCFS keeps jacking up fuel costs while barely denting carbon emissions, and these amendments make it worse for folks like me. I urge CARB to rethin this.

003.1

The Section 95482(h) change lets hydrogen with carbon capture dod the 2035 fossil phaseout and count as 80% renewable by 2030. More hydrogen credits mean higher deficits for gas/diesel when there i already \$0.47/gallon extra on gas (\$4.80 CA vs. \$4.00 U.S., AAA April 2025). Section 95483(c) dumps all base credits to utilities and EV rewards, even motorcycles, cutting gas/diesel relief.

Sections 95486.3/95486.4 juice hydrogen station credits--bigger derates, no caps--pushing ZEV buildout while I pay more to fill up.

This hits hard for me at roughly \$500/year extra for 25k miles, assuming 12 MPG, when 85% of us drive gas/diesel (15M vehicles, DI 2024). LCFS costs soared 47% since 2017 (CARB Dashboard), but transportation emissions dropped just 7% (174MMT to 162MMT, CARB 2023). That's \$17B for peanuts; 37MMT reduced since 2007 (CARB) isn't worth it when credits favor EVs (70%, 2024 data) and leave gas/diesel footing 70% of deficits on 30% of supply.

I work out-of-town jobs with high physical risk for my money. Why should I subsidize hydrogen stations or EV rebates when emissions barely budge? These changes deepen the squeeze without proof they work. Pull back--focus credits on gas/diesel relief, not ZEV handouts. Let workers breathe, not just green tech.

Attachment

Original File Name

Date and 2025-04-10 16:35:17
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Was
Submitted

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Comment 4 for Proposed Low Carbon Fuel Standard Amendments (lcfs2024) - 15-3.

First Name Tara

Last Name Lopez

Email Address taralopez858@gmail.com

Affiliation

Subject Adding Onto the Exurbanite Costs on Students in California

Comment

004.1

I'm a college student in California, juggling tuition, rent, and gas for my beat-up sedan--already stretched thin by this state's insane cost of living. The LCFS keeps driving up fuel prices, and these amendments pile on more pain for students like me, with little proof it's cutting carbon enough to matter. Please reconsider this burden.

Section 95482(h) lets hydrogen with carbon capture count as 80% renewable by 2030 and skips the 2035 fossil phaseout. More hydrogen credits mean higher gas prices--already \$0.47/gallon extra (CARB 2024 Dashboard), pushing California's \$4.80/gallon (AAA April 2025) way past the \$4.00 U.S. average. Section 95483(c) shifts all base credits to utilities and EV rewards, even motorcycles--nothing for gas users like me. Sections 95486.3 and 95486.4 boost hydrogen station credits with bigger derates and no caps, favoring ZEVs while I pay more to commute to class.

Gas is 15% of my \$20k/year budget--\$300 extra yearly when driving roughly 10k miles a year. Rent's \$1,400/month, tuition's \$7k (CSU 2024)--I'm drowning, and 85% of us drive gas/diesel (15M vehicles, DMV 2024). LCFS costs jumped 47% since 2017 (CARB), but emissions only fell 7% (174MMT to 162MMT, CARB 2023)--\$17B for 37MMT since 2007 isn't worth it when EVs hog 70% of credits (2024 data) and gas covers 70% of deficits.

I'm studying, working part-time--not slacking. Why should I fund hydrogen or EV rebates when carbon emissions barely budges? These changes squeeze students harder. Shift credits to ease gas costs for those of us who are already doing the most we can.

Attachment

Original File Name

Date and Time Comment Was

2025-04-10 16:42:34

Submitted

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Comment 5 for Proposed Low Carbon Fuel Standard Amendments (lcfs2024) - 15-3.

First Name Angela

Last Name Kurdyla

Email Address aekurdyla@dons.usfca.edu

Affiliation Citizen of San Francisco

Subject Statement on Third Notice of Public Availability of Modified Text and Availability of Addi

Comment

Dear Clerk of the Board,

My name is Angela Kurdyla, I live in San Francisco, and I am an undergraduate student of Environmental Studies at the University of San Francisco.

It is my belief that the changes made in the "Third Notice of Public Availability of Modified Text and Availability of Additional Documents and Information" are not sufficient to implement the "Proposed Low Carbon Fuel Standard Amendments." Changes made in the "Third Notice..." do not sufficiently respond to the concerns of the nonprofit groups, Food and Water Watch, Communities for a Better Environment, and Growth Energy regarding carbon credit given for the production of renewable hydrogen from the burning of biomethane.

Renewable hydrocarbons are a necessary clean energy source for long term energy storage as we shift away from burning fossil fuels. However, the Board does not account for the implication crediting renewable hydrogen production will have on large agricultural animal feeding operations. Though I acknowledge the positive incentive this amendment has to move away from fossil fuel reliance, incentivizing fuel production in animal agricultural operations will only increase the size of these GHG hotspots. In 2022, the agricultural sector accounted for 8% of state GHG emissions with 70% of these GHG emissions deriving from livestock, primarily dairy farms (California Air Resources Board, 2024). It is my fear that encouraging biomethane production will increase agricultural GHG emissions as agriculture operations see incentive in expanding their operations. Methane digesters are now common

among large dairy farms as it is only large livestock feeding operations that can produce a sufficient amount of manure to benefit off renewable hydrogen production. Herd sizes of dairy facilities grew roughly 3.7% in a year, moving against Biden's Global Methane Pledge committing to a 20% reduction in herd sizes (Skiff, 2024). While the nation should be transitioning away from its dependence on livestock feeding operations, California is moving backwards.

"The Proposed Low Carbon Fuel Standard Amendments" if adopted, will result in a nonuniform transition to better air quality. I urge the California Air Resources Board to vote against the "Proposed Low Carbon Fuel Standard Amendments." The state of California should not jeopardize the air quality of our future for a fleeting economic benefit to the livestock industry.

References:

California Air Resources Board. (2024, September 20). California greenhouse gas emissions from 2000 to 2022.

https://ww2.arb.ca.gov/sites/default/files/2024-09/nc-2000_2022_ghg_inventory_trends.pdf

Skiff, S. (2024, February 21). New research reveals factory farm manure biogas production harms environmental justice, fails to achieve methane reduction targets, and worsens consolidation. Friends of the Earth.

https://foe.org/news/factory-farm-manure-biogas-report/

Attachment

Original File

Name

Date and Time

2025-04-10 21:19:11

Comment Was

Submitted

If you have any questions or comments please contact Clerk of the Board at (916) 322-5594.

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RIVIAN



April 14, 2025

SUBMITTED ELECTRONICALLY AT:

www.arb.ca.gov/lispub/comm/iframe_bcsubform.php?listname=lcfs2024

Re: Third Notice of Public Availability of Modified Text and Availability of Additional Documents and Information for the Proposed Low Carbon Fuel Standard Amendments

To Chair Randolph, Honorable Members of the California Air Resources Board ("CARB"), and Staff,

Rivian Automotive, LLC, ("Rivian") appreciates the opportunity to submit comments in response to the additional modifications released on April 4, 2025, to the proposed Low Carbon Fuel Standard ("LCFS") amendments. Rivian remains strongly supportive of both the LCFS and the rulemaking CARB undertook in 2024 to update the regulation.

We acknowledge the staff's additional modifications in response to feedback from the Office of Administrative Law, and we thank CARB for its continued dedication to this critical policy. While Rivian is disappointed that the modifications remove language allowing EV manufacturers to share in residential base credit generation, we appreciate the need to resolve OAL's questions regarding that provision of the amendments. In place of allocating base credits to automakers, Rivian supports the EV purchase rebate for medium- and heavy-duty ("MHD") fleets and applauds the clarification in these modifications that "high priority and federal fleets," as defined for purposes of the Advanced Clean Fleets regulation, will be eligible. This rebate promises to be an important tool in accelerating the electrification of the MHD market.

At this stage, we believe the priority should be the expeditious finalization and implementation of the modified LCFS amendments. As recent softness in credit prices suggests, the market is asking for certainty. Resolving this rulemaking—and making

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RIVIAN



these amendments effective as soon as possible—is paramount for supporting the state's ambitions to decarbonize the transportation sector.

To that end, Rivian reiterates its thanks to the staff and to the members of the Board for their continued support of the LCFS. We are grateful for everyone's steadfast efforts to finalize this rulemaking. We look forward to the implementation of the amendments and continuing to participate in the LCFS market.

Sincerely,

Tom Van Heeke Senior Policy Advisor, Environmental Rivian Automotive, LLC tvanheeke@rivian.com | 641-888-0035



The Honorable Dr. Steve Cliff Chair, California Air Resources Board 1001 I St, Sacramento, CA 95814 Sacramento, California 95814 April 14, 2025

RE: Third Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information: Proposed Low Carbon Fuel Standard Amendments

Dear Dr. Cliff:

Clean Energy continues to support the amendments to the Low Carbon Fuel Standard (LCFS) that were adopted by the California Air Resources Board on November 8, 2024 and supports immediate approval by the Office of Administrative Law (OAL) of the Third 15-day Package, especially before July 1, 2025 so the amendments can be in effect for reporting in the first quarter of 2025.

Clean Energy, headquartered in California, was a foundation stakeholder in support of the LCFS. As North America's largest provider of renewable natural gas (RNG) transportation fuel with over twenty-eight years of leading industry experience, Clean Energy provides construction, operation and maintenance services for refueling stations nationwide. We have a deep understanding of the growing marketplace, as our portfolio includes over 600 stations in 43 states, including over 250 in California.

We want to emphasize the need for immediate approval to create investment certainty, which has been placed in jeopardy since the amendments were disallowed by OAL. Credit prices were in the early \$70s before the decision and then in the low \$50s by early April. Furthermore, the executive order issued by President Trump titled "Protecting American Energy from State Overreach" has concerned the credit market and is another reason for prompt adoption by OAL to stabilize credit prices and provide certainty.

These amendments will not increase fuel pump prices. Recent analyses show that retail fossil fuel prices are strongly influenced by many factors (e.g., global events, holiday weekends, seasonal fluctuations, refinery disruptions and decisions about production that affect supply, refinery pricing decisions, seasonal fuel blends, and taxes) and fossil fuel producer pricing strategies are complex, reflecting local and regional market conditions. As CARB has noted: "The reality is that the actual cost pass-through from LCFS to retail gasoline or diesel prices is uncertain, that there is no correlation between historical LCFS credit prices and gasoline prices, and that the LCFS is not a major driver of overall retail fuel prices in

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California." This has been demonstrated this year with the increase in fuel pump prices and near an all-time high while LCFS credit prices are near historic lows.

The LCFS is a cost-effective critical tool not only to effectively meet carbon emission reduction targets, but also as a mechanism that fosters technological innovation, supports a robust market for alternative fuels, provides long-term investment certainty and stimulates job creation and investment.

In addition, the LCFS provides compliance flexibility to producers of high carbon intensity transportation fuels to either invest in low carbon alternative fuels or to purchase credits from low carbon fuel producers. This market-based program enables regulated parties to make their own choice as to whether to <u>invest in low carbon fuels directly</u> or to continue to sell purely high carbon emitting fuels.

We appreciate CARB's commitment to ambitious state goals and targets, backed by science-based and fuel neutral policies. The LCFS needs to be stringent and continue rewarding projects based GHG outcomes. Remaining true to these core concepts will ensure California leads the world in rapid transportation sector decarbonization.

Sincerely,

Ryan Kenny

Policy Director - Western U.S.

Clean Energy

Comment Log Display

Here is the comment you selected to display.

Comment 8 for Proposed Low Carbon Fuel Standard Amendments (lcfs2024) - 15-3.

First Name Carolann

Last Name Maccini

Email Address cbucca651@gmail.com

Affiliation

Subject Demanding Reform of the Low Carbon Fuel Standard

Comment

008.1

Dear Governor Newsom and Members of the California Air Resources Board (CARB),

I am writing to you personally to express deep concern about the current state of California's Low Carbon Fuel Standard (LCFS) and to implore you to take immediate action to address the environmental injustices embedded in the program.

Originally intended as a tool to combat climate pollution in the transportation sector, the LCFS has been manipulated by powerful corporations, particularly Big Ag and Big Oil. It has become the nation's largest and most lucrative pollution trading scheme for factory farm biogas, perpetuating harmful practices rather than serving its environmental objectives. It is driving the construction of more factory farms and factory farm biogas projects in states far from California, causing severe harm to air, water, public health, rural economies, and overall quality of life.

The current flaws in the LCFS, such as "avoided methane crediting" and inaccurate life cycle assessments, not only enable pollution but disproportionately harm low-income communities and communities of color. Factory farms, predominantly situated in these marginalized areas, inflict severe damage on air, water, public health, rural economies, and overall quality of life.

I urge you to consider and prioritize the following reforms to the LCFS:

Eliminate "avoided methane crediting" in 2024.

Address inaccuracies in the Life Cycle Assessment that ignore

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Original File Name

associated up and downstream greenhouse gas emissions from factory farm gas production.

Remove the 10-year "grace period" for factory farm gas producers.

Stop double counting by allowing factory farm gas projects paid for and claimed by other programs to sell LCFS credits as well.

CARB holds a pivotal opportunity this year to adopt new rules that align the LCFS with California's environmental justice commitments. Environmental justice, zero emission, and climate advocates have presented a clear alternative to the current policies that heap lavish rewards on the biggest polluters through the Comprehensive EJ Scenario. CARB should adopt those recommendations to stop moving California climate policy in the wrong direction.

I implore you to lead the charge in demanding a future free from the clutches of Big Oil and Big Ag. By prioritizing the well-being of Californians over corporate profits, we can reform the LCFS to protect communities most affected by its current flaws. Your decisive action in this critical matter would demonstrate a commitment to bold climate action rooted in justice. Please stop exporting your bad policy to our front doors.

Date and Time Comment Was Submitted

2025-04-16 05:48:20

If you have any questions or comments please contact Clerk of the Board at (916) 322-5594.

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Comment 9 for Proposed Low Carbon Fuel Standard Amendments (lcfs2024) - 15-3.

First Name Chloe

Last Name Taylor

Email Address chloemmtaylor@gmail.com

Affiliation Resident

Subject Public Comment on Third 15-Day Modifications to Proposed LCFS Amendments

Comment

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009.3

Dear California Air Resources Board

As a college student living in San Francisco and someone deeply concerned about the future of our climate and frontline communities, I appreciate the opportunity to submit my public comment regarding the Third Notice of Modified Text for the Low Carbon Fuel Standard (LCFS) Amendments.

While I support California's efforts to reduce carbon intensity in the transportation sector, I urge CARB to prioritize true zero-emission solutions over transitional or unproven technologies like hydrogen produced with carbon capture and sequestration (CCS). Allowing fossil-based hydrogen with CCS to count toward renewable hydrogen requirements risks prolonging dependence on fossil fuel infrastructure, which harms air quality.

I respectfully ask that CARB make all regulatory documents and amendments accessible in plain language to support public understanding and meaningful participation. The complexity of the tracked changes and APA formatting poses a barrier for students, working people, and non-technical community members trying to stay informed and advocate for equitable policy.

Please ensure this amendment process upholds climate justice, centers public health, and avoids greenwashing technologies that benefit fossil fuel companies more than frontline Californians.

Attachment

Original File Name

Date and Time Comment Was

2025-04-16 09:49:28

Submitted

If you have any questions or comments please contact Clerk of the Board at (916) 322-5594.

Board Comments Home



April 16th, 2025

Matt Botill Chief, Industrial Strategies Division California Air Resources Board 1001 I Street Sacramento, CA 95814

Mr. Botill and CARB Staff,

On behalf of Generate Capital, PBC ("Generate"), I want to extend our sincere appreciation to CARB staff and leadership for your commitment and perseverance in bringing the Low Carbon Fuel Standard (LCFS) rulemaking process to its conclusion. CARB's thoughtful and inclusive approach to stakeholder engagement has helped deliver comprehensive and forward-looking improvements to this policy framework. The final LCFS regulation addresses many of the concerns raised by the market, and we are pleased to see our prior comments reflected in key features of the final rule.

We support the recent updates to the regulatory text in response to the Office of Administrative Law's (OAL) disapproval and commend CARB for responding with expediency, clarity, and transparency. We urge the agency to move quickly to finalize the rule with an effective date as of January 1, 2025, as to avoid any further delay and the additional deterioration of the credit market that would be expected to arise as a result of delayed action. Regulatory certainty and prompt implementation are critical to ensuring that project development and capital formation remain robust in support of this program.

As long-term participants in the LCFS program, Generate invests with conviction that sustainable infrastructure offers market-leading risk-adjusted returns. We look forward to continuing to partner with CARB to help achieve the goals of the LCFS and ensure the program remains a cornerstone of the state's climate and transportation strategy.

Sincerely,

Asher Goldman Vice President

Asher Goldman

Generate Capital

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Steven Cliff, Executive Director California Air Resources Board

RE: SRECTrade Comments on Proposed Low Carbon Fuel Standard (LCFS) Amendments, Proposed Third 15-day Modifications (published April 4, 2025)

Dear Mr. Cliff:

SRECTrade appreciates the clarifications CARB made in the April 4, 2025 draft of the LCFS Amendments. We strongly support CARB's submission of the proposed modifications for adoption, as the amendments are critical to the long-term health of California's low carbon fuel economy.

However, SRECTrade submits the following comments specifically regarding the most recent updates to the EV charger accuracy verification process.

- 011.1 ACCURACY: SRECTrade supports the inclusion of the 5% accuracy requirement added to Section 95191.2(a) for all metering as it strengthens the integrity of the credits generated and the program as a whole.
- CALIBRATION REQUIREMENTS: SRECTrade finds that the current edits to Section 95191.2(a)(1)(A) do not clarify how 'manufacturer's recommended procedures' for internal meters which do not have field calibration functionalities should be treated. Attempting to field calibrate an internal meter that is not designed for post-manufacturing adjustment can result in reduced accuracy, meter damage, voided warranties and compromised data security, which we do not believe is the intent of the regulation.

CARB's previous response to comments referenced that Section 95491.1(c)(1)(G) addresses internal meter accuracy requirements, however SRECTrade does not find Section 95491.1 clear as it relates to the issues above and the most recent revisions to Section 95191.2.

SRECTrade suggests the following options for resolving this issue while proceeding with the adoption of the Amendments:

- CARB could add specific language that clearly indicates that manufacturers specifications certifying internal meters accuracy within 5% are acceptable documentation for verifiers to ensure compliance. Similarly, documentation of an EV charger's certification of compliance with other California EVSE standards (such as the DMS CTEP) should also be considered acceptable evidence of accuracy for verification purposes.
- Alternatively, CARB could remove the most recent edits and leave the language as previously proposed in Section 95191.2 and work with the EV charging industry to develop guidance on metering accuracy verification. This guidance could provide more detail and specific direction than what is currently possible in the regulation.

Sincerely,

Ryan Huggins SRECTrade, Inc.

About SRECTrade

SRECTrade provides management and transaction solutions for renewable energy and clean fuel programs across North America. SRECTrade's parent company, Xpansiv, provides market infrastructure to rapidly scale the world's energy transition. Xpansiv operates CBL, the largest spot exchange for environmental commodities, including carbon credits and renewable energy certificates.



The Honorable Liane Randolph Chair California Air Resources Board 1001 | Street Sacramento, CA 95814

Dear Chair Randolph:

As a developer of dairy digester RNG and biogas-to-electricity projects for EV charging in West Coast states, Promus Energy appreciates the opportunity to comment on the third 15-day proposed changes to the CA Low Carbon Fuel Standard (LCFS). Promus appreciates the pace at which CARB has proposed the LCFS rule revisions to satisfy the California Office of Administrative Law (OAL).

Promus agrees with the changes proposed by CARB and urges a rapid resubmission to OAL to finally implement the new LCFS rules. Finalization of the LCFS program rules package is urgently needed to bring the credit market into balance after three years of low values and provide sustained incentives for low-carbon fuels, especially the ultra-low CI fuels needed to achieve a 90% average CI reduction by 2045. Repeated delays and market uncertainties have undermined financing and development of the lowest carbon fuels. Promus appreciates CARB's understanding of this and efforts to implement the new regulations as soon as possible.

Sincerely,

012.1

Dan Evans, President
Promus Energy LLC
1201 Third Ave., Suite 320
Seattle, Washington 98101
dan@promusenergy.com
206.300.0835

Iwatani Iwatani Corporation of America

April 17, 2025

Ms. Liane M. Randolph California Air Resources Board 1001 I Street Sacramento, CA 95814

RE: California Air Resources Board's Potential Changes to the Low Carbon Fuel Standard

Dear Chair Randolph,

013.1

Iwatani Corporation of America (ICA) would like to thank the California Air Resources Board (CARB) for the opportunity to comment on the potential changes to the Low Carbon Fuel Standard (LCFS) program. ICA owns and operates a network of hydrogen refueling stations across California and is rapidly expanding to serve the fast-growing hydrogen market in California. Our expansion plans include stations that support a variety of on-road fuel cell electric vehicles in the light-duty, medium-duty, and heavy-duty sectors. Since 1941, Iwatani has regarded hydrogen as the ultimate clean energy source and has consistently engaged in initiatives to encourage its widespread use. ICA is committed to supporting the zero emissions vehicle (ZEV) market by expanding the fueling infrastructure and supplying hydrogen to both light-duty and heavy-duty vehicles. Under the corporate slogan "A world where all enjoy true comfort – this is Iwatani's desire," we strive to solve environmental concerns with the aim of achieving a carbon free society through the use of hydrogen.

ICA greatly appreciates CARB's updated proposed changes, which reflect a thoughtful consideration of feedback from the hydrogen industry. Notably, we commend the removal of the HRI credit generation cap based on station capital expenditure for both the LMD and HD HRI programs, as well as the increase in the derating factor for public HD-HRI from 50% to 62.5%. We believe these revisions enhance the flexibility and predictability of the LCFS program, helping to better incentivize private investment in zero-emission vehicle (ZEV) infrastructure. We respectfully submit the following additional comments for your consideration to further strengthen the program.

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Iwatani Corporation of America

ZEV Fueling Infrastructure Pathways

On October 1, 2024, CARB released final modifications to the proposed amendments, increasing the public LMD station HRI capacity factor from 50% to 100%, a change that aligned with public comments from the hydrogen industry. However, in the Proposed Third 15-Day Changes to the Regulation Order, the capacity factor was reduced to 62.5%. This reduction negatively impacts the business case for LMD stations and poses a risk to the growth of the light-duty hydrogen vehicle market. Lowering the capacity factor may also undermine the original intent of the HRI program—to support stations as fleet demand increases over time. We respectfully urge CARB to restore the LMD-HRI capacity factor to 100%, which would strengthen investment incentives and help accelerate the adoption of hydrogen-powered vehicles in California.

ICA does appreciate CARB's efforts to incentivize building stations with the appropriate capacity that can support expanded vehicle volumes over time. We also appreciate the desire to create HRI pathways that support station growth for light-duty, medium-duty, and heavy-duty vehicles. We believe that California's ambitious carbon reduction goals require the rapid expansion of clean fuel infrastructure, including hydrogen, and the proposed amendments will pave the road to achieve the ZEV mandate goals.

Sincerely,

Hossein Tabatabaie

Director of Product Management



4435 "O" Street, Suite 210 - Lincoln, NE 68510 - 402-441-3239

April 21, 2025

Chair Liane Randolph & Members of the Board California Air Resources Board 1001 I Street, Sacramento, CA 95814

Via Electronic Submission

Re: Third 15-Day Changes to the Proposed LCFS Regulation Order

Dear Chair Randolph and Members of the California Air Resources Board:

The Nebraska Soybean Association appreciates the opportunity to comment on the proposed modifications (Third 15-Day Changes) to the Low Carbon Fuel Standard (LCFS) program. The Nebraska Soybean Association has welcomed engagement with the California Air Resources Board (CARB) and staff throughout this multi-year process to update the LCFS program.

The Nebraska Soybean Association serves as an organization that represents Nebraska soybean growers assuring sound policy and regulatory decisions are made that impact soybean growers. The Nebraska Soybean Association represents soybean producers in our state that produced 301 million bushels of soybeans in 2024. Nebraska is a state where roughly 33 percent of the acres are irrigated.

CARB's Third 15-Day Changes to revise the LCFS did not address our major concerns with provisions included in the final amendments approved by CARB. In addition to the new proposals in the Third 15-Day Changes package, the Nebraska Soybean Association (NSA) remains deeply concerned with the drastic and inequitable pivot CARB has made related to agricultural feedstocks used for biofuels. The NSA continues to encourage that updates to the LCFS program are based on up-to-date and sound science, as required by AB-32. Outlined below are our concerns and proposed solutions that will enable CARB to meet its climate goals, protect the environment and all Californians, while also supporting American soybean farmers and processors who are investing in the future of low-carbon energy.

Serious Feedstock Cap Concerns and Proposed Solutions

The Nebraska Soybean Association still has significant concerns with the vegetable oil feedstock cap that was included in the initial 15-Day Changes posted in August 2024. The current proposal restricts the amount of soybean oil, canola oil and sunflower seed oil that is allowed to generate credits in the program at an inequitable 20% by company. CARB's own data demonstrates that vegetable oil feedstocks, including soy, have consistently exceeded the proposed cap since 2021.

Capping these proven, sustainable, and scalable feedstocks would suppress the supply of renewable diesel, increase reliance on fossil fuels, and raise fuel prices for California consumers. Even CARB staff acknowledged in the April 2024 workshop that a cap would reduce air quality benefits and likely increase NOx and PM2.5 emissions. All of this, including the recent tariffs on imported feedstocks greatly increase costs and further substantiate U.S. based feedstocks as the clear-cut choice. The Nebraska Soybean Association urges CARB to remove the cap on U.S. based vegetable oil feedstocks to provide a more economically feasible, locally produced and sustainable, climate smart option for the people and the planet.

Agricultural feedstocks for biofuel production are already held to a high standard for participation in the U.S. Renewable Fuel Standard (RFS). Rather than adding sustainable U.S. based feedstocks to its arbitrary proposed cap, CARB needs to update carbon intensity analysis and oversight of imported feedstocks, which are not held to the same level of accountability. Recent actions by the European Union in response to fraudulent Chinese biodiesel imports underscore this concern¹. The EU committee recently met at the request of a member state to discuss alleged fraud in biodiesel imports from China. Fraud continues to be an issue with imported feedstocks and needs to be addressed further. NSA strongly encourages CARB to adopt enforceable traceability and verification standards, including origin disclosures, documentation audits, and physical testing. Without implementing sustainable solutions to the above and not eliminating a cap on U.S. vegetable oil feedstock, CARB is essentially putting the feedstocks from foreign countries (i.e., China) above those of the United States.

Sustainability Guardrails and Traceability Concerns

The Nebraska Soybean Association remains very concerned about the sustainability guardrails. The sustainability guardrails are more onerous than the specified source requirements used for non-U.S. waste feedstock imports. Palm oil in Southeast Asia has had forced labor concerns², but CARB does not require used cooking oil derived from palm to track social or economic sustainability. Concerningly, petroleum does have to track these criteria. CARB's proposal makes it administratively easier to use non-sustainable petroleum³ in the state than biofuels that have lower carbon intensity (CI) scores and are produced from sustainable feedstocks grown in the United States. Land use change is already captured in the indirect land use change (ILUC) score, which still makes it unclear what actual purpose the guardrails serve.

If CARB insists on agricultural feedstock traceability, then it should reward sustainable practices beyond what is already assumed in the lifecycle analysis (LCA). The U.S. Department of Agriculture (USDA) has developed a tool to quantify the CI reductions for no-till, cover crops and nitrogen inhibitors. Considering this integral information, the carbon intensity of soy-based biofuels could improve through the mentioned climate smart ag practices on the field where the soybeans were produced. Other farming practices like low-till, nutrient management, enhanced efficiency fertilizers, buffers, wetland and grassland management, tree planting on working lands, planting for higher carbon sequestration, and soil amendments all could and should be accounted to assign a lower CI score to an agricultural feedstock. USDA already tracks all these practices through several of their managed conservation programs. In addition, there are a variety of other practices that scientifically lower the CI score of soybean feedstocks for biofuels, and USDA is actively working to develop mechanisms to account for those. If CARB insists on tracing feedstocks back to the farm, then it should also acknowledge when those feedstocks are produced with lower CI practices.

Moreover, USDA has recognized the CI reduction benefits of certain sustainable or climate-smart practices for the purposes of clean fuel transportation programs and is undertaking a rulemaking process to develop final guidelines for the quantification of these practices. Through planting decisions, soil management, and other practices, soybean farmers can continuously reduce environmental impacts. In addition, some soybeans are double cropped meaning they are grown as a secondary crop following a primary crop within a growing season. They are not displacing other crops or land uses. Double-crop soybeans should be eligible to have the ILUC component of the CI score removed or at least shared with the other crop in the rotation. NSA proposes the aforementioned issues to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Modernized, Accurate, Climate Smart Carbon Intensity Modeling and Scoring

The Nebraska Soybean Association remains concerned that without a comprehensive update to the Global Trade Analysis Project model for biofuels (GTAP-BIO) that CARB utilizes, U.S. soy-based feedstocks will be phased out of the LCFS even without the additional limitations included in the Second and Third 15-Day Changes. Current data indicates a much lower CI score for U.S. soybeans, as growers continue to improve soil

¹ EU industry demands answers as 'fraudulent' Chinese biofuels continue to flow - Euractiv

²https://apnews.com/article/virus-outbreak-only-on-ap-indonesia-financial-markets-malaysia-7b634596270cc6aa7578a062a30423bb

https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.858512/full

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practices, limit water use, lower on-farm emissions and more. CARB is recommending stringent sustainability guardrails for U.S. soy but is still on track to likely phase-out U.S. soy-based biofuels from credit generation by approximately 2035 or sooner.

As CARB looks to develop a more aggressive auto acceleration mechanism to reach CI reduction benchmarks sooner, using outdated methodologies will only limit the output of actual improvement over time in terms of emissions reductions. As CARB updates all other major lifecycle emissions models through this rulemaking, NSA once again urges action to update the GTAP-BIO model so that the most current, climate smart and science-based data may be used to determine carbon intensity reductions. The reasoning and sources indicated in the Third 15-Day Changes do not address this concern and need to be revised to ensure accuracy. NSA proposes this issue to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Equitable Entities Eligible to Apply for Fuel Pathways

The Nebraska Soybean Association is very concerned about CARB's decision to give the Executive Officer authority to stop accepting new pathways for biomass-based diesel starting in January 2031. The Nebraska Soybean Association does not understand how this benefits the LCFS. Under AB-32, CARB must under statute minimize costs and maximize GHG reductions. It is unclear how this is served by rejecting new pathways. In fact, the LCFS is best served by allowing the most available and equitable pathways. If these pathways cannot achieve cost-effective GHG savings, they will not be utilized by the market in the LCFS. In essence, an increase in pathways can only serve to improve GHG benefits in California. Singling out a single fuel for prejudicial treatment is baffling given the goals of the LCFS and the authority that establishes it. NSA urges CARB to continue to allow equitable pathways forward with no date of denial.

Recommended Climate Enhancing Solutions for CARB

As CARB finalizes its update to the LCFS, the Nebraska Soybean Association recommends several actions that will likely prevent an increase in fossil diesel use, improve carbon intensity calculations, and improve market access for sustainable U.S. agricultural feedstock providers.

First, CARB should not apply the vegetable oil feedstock cap proposal to U.S. feedstocks. As noted, these feedstocks are already subject to federal guardrails to ensure production on land not converted since 2008. The RFS was designed specifically to prevent land conversion for biofuel production, and USDA data shows a decrease in farmland over the same period.

Second, CARB should convene an expert working group to consider issues related to the sustainability provisions and indirect land use change (ILUC). The Nebraska Soybean Association recommends that this expert working group convene before the end of 2025 and provide recommendations by the end of Fall 2026.

Third, NSA retains strong concerns about the ability of supply chains to comply with the sustainability guardrails. If CARB does move forward with the guardrails, they must reconsider its proposed sustainability requirements to allow soybean growers the opportunity to participate in the California biofuels market through innovative and climate smart agriculture practices. If traceability can be used to show additional benefits in CI scoring, CARB must look to programs already developed through farmer input and provide improved scoring for feedstocks that employ sustainability practices to minimize the changes in comparative costs (i.e., USDA accredited programs and practices). CARB should work with USDA to develop an aligned scheme to quantify climate-smart agricultural practices for the purposes of biofuel feedstocks. USDA has already engaged with CARB regarding this project, which could be applied to the work that CARB is doing on traceability and carbon quantification of agricultural biofuel feedstocks.

Lastly, CARB must undertake a comprehensive update of the GTAP-BIO model for soybean oil used in biofuel production. Without using the most up-to-date and accurate data, CARB is doing a disservice to the U.S. feedstock producers and California's citizens by calculating carbon intensity scores not rooted in current facts. Through CARB's own analysis we know prejudicial feedstock treatment will lead to more emissions in the California transportation sector, harming the environment.

Concluding Thoughts/Pathway Forward

The Nebraska Soybean Association is encouraged by the continued successes of programs that support the development of cleaner, low-carbon fuels. However, it is critical that CARB finalizes updates in a way that equitably include U.S. agricultural feedstocks through policies that are science-based aligning with the most up to date information as well as promoting the sustainability of U.S. based products and businesses; including the elimination of capping on U.S. vegetable oil feedstocks and applying sustainability guardrails that are economically feasible for farmers while rewarding their practices that lower CI.

CARB's Third 15-Day Changes did not address any of the fundamental issues raised by the Nebraska Soybean Association in the First and Second 15-Day Changes and fails to acknowledge the potential unintentional consequences of a feedstock outlined by its own employees in previous discussions. CARB is required under the law to achieve the maximum technically feasible and cost-effective reductions in greenhouse gas emissions. The most recent 15-Day Changes show a lack of willingness to achieve the statutory obligations set forth in AB-32 and neglect modernized, climate smart, science-based solutions, ultimately disregarding the protection of U.S. based feedstocks, the people, and the planet. The Nebraska Soybean Association also asks that CARB respond in writing to further substantiate their decisions regarding our concerns expressed in this letter. We look forward to your written responses as a state regulatory body, whose responsibility is to protect its' citizens and the environment by providing transparency on decisions made for those of impact.

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The Nebraska Soybean Association is eager to continue working with CARB to support the role of agriculture in diversifying the fuel supply while reducing carbon intensity and increasing clean air in California and beyond. On behalf of U.S. soybean farmers, we appreciate the opportunity to comment and look forward to collaborating with CARB and other relevant stakeholders on implementation of policies that expand the use of U.S. soybased biofuels and market opportunities for U.S. soybean farmers.

Sincerely,

Part Notalusal

Kent Grotelueschen, President

Nebraska Soybean Association



April 18, 2025

The Honorable Steven S. Cliff, Ph.D. Executive Officer California Air Resources Board 1001 I Street Sacramento, California 95814

The Honorable Liane M. Randolph Chair California Air Resources Board 1001 I Street Sacramento, California 95814

RE: Proposed Low Carbon Fuel Standard Amendments; Third Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information

Dr. Cliff and Chair Randolph:

NATSO, Representing America's Travel Centers and Truckstops, and SIGMA: America's Leading Fuel Marketers (together, the "Associations") represent more than 80 percent of retail sales of motor fuel in the United States. On behalf of the diverse and forward-thinking retail fuel industry, we are eager to work with the California Air Resources Board ("CARB" or the "Agency") to advance policies that lower transportation emissions in California.

The Associations strongly support several of the proposed changes made in the third iteration of 15-Day Changes (the "Third Proposed Amendments")² that support the development of heavy-duty ("HD") hydrogen refueling infrastructure in California.³ Specifically, the Associations applaud the Agency for proposing to modify the HD hydrogen refueling infrastructure ("HRI") program by (i) removing the restrictions on revenue generated through credits (tied to capital expenditure); and (ii) adjusting the proposed derating factor for hydrogen refueling stations. The Associations also support allowing hydrogen produced with accompanying carbon capture and sequestration ("CCS") technology ("blue" hydrogen) to contribute to the renewable hydrogen requirements under the LCFS.

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¹ NATSO currently represents approximately 5,000 travel plazas and truckstops nationwide, comprising both national chains and small, independent locations. SIGMA represents a diverse membership of approximately 260 independent chain retailers and marketers of motor fuel. The retail fuels and convenience industry provide 2.38 million jobs at approximately 120,000 retail establishments across the country.

² "Third Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information, Proposed Low Carbon Fuel Standard Amendments", California Air Resources Board, (April 4, 2025), *available at* https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/3rd_15day_notice.pdf?utm_medium=email&utm_source=govdelivery.

³ The Associations previously filed extensive comments on the first and second iterations of 15-Day Changes proposed by the Agency in August and October 2024, respectively, and encourage CARB to continue to closely consider the fuel market implications detailed at length in those comments. *See* NATSO, SIGMA comments (August 27, 2024), *available at* https://www.arb.ca.gov/lists/com-attach/7482-lcfs2024-AmxTNFwpUnJXPgJd.pdf; *See also* NATSO, SIGMA comments (October 16, 2024), *available at* https://www.arb.ca.gov/lists/com-attach/80-lcfs2024-2nd15day-UjxVMlciACALYIQL.pdf

Many of the Associations' members – particularly those with highway locations that service heavy duty commercial trucks – are actively expanding their hydrogen capabilities in response to market- and federal policy signals. They have developed new commercial relationships with companies in the hydrogen value chain, actively participate in multiple "hydrogen hub" projects – including the ARCHES project in California – and continue to pursue hydrogen grant and incentive opportunities.

Commercial decisions to invest in heavy duty vehicles will be grounded in economics. Businesses will not purchase HD electric or hydrogen vehicles at scale unless the total cost of operation is comparable to the cost of diesel-powered trucks. The cost of hydrogen is, by far, the most impactful component of a prospective consumer's total cost of ownership. Minimizing fuel costs should therefore be an essential element of any policy intended to decarbonize heavy duty trucking, including via hydrogen as a transportation fuel. As transportation energy retailers and distributors, our membership will rely upon hydrogen producers to provide an economical supply of clean hydrogen in the years ahead.

The LCFS should *maximize* the market's ability to realize decarbonization objectives. The proposed derating factor for public HRI issued by the Agency in the second 15-Day Notice,⁴ coupled with low station capacity requirements (set at 6,000 kilograms per day), would have resulted in untenable, inadequate LCFS incentives which would have failed to prompt investments in HD HRI in California.⁵

015.2 cont.

The Associations strongly support the changes made to the capacity factor (and, accordingly, the derating factor) in the Third Proposed Amendments. Specifically, our members support a derating factor of 37.5 percent as proposed (62.5 percent capacity factor), which will help to partially remediate the capital risk taken by HD hydrogen station developers and encourage investment. If adopted, these changes will improve the business case for HD HRI investments in California and will help to support the hydrogen capacity necessary to achieve the Agency's HD decarbonization objectives.

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The Associations also strongly support eliminating the restrictions on HRI revenue generation, which were previously capped at 1.5 times capital expenditures ("capex"). The revenue restriction and derating factor are intended to serve identical purposes, but when combined, would have imposed considerable, unnecessary investment risk onto developers. The Associations thus support the proposed changes that eliminate the revenue generation limitation while also reducing the derating factor for HD HRI at 37.5 percent.

015.3 cont.

Finally, the Associations are in favor of the proposal to allow blue hydrogen to contribute to the renewable hydrogen requirements under the LCFS. Providing as much flexibility as possible for hydrogen fuel production will best enable the growth of HD hydrogen-powered transportation, which relies on a robust, economical supply of hydrogen to function.

⁴ See "Second Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information, Proposed Low Carbon Fuel Standard Amendments", California Air Resources Board, (October 1, 2024), available at https://www2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/15day_notice.pdf

⁵ Supra n. 3. The Associations previously filed comments in October 2024 requesting the changes made by the Agency in the Third Proposed Amendments to the capacity factor and credit generation restrictions.

Together, the elimination of the HRI revenue cap and the reduced discount factor proposed by the Agency have the potential to make a meaningful difference in improving the viability of HD hydrogen transportation in California, an essential element in lowering transportation emissions in the coming decades. Thank you for considering our perspective on these important topics. We would welcome the opportunity to further discuss these issues with you at any time.

Sincerely,

NATSO, Representing America's Travel Plazas and Truckstops SIGMA: America's Leading Fuel Marketers



April 21, 2025

Honorable Chair Liane Randolph and Honorable Board Members California Air Resources Board 1001 | Street
P.O. Box 2815
Sacramento, CA 95812

Re: Proposed Third 15-day Change Amendments to the Low Carbon Fuel Standard Regulation

Submitted to https://ww2.arb.ca.gov/applications/public-comments

Dear Chair Randolph and Honorable Board Members:

CalETC appreciates this opportunity to SUPPORT the Low Carbon Fuel Standard (LCFS) regulation. CalETC believes that the changes contained in the Third 15-day Change Amendments address the concerns raised by the Office of Administrative Law (OAL) as well as incorporating changes identified in CARB Board Resolution 24-14 upon adoption of the LCFS amendments on November 8, 2024.

CalETC is a non-profit association committed to the successful introduction and large-scale deployment of all forms of electric transportation including plug-in electric vehicles of all weight classes, transit buses, port electrification, off-road electric vehicles and equipment, and rail. Our board of directors includes Los Angeles Department of Water and Power, Pacific Gas and Electric, Sacramento Municipal Utility District, San Diego Gas and Electric, Southern California Edison, Northern California Power Agency, and the Southern California Public Power Authority. Our membership also includes major automakers, manufacturers of zero-emission trucks and buses, developers and operators of charging stations and other industry leaders supporting transportation electrification. CalETC supports and advocates for the transition to a zero-emission transportation future to spur economic growth, fuel diversity and energy independence, ensure clean air, and combat climate change. Additionally, CalETC believes that LCFS provides benefits for consumers and is an important tool in the transition to a decarbonized economy.

As noted in our February 20 and August 27, 2024 comment letters, CalETC strongly supports the Low Carbon Fuel Standard as it has been tremendously successful in supporting the transition from petroleum to cleaner transportation fuels including electric fuel. CalETC appreciates the

1015 K STREET, SUITE 200 SACRAMENTO, CA 95814 P [916] 551-1943 F [916] 441-3549

opportunity to provide comments on this important regulation. If you have any questions, please do not hesitate to contact me at any time.

Best,

Laura Renger

Executive Director

cc: Rajinder Sahota

Matthew Botill

Jordan Ramalingam

FIRSTELEMENT FUEL

FirstElement Fuel Inc. | 5281 California Ave, Suite 260, Irvine, CA 92617 | 949-205-5553

April 18, 2025

Ms. Rajinder Sahota Deputy Executive Officer, Climate Change and Research California Air Resources Board 1001 I Street, Sacramento California 95814

Subject: LCFS Third15-day Notice Comments

Dear Ms. Sahota,

These two issues are prohibiting individual applicants from HRI if they exceed 1% of deficits and the derate applied to the light- and medium-duty HRI (LMD-HRI).

Penalizing Success

The current LD HRI program does not have an individual applicant prohibition. As we identified in our response to the first 15-day notice¹, limiting a single applicant to 1% of the deficit amount will keep us from deploying further stations, despite having California Energy Commission (CEC) and Alliance for Renewable Clean Hydrogen Energy Systems (ARCHES) grants for additional stations. With more and more companies exiting the hydrogen refueling market, we feel increasingly isolated with more responsibility to the automakers and existing drivers. As a first-mover, we have gained invaluable experience with our station equipment and operations, and our liquid stations now regularly exceed uptimes of over 92%. We are positioned to assist California meet it's zero-emissions and low carbon transportation goals but will be prohibited from doing so. This is especially critical as medium-duty trucks enter the market. We urge the removal of this 1% of the deficit limitation for both the LMD and HD HRI programs or at least waive this requirement for CEC or ARCHES funded stations.

Light- and Medium-Duty Derate

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The revised language includes an increase of the HD-HRI derate from 50% to 62.5%, based on industry requests. This is a welcome change, however, the same derate is now applied to LMD HRI with a maximum station capacity remaining at 1,200 kg/d. This makes the available LMD-HRI credit only 750 kg/d, which encourages smaller not larger stations. As

¹ https://www.arb.ca.gov/lists/com-attach/7400-lcfs2024-VjBQMwNkVVkFMlRh.pdf

FIRSTELEMENT FUEL

FirstElement Fuel Inc. | 5281 California Ave, Suite 260, Irvine, CA 92617 | 949-205-5553

017.4 cont. we had pointed out in our first 15-day comment letter², these neighborhood stations need to be larger to accommodate fuel cell pickup and work trucks being deployed by the end of the decade by the automakers. CARB staff had changed the maximum crediting for LMD-HRI to 1,200 kg/d in the 2nd 15-day notice. It is unclear why you have now gone back to a lower crediting amount unless there was an inadvertent omission of changing the maximum station capacity to 2,000 kg/d as was in the first 15-day notice. We urge CARB to remove the derate for LMD-HRI or make the maximum capacity 2,000 kg/d to incentivize larger stations.

We appreciate CARB staff's work on enabling zero-emissions transportation technologies, and our company was built to enable these same goals through infrastructure. However, constraining successful applicants within the HRI program and shrinking the LMD stations will not achieve the desired outcome of more ZE transportation and will actually have the opposite effect. We look forward to working with staff to implement these critical changes.

Respectfully,

Matt Miyasato, Ph.D.

Chief Public Policy & Programs Officer

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² ibid



April 18, 2024

Steve Cliff
Executive Officer
California Air Resources Board
1001 I Street
Sacramento, CA 95814
(Comments submitted electronically)

RE: Proposed Third 15-Day Changes to Proposed LCFS Regulation order

Dear Executive Officer Cliff,

018.2

This letter is submitted on behalf of my client Raízen Energia S.A. ("Raízen"). Raízen appreciates the opportunity to provide comments on the Proposed 15-Day Changes to the Low Carbon Fuel Standard (LCFS) Regulation.

We recognize and commend the efforts made by CARB to enhance the clarity and precision of the regulatory language in response to the Office of Administrative Law's (OAL) direction. The updated language contained in the 15-Day Changes addresses the ambiguity concerns raised by OAL, contributing to improved regulatory transparency and compliance.

In particular, we welcome the explicit recognition and incorporation of more regionalized tools, such as MapBiomas, in the Land Use Change (LUC) section. This is a valuable step forward in capturing land use dynamics with greater granularity and local accuracy. This recognition of regional tools and expertise reflects CARB's openness to integrating credible, science-based data sources from producer countries like Brazil to inform carbon intensity determinations.

We are hopeful that these improvements will pave the way for a more nuanced and precise assessment of LUC emissions, particularly for sugarcane-based biofuels.

Looking ahead, we look forward to supporting CARB's work by sharing additional data sources and expertise from Brazil that can enable further refinements of LUC estimates and other sustainability assessments. We also look forward to continuing to engage in constructive dialogue and technical collaboration.

Thank you for your leadership and continued commitment to scientific integrity and international cooperation in advancing low-carbon fuels.

Sincerely,

Graham Noyes

Noyes Law Corporation

On Behalf of Raízen

Comment Log Display

Here is the comment you selected to display.

Comment 19 for Proposed Low Carbon Fuel Standard Amendments (lcfs2024) - 15-3.

First Name Annalyn

Last Name Sanders

Email Address annalynsanders@yahoo.com

Affiliation Clean Truck Testing Location

Subject Clean Truck Test Location Training

Comment

Hello,

We are doing the testing for the clean truck checks so our customers are compliant and can get registration. There have been more issues arising with the OVI testing and submission. Our mutual customers are calling us because YOU show them non compliant when they go to the DMV, when they are compliant. All we can do on our end is resubmit the forms.

Can you consider offering training not only for the admin side of this, but also for what to say to our customers who are upset with us when we try to explain we are not CARB affiliated per say we are just a testing location? We do not know any reasoning behind it.

ALSO, we do not own trucks, so we can only get so far on the website to see what it looks like. But we get a LOT of elder people with motor homes that are NOT tech savy, can we get a training course on how to help them as well?

Is there compensation or reimbursement for the amount of time we spend on your website or trying to help customers with issues that fall on your end?

Is there compensation for our customers who have not been registered since February because the DMV won't except the forms directly it has to come to you even though it has been sent to you?

Attachment

Original File Name

Date and Time Comment Was Submitted

2025-04-18 17:11:11

If you have any questions or comments please contact Clerk of the Board at (916) 322-5594.

Board Comments Home













April 21, 2024

Clerk's Office California Air Resources Board 1001 | Street Sacramento, CA 95814

020.1

020.2

020.3

Submitted electronically via: https://ww2.arb.ca.gov/applications/public-comments

Re: Proposed Amendments to the Low Carbon Fuel Standard (LCFS) Regulation

Dear Chair Randolph and Honorable Board Members:

This letter is submitted on behalf of Los Angeles Department of Water and Power, Pacific Gas and Electric Company, Sacramento Municipal Utility District, San Diego Gas & Electric Company, Southern California Edison Company, Burbank Water and Power, Pasadena Water and Power, and the Northern California Power Agency ("the CA Utilities"). The CA Utilities appreciate this opportunity to comment on the additional modifications to the Low Carbon Fuel Standard (LCFS) amendments for a third 15-day public comment period. The CA Utilities believe these changes address the concerns raised by the Office of Administrative Law (OAL) as well as incorporating changes identified in CARB Board Resolution 24-14 upon adoption of the LCFS amendments on November 8, 2024.

The California Utilities are supportive of the most recent changes made to the California Clean Fuel Reward (CFR) program, including removing the participation exclusion for High Priority and Federal Fleets and rescinding the option for the Executive Officer to redirect base credits from the CFR to OEMs. Both these changes provide clarity and increase certainty, allowing the EDUs to more effectively plan for the program's success. The California Utilities understand the importance of a strong medium- and heavy-duty incentive program to galvanize the market, reduce local air pollution, and support the state's climate goals.

The California Utilities appreciate the extensive opportunities for comment throughout the rulemaking process and urge a swift adoption of the regulation.

Respectfully,

The CA Utilities

cc: Rajinder Sahota Matthew Botill Jordan Ramalingam



California Fuels and Convenience Alliance

2520 Venture Oaks Way, Suite 100

Sacramento, CA 95833

916.646.5999

April 18, 2025

California Air Resources Board 1001 I Street Sacramento, CA 95814

RE: Proposed LCFS Amendments - Concerns Regarding CCS Requirements for Hydrogen Infrastructure

The California Fuels and Convenience Alliance (CFCA) represents approximately 300 members, including nearly 90% of all independent petroleum marketers in the state and more than half of the state's 12,000 convenience retailers. Our members—predominantly small, family- and minority-owned businesses—play a vital role in California's fuel supply chain, serving local governments, emergency services, school districts, transit companies, independent fuel retailers, and the agriculture industry.

- CFCA appreciates CARB's continued recognition of hydrogen as a key part of California's low-carbon 021.1 future and acknowledges several important improvements in the proposed LCFS amendments:
 - Lowered the derating cap for the Heavy-Duty Hydrogen Refueling Infrastructure (HD HRI) program
 - Removed the revenue cap on HD HRI stations
 - Included "blue hydrogen" (natural gas with CCS) as an eligible production pathway

While these changes are significant and appreciated, CFCA remains concerned about the requirement that fossil-based hydrogen be paired with CCS to remain eligible after 2030 and 2035, as CCS technology remains prohibitively expensive and geographically limited.

COST & COMPLEXITY: CCS COULD SLOW HYDROGEN ADOPTION

While we support hydrogen's growing role in decarbonizing the heavy-duty sector, requiring fossil-based hydrogen to be paired with CCS by 2030 and again as a condition for post-2035 eligibility presents several critical challenges:

 High upfront costs and limited access to CCS infrastructure: CCS remains prohibitively expensive and geographically limited. According to a 2023 study, a typical CCS project injecting approximately 1 million metric tons of CO₂ per year—using 3 injection wells and 1 monitoring well—has a capital cost just under \$100 million, with operating costs averaging \$8 per metric ton of CO₂. Most hydrogen producers—especially those trying to enter the market—are not in a position to finance or access this technology at the required scale within the proposed timelines.

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- Delays in hydrogen infrastructure buildout: Hydrogen refueling stations and production hubs are still in early phases of deployment. Tying future eligibility to CCS requirements risks delaying or stalling these projects, especially among early adopters who are not vertically integrated.
- Affordability and adoption barriers: The added cost of CCS will likely be passed down the value chain, raising the price of hydrogen fuel. This will make it less attractive for fleets, limiting widespread adoption at a time when we need more commercial use to achieve emissions goals.

FLEXIBILITY IS KEY TO BUILDING A HYDROGEN MARKET

We respectfully urge CARB to consider modifications that will better support near- and long-term development of hydrogen infrastructure:

- Allow alternative compliance options or extended timelines for fossil-based hydrogen production in the early stages of market growth.
- Consider **graduated CCS requirements** that reflect technology and cost developments over time, rather than fixed 2030 and 2035 thresholds.
- Continue supporting **infrastructure credits** and incentives for early hydrogen investments that may not be CCS-ready but still contribute to decarbonization goals.

BALANCING CLIMATE AMBITION WITH IMPLEMENTATION REALITY

CFCA supports the state's ambition to accelerate low-carbon fuels and technologies, and we greatly appreciate the thoughtful improvements CARB has made to strengthen hydrogen's role as a viable fuel option. The recent adjustments to the HD HRI program and the inclusion of blue hydrogen under the LCFS are meaningful steps that enhance the economic feasibility and attractiveness of hydrogen infrastructure.

At the same time, we remain concerned that the CCS mandate—particularly under the accelerated timelines proposed—could unintentionally hinder near-term adoption of hydrogen. To fully realize the benefits of the recent program enhancements, we encourage CARB to maintain regulatory flexibility, support innovation, and avoid imposing requirements that could discourage early investment in this critical energy pathway.

We appreciate the opportunity to provide feedback on the proposed LCFS amendments and look forward to further engagement to ensure the regulation supports practical implementation.

If you have any questions, please contact CFCA's Sr. Director of Government Affairs, Alessandra Magnasco, at <u>alessandra@cfca.energy</u>.

Sincerely,

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Aust Magnet

Alessandra Magnasco Sr. Director of Government Affairs April 21, 2025

Ms. Liane Randolph, Chair California Air Resources Board 1001 I Street Sacramento, CA 95814

Submitted Electronically: https://ww2.arb.ca.gov/lispub/comm/bclist.php

RE: Hyundai's Comments to the California Air Resources Board's Low Carbon Fuel Standard Third 15-Day Changes

Dear Chair Randolph:

Hyundai Motor North America ("Hyundai") appreciates the opportunity to comment on the California Air Resources Board's ("CARB") Low Carbon Fuel Standard's ("LCFS") third set of 15-day changes published on April 4, 2025.

Hyundai offers a variety of electric vehicle ("EV") powertrains including six battery-electric vehicle models between our Hyundai and Genesis brands as well as light-duty and heavy-duty hydrogen fuel cell electric vehicles ("FCEV"). We strongly support robust policies and incentives to increase EV adoption, particularly given last year's slowdown in EV take rates.

- We were disappointed to see changes to CARB's Board-approved LCFS amendments that removed the option for automakers to earn up to 45 percent base credits. This allowance would have boosted EV adoption, which is especially important when adoption rates are waning, and state incentives such as the Clean Fuel Rewards program and Clean Vehicle Rebate Project are no longer available to consumers. Automakers are in the best position to repurpose the credit proceed, avoiding EV purchase stagnation by implementing programs that reengage prospective EV buyers.
- Regarding hydrogen fuel requirements, it is crucial that the minimum percentage of renewable hydrogen is cost competitive. The average price of hydrogen is \$33.49ⁱ per kilogram which means it would cost \$212 to fill a Hyundai NEXO FCEV and \$2,244 to fill a Hyundai XCIENT Fuel Cell Class 8 tractor. The requirement for 80 percent renewable hydrogen and the addition of carbon capture and sequestration technology will undoubtedly increase the cost of hydrogen. Since this technology is still in its infancy, it is crucial that hydrogen fuel be affordable otherwise FCEVs are unlikely to become a viable option for consumers. CARB seems to understand that hydrogen technologies will be necessary to meet California's climate goals. Therefore, we strongly suggest that the renewable hydrogen percent requirement be limited to a level that would reduce the carbon intensity of hydrogen to zero, achievable with a 33 percent renewable hydrogen blend (depending on the source of the biogas).

In closing, Hyundai urges CARB to reinstate automakers' ability to earn up to 45 percent of base credits as well as reconsider the requirement of 80 percent renewable hydrogen due to cost competitiveness. Hyundai aligns with comments submitted by the Alliance for Automotive Innovation and appreciates CARB's consideration of our requests. Feel free to reach out to Gil Castillo at gcastillo@hmausa.com if you would like to discuss further.

Sincerely,

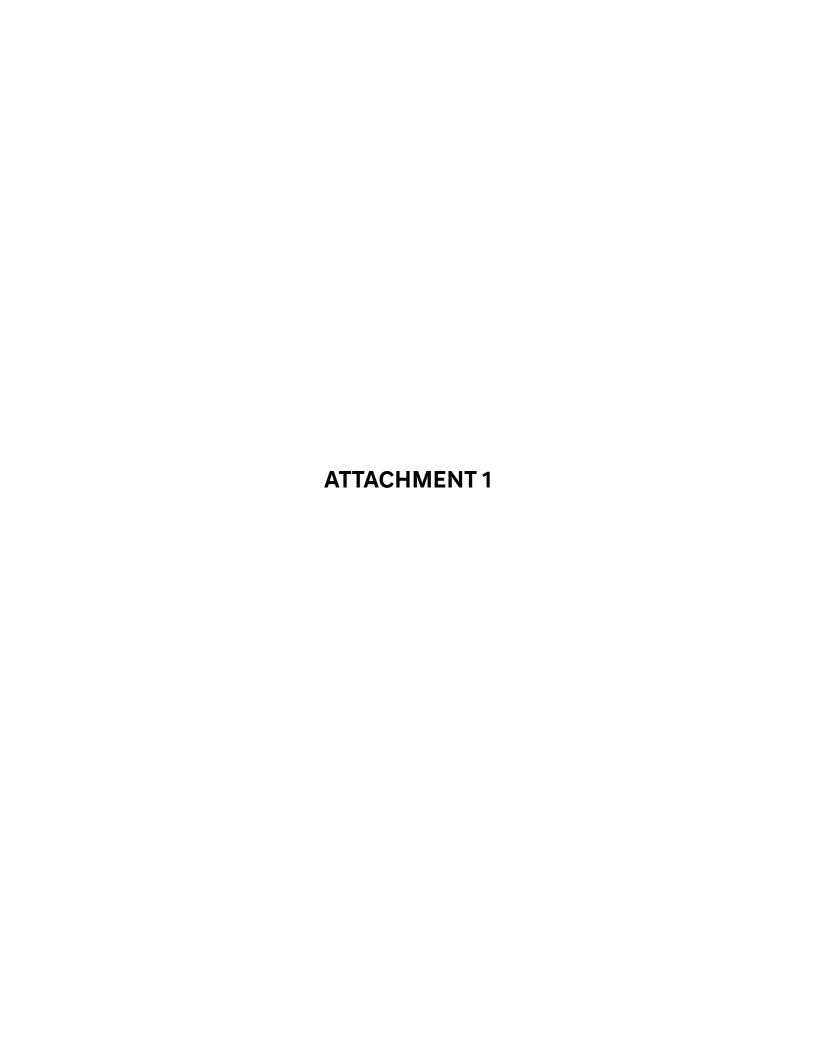
Olabisi Boyle

Senior Vice President, Product Planning & Mobility Strategy Hyundai Motor North America

Enclosures:

Attachment 1 – Hyundai comments to CARB LCFS first 15-day changes Attachment 2 – Hyundai comments to CARB LCFS second 15-day changes

ⁱ See S&P Global, <u>California hydrogen pump prices for light-duty vehicles reach new highs</u> (October 1, 2024) located at https://www.spglobal.com/commodity-insights/en/news-research/latest-news/energy-transition/100124-california-hydrogen-pump-prices-for-light-duty-vehicles-reach-new-highs



Ms. Laine Randolph, Chair California Air Resources Board 1001 I Street Sacramento, CA 95814

Submitted Electronically: https://ww2.arb.ca.gov/lispub/comm/bclist.php

RE: Hyundai's Comments to the California Air Resources Board's Low Carbon Fuel Standard 15-Day Changes

Dear Chair Randolph:

Hyundai Motor North America ("Hyundai") appreciates the opportunity to comment on the California Air Resources Board's ("CARB") Low Carbon Fuel Standard's ("LCFS") 15-day changes that were published on August 12, 2024.

Hyundai offers a diverse line up of quality and affordable electric vehicles ("EV") which include battery, plug-in hybrid, hybrid, and fuel-cell electric (both light- and heavy-duty) vehicles. We are committed to innovative initiatives that propel forward the EV transition. For example, we are a proud member of IONNA¹, the joint venture of eight automakers to build out more than 30,000 chargers across the nation. As a key partner in the NorCAL ZERO demonstration project², we deployed 30 heavy-duty XCIENT fuel-cell trucks to support the world's most capable hydrogen refueling station in Oakland. Additionally, we seek to convert drivers to EVs by offering a hands-on experience with EVs through a low-commitment, "try-before-you-buy" subscription program, Evolve+³. We will continue to doggedly pursue innovative solutions to spur EV adoption among early majority buyers.

Hyundai recognizes CARB's hard work and dedication in revamping the LCFS regulation. We greatly appreciate the proposal for automakers to earn Base Credits for plug-in electric vehicles ("PEVs"). Automakers are best positioned to efficiently utilize proceeds to further advance the EV transition as automakers have the most at stake. Additionally, we support the 9% stringency increase in carbon intensity ("CI"), as well as the proposed automatic acceleration mechanism, in hopes these together will increase the LCFS credit prices.

¹ See <u>ionna.com</u>.

² See Press Release, Hyundai Newsroom, Hyundai Motor Spearheads U.S. Zero-Emission Freight Transportation with NorCAL ZERO Project Launch (March 5, 2024), https://www.hyundai.news/eu/articles/press-releases/norcal-zero-project-launch.html.

³ See Press Release, Hyundai Newsroom, <u>Hyundai Announces Evolve+ EV Subscription Program at the Chicago Auto Show</u> (February 9, 2023), https://www.hyundainews.com/en-us/releases/3763.

However, significant investments are still needed for CARB to meet its environmental goals. California is behind in charging infrastructure to support the quantity of PEVs (aka ZEVs) required by CARB's Advanced Clean Car II (ACC II) regulation⁴ and woefully behind in hydrogen infrastructure for both light-duty and heavy-duty applications⁵. For example, in Southern California, there are no performant heavy-duty stations publicly available. The existing three stations are not a viable option due to limited fuel and station reliability issues. Additionally, PEVs are facing headwinds in the market, resulting in a much slower adoption rate than anticipated. Therefore, significant incentives are needed to rebuild the momentum.

Below are specific requests that we kindly ask you to consider.

- 1. The existing monies that the utilities collected but did not allocate through the Clean Fuel Reward ("CFR") program should be divided among automakers who sold PEVs from the time the program expired, September 1, 2022 until the next iteration of LCFS is implemented next year. Unfortunately, the automakers experienced a lost opportunity during this timeframe that would have otherwise supported EV expansion investments.
- 2. The CFR program has been changed to be used only for medium- and heavy-duty vehicles. We request that proceeds from credits generated from light-duty vehicles be utilized for light-duty vehicles.
- 3. The proposal states that the light-duty fast charging infrastructure ("FCI") program sunsets at the end of 2030. We request that this program be extended to 2035 to align with CARB's ACC II requirement of 100% ZEV sales by 2035 model year.
- 4. We request that the final amendments allow hydrogen-powered fuel-cell electric vehicles ("FCEVs") to receive Base Credits or, at a minimum, Incremental Credits subject to the applicable requirements for PEVs. Like PEVs, these vehicles produce no tailpipe emissions and should receive the same benefits as PEVs.
- 5. We have strong concerns that hydrogen produced using fossil gas feedstock can no longer generate credits starting in 2031. The hydrogen industry is still in its infancy. By removing fossil gas as an allowed feedstock at such an early stage, it may undercut the market's development. While we understand that water electrolysis is the goal, without abundant

⁴ See <u>CA AB 2127</u> Second Electric Vehicle Charging Infrastructure Assessment (updated March 6, 2024), located at https://www.energy.ca.gov/publications/2024/assembly-bill-2127-second-electric-vehicle-charging-infrastructure-assessment. The assessment states that 1.01 million chargers are needed to support 7.1 million light-duty vehicles by 2030, and 2.11 million chargers to support 15.2 million light-duty vehicles in 2035 to meet California's zero-emission vehicle targets. As of August 26, 2024, the California Energy Commission website shows 105,012 total public and shared private chargers (https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics-collection/electric).

⁵ See <u>CARB Hydrogen Station Network Self-Sufficiency Analysis per Assembly Bill 8</u> (October 2021), located at https://ww2.arb.ca.gov/sites/default/files/2021-10/hydrogen_self_sufficiency_report.pdf, p. 14 ("With respect to hydrogen, the EO tasks all State agencies to work with other organizations in the private and public sectors to support the development of 200 hydrogen stations by 2025."). Additionally, according to the Hydrogen Fuel Cell Partnership, there are a total of 55 hydrogen stations 18,729 FCEVs in California as of July 3, 2024. See Hydrogen Fuel Cell Partnership, <u>FCEV Sales, FCEB, & Hydrogen Station Data</u> (Numbers as of July 3, 2024), https://h2fcp.org/by_the_numbers.

access to deionized water and more affordable green electricity – which will take considerable time to build out – hydrogen will not be cost-competitive. Meeting diesel Total Cost of Ownership is key to driving fleet adoption. We request that blended feedstock of bio and fossil gas be allowed in 2031 and beyond to generate credits until alternative technologies reach market readiness.

6. Though we are hopeful that the proposed CI standards will appropriately increase credit prices, we strongly encourage CARB to continue its dialogue with hydrogen refueling station operators. The current decline in LCFS credit values caused tremendous hardships on the operators, and this unfortunately resulted in a significant price increase at the pump. Appropriate LCFS credit values are imperative to maintain the affordability of hydrogen and ultimately drive FCEV adoption of all vehicle classes.

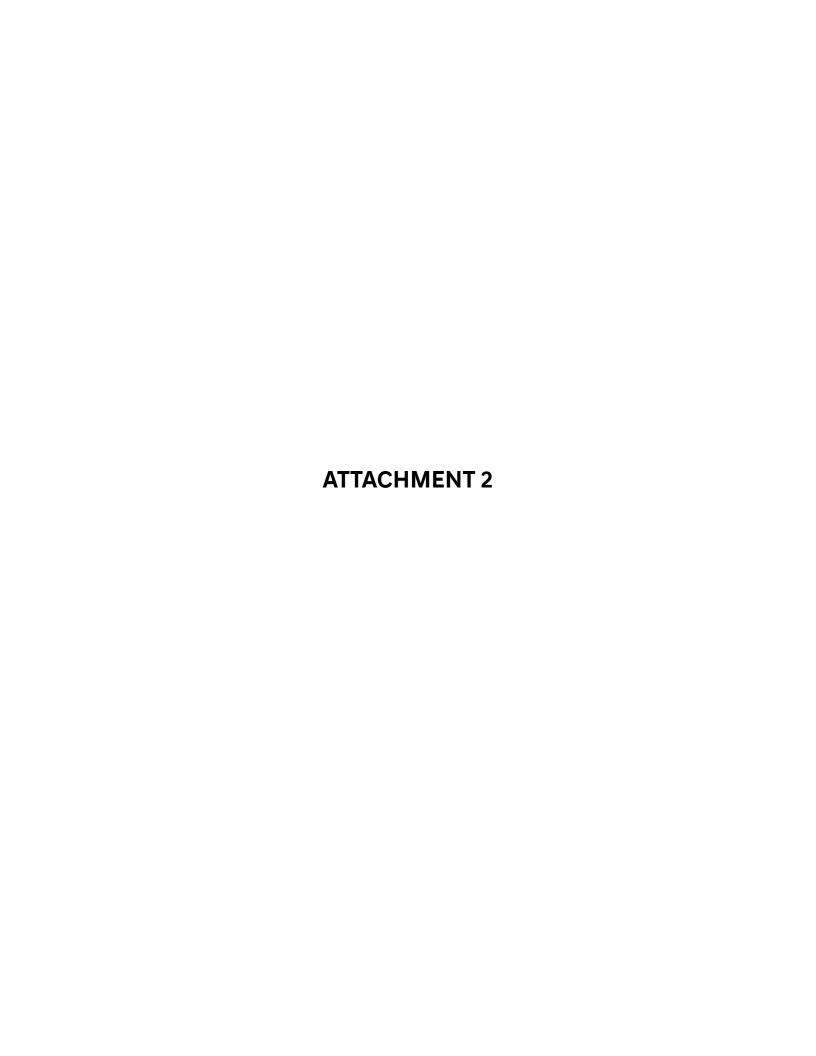
In closing, Hyundai appreciates CARB staff's efforts on these amendments. We also support the environmental goals that California's LCFS program strives to achieve. Hyundai is aligned with the comments submitted by the Alliance for Automotive Innovation. We are more than happy to discuss our comments further; please feel free to reach out to Gil Castillo at gcastillo@hmausa.com with any questions. Thank you.

Sincerely,

Olabisi Boyle

Senior Vice President, Product Planning & Mobility Strategy

Hyundai Motor North America



October 16, 2024

Ms. Liane Randolph, Chair California Air Resources Board 1001 I Street Sacramento, CA 95814

Submitted Electronically: https://ww2.arb.ca.gov/lispub/comm/bclist.php

RE: Hyundai's Comments to the California Air Resources Board's Low Carbon Fuel Standard Second 15-Day Changes

Dear Chair Randolph:

Hyundai Motor North America ("Hyundai") appreciates the opportunity to comment on the California Air Resources Board's ("CARB") Low Carbon Fuel Standard's ("LCFS") second 15-day changes that were published on October 1, 2024. We support the environmental goals that California's LCFS program strives to achieve.

Hyundai offers a diverse line up of electric vehicles ("EV") and is committed to initiatives that encourage EV adoption. However, as stated in our previous comment letter (Attachment 1), EVs continue to experience slower adoption rates in the market than anticipated. We believe that the LCFS program as well as complementary incentive programs are necessary to overcome this hurdle.

One area of particular importance is the opportunity for automakers to earn Base Credits for plugin electric vehicles ("PEVs"). Accordingly, we greatly appreciate that this important provision remains in staff's LCFS proposal and urge Board approval of this provision. Automakers are well positioned to efficiently utilize LCFS credit proceeds to accelerate the EV transition. Additionally, we would like to thank you for allowing LCFS credit generation for 80 percent or more renewable hydrogen dispensed for calendar years 2030-2034.

In closing, Hyundai is aligned with the comments submitted by the Alliance for Automotive Innovation and appreciates CARB's dedication in its continued work revising the LCFS regulation.

Sincerely,

Olabisi Boyle

Senior Vice President, Product Planning & Mobility Strategy

Hyundai Motor North America

IOWA SOYBEAN ASSOCIATION

1255 SW Prairie Trail Pkwy. Ankeny, IA 50023



April 21, 2025

Chair Liane Randolph & Members of the Board California Air Resources Board 1001 I Street, Sacramento, CA 95814

Via Electronic Submission

Re: Third 15-Day Changes to the Proposed LCFS Regulation Order

Dear Chair Randolph and Members of the California Air Resources Board:

The Iowa Soybean Association appreciates the opportunity to comment on the proposed modifications (Third 15-Day Changes) to the Low Carbon Fuel Standard (LCFS) program. Iowa Soybean Association has welcomed engagement with the California Air Resources Board (CARB) and staff throughout this multi-year process to update the LCFS program.

Founded in 1964 and governed by a board of 22 farmers, the Iowa Soybean Association (ISA) is committed to enhancing the long-term competitiveness and sustainability of the soybean industry and Iowa's 40,000 soybean producers. With Iowa leading the nation in biodiesel production and ranking second nationally in soybean production, the ISA is driven to deliver increased soybean demand while actively working with farmers to develop production systems and practices that maximize their overall operation and profitability.

CARB's Third 15-Day Changes to revise the LCFS did not address our major concerns with provisions included in the final amendments approved by CARB. In addition to the new proposals in the Third 15-Day Changes package, Iowa Soybean Association remains deeply concerned with the drastic and inequitable pivot CARB has made related to agricultural feedstocks used for biofuels. Iowa Soybean Association continues to encourage that updates to the LCFS program are based on up-to-date and sound science, as required by AB-32. Outlined below are our concerns and proposed solutions that will enable CARB to meet its climate goals, protect the environment and all Californians, while also supporting American soybean farmers and processors who are investing in the future of low-carbon energy.

Serious Feedstock Cap Concerns and Proposed Solutions

Iowa Soybean Association still has significant concerns with the vegetable oil feedstock cap that was included in the initial 15-Day Changes posted in August 2024. The current proposal restricts the amount of soybean oil, canola oil and sunflower seed oil that is allowed to generate credits in

the program at an inequitable 20% by company. CARB's own data demonstrates that vegetable oil feedstocks, including soy, have consistently exceeded the proposed cap since 2021.

Capping these proven, sustainable, and scalable feedstocks would suppress the supply of renewable diesel, increase reliance on fossil fuels, and raise fuel prices for California consumers. Even CARB staff acknowledged in the April 2024 workshop that a cap would reduce air quality benefits and likely increase NOx and PM2.5 emissions. All of this, including the recent tariffs on imported feedstocks greatly increase costs and further substantiate U.S. based feedstocks as the clear-cut choice. Iowa Soybean Association urges CARB to remove the cap on U.S. based vegetable oil feedstocks to provide a more economically feasible, locally produced and sustainable, climate smart option for the people and the planet.

Agricultural feedstocks for biofuel production are already held to a high standard for participation in the U.S. Renewable Fuel Standard (RFS). Rather than adding sustainable U.S. based feedstocks to its arbitrary proposed cap, CARB needs to update carbon intensity analysis and oversight of imported feedstocks, which are not held to the same level of accountability. Recent actions by the European Union in response to fraudulent Chinese biodiesel imports underscore this concern¹. The EU committee recently met at the request of a member state to discuss alleged fraud in biodiesel imports from China. Fraud continues to be an issue with imported feedstocks and needs to be addressed further. Iowa Soybean Association strongly encourages CARB to adopt enforceable traceability and verification standards, including origin disclosures, documentation audits, and physical testing. Without implementing sustainable solutions to the above and not eliminating a cap on U.S. vegetable oil feedstock, CARB is essentially putting the feedstocks from foreign countries (i.e., China) above those of the United States.

Sustainability Guardrails and Traceability Concerns

Iowa Soybean Association remains very concerned about the sustainability guardrails. The sustainability guardrails are more onerous than the specified source requirements used for non-U.S. waste feedstock imports. Palm oil in Southeast Asia has had forced labor concerns², but CARB does not require used cooking oil derived from palm to track social or economic sustainability. Concerningly, petroleum does have to track these criteria. CARB's proposal makes it administratively easier to use non-sustainable petroleum³ in the state than biofuels that have lower carbon intensity (CI) scores and are produced from sustainable feedstocks grown in the United States. Land use change is already captured in the indirect land use change (ILUC) score, which still makes it unclear what actual purpose the guardrails serve.

If CARB insists on agricultural feedstock traceability, then it should reward sustainable practices beyond what is already assumed in the lifecycle analysis (LCA). The U.S. Department of Agriculture (USDA) has developed a tool to quantify the CI reductions for no-till, cover crops and

¹ EU industry demands answers as 'fraudulent' Chinese biofuels continue to flow - Euractiv

² https://apnews.com/article/virus-outbreak-only-on-ap-indonesia-financial-markets-malaysia-7b634596270cc6aa7578a062a30423bb

³ https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.858512/full

nitrogen inhibitors. Considering this integral information, the carbon intensity of soy-based biofuels could improve through the mentioned climate smart ag practices on the field where the soybeans were produced. Other farming practices like low-till, nutrient management, enhanced efficiency fertilizers, buffers, wetland and grassland management, tree planting on working lands, planting for higher carbon sequestration, and soil amendments all could and should be accounted to assign a lower CI score to an agricultural feedstock. USDA already tracks all these practices through several of their managed conservation programs. In addition, there are a variety of other practices that scientifically lower the CI score of soybean feedstocks for biofuels, and USDA is actively working to develop mechanisms to account for those. If CARB insists on tracing feedstocks back to the farm, then it should also acknowledge when those feedstocks are produced with lower CI practices.

Moreover, USDA has recognized the CI reduction benefits of certain sustainable or climate-smart practices for the purposes of clean fuel transportation programs and is undertaking a rulemaking process to develop final guidelines for the quantification of these practices. Through planting decisions, soil management, and other practices, soybean farmers can continuously reduce environmental impacts. In addition, some soybeans are double cropped meaning they are grown as a secondary crop following a primary crop within a growing season. They are not displacing other crops or land uses. Double-crop soybeans should be eligible to have the ILUC component of the CI score removed or at least shared with the other crop in the rotation. Iowa Soybean Association proposes the aforementioned issues to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Modernized, Accurate, Climate Smart Carbon Intensity Modeling and Scoring

Iowa Soybean Association remains concerned that without a comprehensive update to the Global Trade Analysis Project model for biofuels (GTAP-BIO) that CARB utilizes, U.S. soy-based feedstocks will be phased out of the LCFS even without the additional limitations included in the Second and Third 15-Day Changes. Current data indicates a much lower CI score for U.S. soybeans, as growers continue to improve soil practices, limit water use, lower on-farm emissions and more. CARB is recommending stringent sustainability guardrails for U.S. soy but is still on track to likely phase-out U.S. soy-based biofuels from credit generation by approximately 2035 or sooner.

As CARB looks to develop a more aggressive auto acceleration mechanism to reach CI reduction benchmarks sooner, using outdated methodologies will only limit the output of actual improvement over time in terms of emissions reductions. As CARB updates all other major lifecycle emissions models through this rulemaking, Iowa Soybean Association once again urges action to update the GTAP-BIO model so that the most current, climate smart and science-based data may be used to determine carbon intensity reductions. The reasoning and sources indicated in the Third 15-Day Changes do not address this concern and need to be revised to ensure accuracy. Iowa Soybean Association proposes this issue to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Equitable Entities Eligible to Apply for Fuel Pathways

023.1

lowa Soybean Association is very concerned about CARB's decision to give the Executive Officer authority to stop accepting new pathways for biomass-based diesel starting in January 2031. Iowa Soybean Association does not understand how this benefits the LCFS. Under AB-32, CARB must under statute minimize costs and maximize GHG reductions. It is unclear how this is served by rejecting new pathways. In fact, the LCFS is best served by allowing the most available and equitable pathways. If these pathways cannot achieve cost-effective GHG savings, they will not be utilized by the market in the LCFS. In essence, an increase in pathways can only serve to improve GHG benefits in California. Singling out a single fuel for prejudicial treatment is baffling given the goals of the LCFS and the authority that establishes it. Iowa Soybean Association urges CARB to continue to allow equitable pathways forward with no date of denial.

Recommended Climate Enhancing Solutions for CARB

As CARB finalizes its update to the LCFS, Iowa Soybean Association recommends several actions that will likely prevent an increase in fossil diesel use, improve carbon intensity calculations, and improve market access for sustainable U.S. agricultural feedstock providers.

First, CARB should not apply the vegetable oil feedstock cap proposal to U.S. feedstocks. As noted, these feedstocks are already subject to federal guardrails to ensure production on land not converted since 2008. The RFS was designed specifically to prevent land conversion for biofuel production, and USDA data shows a decrease in farmland over the same period.

Second, CARB should convene an expert working group to consider issues related to the sustainability provisions and indirect land use change (ILUC). Iowa Soybean Association recommends that this expert working group convene before the end of 2025 and provide recommendations by the end of Fall 2026.

Third, Iowa Soybean Association retains strong concerns about the ability of supply chains to comply with the sustainability guardrails. If CARB does move forward with the guardrails, they must reconsider its proposed sustainability requirements to allow soybean growers the opportunity to participate in the California biofuels market through innovative and climate smart agriculture practices. If traceability can be used to show additional benefits in CI scoring, CARB must look to programs already developed through farmer input and provide improved scoring for feedstocks that employ sustainability practices to minimize the changes in comparative costs (i.e., USDA accredited programs and practices). CARB should work with USDA to develop an aligned scheme to quantify climate-smart agricultural practices for the purposes of biofuel feedstocks. USDA has already engaged with CARB regarding this project, which could be applied to the work that CARB is doing on traceability and carbon quantification of agricultural biofuel feedstocks.

Lastly, CARB must undertake a comprehensive update of the GTAP-BIO model for soybean oil used in biofuel production. Without using the most up-to-date and accurate data, CARB is doing a disservice to the U.S. feedstock producers and California's citizens by calculating carbon intensity scores not rooted in current facts. Through CARB's own analysis we know prejudicial

feedstock treatment will lead to more emissions in the California transportation sector, harming the environment.

Concluding Thoughts/Pathway Forward

lowa Soybean Association is encouraged by the continued successes of programs that support the development of cleaner, low-carbon fuels. However, it is critical that CARB finalizes updates in a way that equitably include U.S. agricultural feedstocks through policies that are science-based aligning with the most up to date information as well as promoting the sustainability of U.S. based products and businesses; including the elimination of capping on U.S. vegetable oil feedstocks and applying sustainability guardrails that are economically feasible for farmers while rewarding their practices that lower CI.

CARB's Third 15-Day Changes did not address any of the fundamental issues raised by Iowa Soybean Association in the First and Second 15-Day Changes and fails to acknowledge the potential unintentional consequences of a feedstock outlined by its own employees in previous discussions. CARB is required under the law to achieve the maximum technically feasible and cost-effective reductions in greenhouse gas emissions. The most recent 15-Day Changes show a lack of willingness to achieve the statutory obligations set forth in AB-32 and neglect modernized, climate smart, science-based solutions, ultimately disregarding the protection of U.S. based feedstocks, the people, and the planet. Iowa Soybean Association also asks that CARB respond in writing to further substantiate their decisions regarding our concerns expressed in this letter. We look forward to your written responses as a state regulatory body, whose responsibility is to protect its' citizens and the environment by providing transparency on decisions made for those of impact.

Iowa Soybean Association is eager to continue working with CARB to support the role of agriculture in diversifying the fuel supply while reducing carbon intensity and increasing clean air in California and beyond. On behalf of U.S. soybean farmers, we appreciate the opportunity to comment and look forward to collaborating with CARB and other relevant stakeholders on implementation of policies that expand the use of U.S. soy-based biofuels and market opportunities for U.S. soybean farmers.

Sincerely,

023.2

Brent Swart President

Iowa Soybean Association



Matthew Botill California Air Resources Board 1001 I Street Sacramento, California 95814

April 21, 2025

Re: RNG Coalition's Comments on Low Carbon Fuel Standard Third 15-Day Amendments

Dear Mr. Botill:

024 1

The Coalition for Renewable Natural Gas (RNG Coalition) is a California-based nonprofit organization representing and providing public policy advocacy and education for the Renewable Natural Gas (RNG) industry.¹

RNG Coalition respectfully submits these comments to the California Air Resources Board (CARB) in response to the April 4, 2025, Third Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information Proposed Low Carbon Fuel Standard (LCFS) Amendments (Third 15-Day Package).

CARB and OAL Should Move Swiftly to Restore Investment Certainty for Clean Fuels

RNG Coalition remains a strong supporter of the LCFS program. Put simply, the LCFS framework works, and the availability of clean fuels incented by the LCFS has exceeded historical expectations. RNG development is one of the first major low carbon fuel industries built primarily around the LCFS program. We have only been successful because of CARB's prior strong commitment to clean fuels.

Transportation remains the largest sector of greenhouse gas (GHG) emissions in California, and additional deployment of a variety of low carbon fuel supply is clearly feasible. The only barrier hobbling the program's continued success is the regulatory delay in enhancing overall program ambition. Given the LCFS credit surpluses, a significant stepdown in the Annual Carbon Intensity (CI) Benchmarks cannot be delayed any further. At this stage, the top priority should be the expeditious finalization and 2025 Q1 implementation of the target step down.

¹ For more information see: <u>http://www.rngcoalition.com/</u>



024.1 cont. All parties received adequate notice throughout this extended rulemaking process and are prepared for implementation of the new rule, effective at the start of the 2025.

Few, if any, parties could have anticipated changes requested by the Office of Administrative Law (OAL). Clean fuel credit generators—such as RNG producers—should not be punished with any further administrative delays to the rule. Obligated parties (deficit generators) are all well informed about the rule changes and further delays are not necessary.

Conclusion

At current LCFS prices—and in the face of the programmatic uncertainty created by more than four years² of discussion on this rulemaking—new RNG projects driven by the LCFS will be extremely limited until this rule is finalized.

Finalizing the rule will restore investment certainty, leverage renewable gas production to reduce methane emissions, improve organic waste management, and decarbonize California's transportation sector. We thank CARB for your continued work and look forward to the swift conclusion of this rulemaking.

Sincerely,

Sam Wade

Vice President of Public Policy RNG Coalition (916) 588-3033 sam@rngcoalition.com

² We note that our comment letter on the October 2020 Workshop discussed the need for more ambitious targets and requested that the rule be in effect by Jan 2024, available here: https://www.arb.ca.gov/lists/com-attach/48-lcfs-wkshp-oct20-ws-WmhRZ11tB2VVY1Vg.pdf



April 21, 2025

Rajinder Sahota, Deputy Executive Officer Low Carbon Fuel Standard Program California Air Resources Board 1001 I St. Sacramento, CA 95814

RE: American Biogas Council Comments on the Release of the Third 15-Day Changes

Dear Ms. Sahota

The American Biogas Council (ABC) appreciates the opportunity to comment on the recently released 15-day package for the Low Carbon Fuel Standard (LCFS). The ABC is the voice of the U.S. biogas industry dedicated to maximizing carbon reduction and economic growth using biogas systems. We represent more than 400 companies in all parts of the biogas supply chain that are leading the way to a better future by maximizing all the positive environmental and economic impacts biogas systems offer when they are used to recycle organic material into renewable energy and soil products.

Since its implementation in 2011, the LCFS has become a highly successful flagship policy that drives investments in low carbon fuels and delivers millions of tons of reductions in greenhouse gases (GHG) to meet California's statutory climate commitments. The LCFS is the hallmark of effective environmental policy in that it: 1) sets clear, science-based targets; 2) establishes clear regulations for program implementation; and 3) provides the market with flexibility to innovate.

The recent administrative disapproval of the program's amendments from the Office of Administrative Law (OAL) has unfortunately delayed the implementation of these vital amendments. The ABC would like to underscore the importance of concluding this rulemaking as soon as possible. Any further delay to the rulemaking diminishes the necessary signal the market needs to facilitate and encourage the continued investments in clean fuels. Without a strong policy signal, the state risks missing opportunities to further reduce GHG emissions from transportation fuels. Thus, the ABC strongly encourages CARB to swiftly address the concerns laid out in the disapproval, resubmit the package to OAL, and begin implementation of the new amendments promptly.

Thank you to the staff for their hard work and for the opportunity to comment.

Sincerely,

PALES for

025.1

Patrick Serfass, Executive Director

CC:

Matthew Botill, Division Chief, Industrial Strategies Division Jordan Ramalingam, Manager, Alternative Fuels Section Dillion Miner, LCFS Program



VIA ELECTRONIC FILING

April 21, 2025

Matthew Botill California Air Resources Board 1001 I Street Sacramento, California 95814

Anew Climate Comments on the Proposed Low Carbon Fuel Standard Third 15-Day Amendments

Dear Mr. Botill:

Anew Climate, LLC ("Anew") is one of the largest climate solutions providers in North America and has an established track record of participating in California's various sustainability programs, including the Low Carbon Fuel Standard ("LCFS").

We would like to thank the California Air Resources Board ("CARB") and its staff for the hard and diligent work over the last few years to propose amendments to the LCFS in response to the 2022 Scoping Plan Update. Anew shares CARB staff's dedication to ensuring that the LCFS continues to play a significant role in decarbonizing California's transport sector and helping California achieve its ambitious climate goals. We have appreciated the multiple opportunities to engage in the process with our written comments.

At this time, there is only one thing left to do: We urge CARB to expeditiously adopt the revisions to the LCFS as proposed in its 3rd 15-Day Notice, and to maintain January 1, 2025 as the effective date for the revisions to the program and to require Q1 2025 reporting under the amended targets. Any further delay with respect to implementing the new provisions that are intended to make the program more effective and durable by ensuring continued investment in low-carbon fuels and fuel technologies would lead to the opposite result.

We thank CARB for its important work in implementing the LCFS program. Should you have any questions about anything we have stated here or require further clarification, please contact Andrew Brosnan at abrosnan@anewclimate.com.

Sincerely,

026.1

Anew Climate, LLC

Houston TX Salt Lake City, UT San Francisco, CA Calgary, AB Budapest, Hungary Madrid, Spain



901 H St. Ste. 120 #74 Sacramento, CA 95814 (310) 455-6095 www.CaliforniaHydrogen.org

April 21, 2025

California Air Resources Board 1001 I Street Sacramento, CA 95814

Re: Low Carbon Fuel Standard 3rd Notice – California Hydrogen Business Council comments

The California Hydrogen Business Council (CHBC) submits these comments to the California Air Resources Board (CARB) on the 3rd Notice of Modified Text to the Low Carbon Fuel Standard published April 4, 2025. We support many of the modifications recommended, and we would also like to highlight two issues that still need improvement.

Areas of Support

- CHBC strongly supports the proposed modification of 95482(h) to allow hydrogen paired with carbon capture and storage (CCS) to count toward the 80% renewable hydrogen requirement by 2030 and the exclusion of hydrogen produced with accompanying carbon capture and sequestration technology from the existing phaseout of fossil hydrogen by 2035. These modifications respond to requests we made in commenting on previous versions of the rule, which we appreciate, as hydrogen production paired with CCS is a zero-carbon solution. This should significantly expand hydrogen production, which will facilitate cost reduction of hydrogen prices, and support the sector's growth. CARB acknowledged the need for significant growth of the hydrogen market in the 2022 Scoping Plan, stating the need for 1,700 times the amount of hydrogen available to meet the state's carbon neutrality goals. This change also aligns with the Biden Administration's revisions for eligibility for the 45V hydrogen production tax credit, which recognizes the value of low-carbon intensity hydrogen.
 - CHBC also supports the proposal to remove language that limits the estimated cumulative value of Hydrogen Refueling Infrastructure (HRI) credits generated by a station to 1.5 times capital expenditure in sections 95486.3(a)(4)(H) and 95486.4(a)(4)(I). This is another modification we requested and are pleased to see included in this round of adjustments. By eliminating the 1.5X cap, the Hydrogen Refueling Infrastructure program will become more aligned with its purpose of

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028.3

supporting early-stage infrastructure development and long-term market growth. It will reduce the financial uncertainty surrounding station operations, attract greater investment, and encourage the construction of stations designed for the future, all while allowing the self-regulating nature of the program to maintain balance between station capacity and vehicle rollout.

Recommendations for Additional Improvement

- In 95486.3(a)(2)(F), staff proposes to modify the derating factor for light, medium and heavy-duty (HD) HRI. The revised language includes an increase of the HD-HRI derate from 50% to 62.5%, and the same derate is now applied to light-and medium duty (LMD) HRI with a maximum station capacity remaining at 1,200 kg/d. This makes the available LMD-HRI credit only 750 kg/d, which encourages smaller, not larger, stations. These neighborhood stations need to be larger to accommodate fuel cell pickup and work trucks being deployed by the end of the decade by participating auto OEMs. CARB staff had changed the maximum crediting for LMD-HRI to 1,200 kg/d in the 2nd 15-day notice. It is unclear why this proposal reverts to a lower crediting amount unless there was an inadvertent omission to change the maximum station capacity to 2,000 kg/d as was in the first 15-day notice. We urge CARB to remove the derate for LMD-HRI or make the maximum capacity 2,000 kg/d to incentivize larger stations. Further, we do not see the need for a derating factor for either LMD or HD HRI investments.
- In subsection 95486.4(a)(1)(B)(1), staff proposes to clarify that the five-mile distance requirement for shared HD-HRI stations will be calculated based upon the shortest great-circle distance between the proposed site and an Alternative Fuel Corridor. We find this to be a missed opportunity. The requirement that HD-HRI stations must be located within five miles of any Federal Highway Administration (FHWA) Alternative Fuel Corridor is highly restrictive and overlooks critical freight routes such as drayage routes. This requirement could inadvertently limit the redundancy of the fueling network and eliminate high traffic points in the freight system which are essential for reliable service. There is no sound rationale for this restriction. While many refueling activities

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occur near freight corridors, ¹ not all refueling is near freight corridors, and refueling should not be constrained by proximity to these corridors. CARB staff currently has the authority to accept or reject HRI credit applications, which should be based on the merits of each proposal rather than an arbitrary distance requirement. For example, the Otay Mesa border crossing—one of the busiest freight corridors—is not within five miles of a designated clean corridor, yet it sees over a million truck crossings annually. This is a clear example of how such a rule could undermine the strategic placement of HRS. We recommend Executive Officer discretion on requirements for HD-HRI station placement outside of the five-mile limit.

CHBC appreciates CARB's attention to these comments and recommendations.

Sincerely,

Tim McRae

Vice President for Public Affairs

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California Hydrogen Business Council

tmcrae@californiahydrogen.org

916-995-9685

¹ See https://www.arb.ca.gov/lists/com-attach/8-lcfs-wkshp-aug18-ws-AmhVJIM+VnwHLABh.pdf



Comments of Kia Corporation to the California Air Resources Board

RE: 15-Day Notice of Modifications to Proposed Low Carbon Fuel Standard Amendments

April 21, 2024

The Kia Corporation (Kia) submits these comments to the California Air Resources Board (CARB) on the modifications to amendments to the Low Carbon Fuel Standard (LCFS) published on April 4, 2025 (third proposed 15-day changes to the LCFS).

Kia, part of the Hyundai Motor Group (HMG), is a dynamic part of the world's third largest automaker. Kia is committed to electric vehicles (EVs) and is investing \$28 billion by 2027 into EVs and other advanced technologies. Kia is focused on popularizing EVs at all levels of the market and becoming a global leader in EVs and electrification.

Kia supports comments submitted by the Alliance for Automotive Innovation (AFAI) that recommend modifying subsection (c)(1)(B) of subsection 95483 to direct the Executive Officer to allot 45% of base credits for residential electric vehicle charging to automakers (OEMs). The latest 15-day notice has removed any opportunity for revenue generated by light duty (LD) EVs to be used to promote the LD EV market. Kia opposes this change. Kia continues to strongly support CARB providing base credits to OEMs of LD EVs. Providing base credits to LD EV OEMs is a direct and effective way to advance electrification, and thereby reduce emissions of GHGs, in the transportation sector.

According to the California Greenhouse Gas Emission Inventory Program, passenger vehicles are the single largest source of greenhouse gas (GHG) emissions (27.6%) in the state, emitting more GHGs than the electricity (16.1%) and agricultural (8%) sectors combined.¹ Directly addressing emissions from this sector may have the largest impact in reducing GHG emissions.

Kia routinely and extensively provides customer rebates on EVs. Kia also invests in advancing EV charging infrastructure through investments in IONNA and works with partners such as Wallbox and Electrify America. New proceeds from base credits will position Kia and other OEMs to increase their ability to provide customer rebates on EVs, reducing consumer-facing transaction prices, and increase investments in advancing EV infrastructure. Reduced EV transaction prices and accelerated EV infrastructure growth will serve to increase EV adoption and thereby the use of low-carbon intensity (low-CI) electricity as a transportation fuel. This is a double benefit to consumers as low-CI electricity is generally more affordable than gasoline and other liquid transportation fuels.

¹ California Air Resources Board, "Current California GHG Emission Inventory Data", accessed April 2025

Kia appreciates the opportunity to provide comments on the proposed modifications and looks forward to continuing working with CARB to advance the state's goals.



April 21, 2025

Rajinder Sahota, Deputy Executive Officer Low Carbon Fuel Standard Program California Air Resources Board, 1001 I Street Sacramento, CA 95814

RE: CALSTART Comments on the Release of the Third 15-Day Changes

Clean Transportation Technologies and Solutions

www.calstart.org

Board of Directors

Mr. Doran J. Barnes
Foothill Transit

Mr. John Boesel
CALSTART

Mr. Avninder Buttar

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Ms. Chelle Izzi

Mr. Brady Matoian OK Produce

Mr. Chris Nevers Rivian

Ms. Katie Sloan Southern California Edison

Mr. Chris Stoddart New Flyer of America

Ms. Cynthia Williams Ford Motor Company

CALSTART would like to thank CARB staff for the opportunity to comment on the recently released 15-day package for the Low Carbon Fuel Standard (LCFS). Since 2011, the LCFS has successfully allowed California to decrease the carbon intensity (CI) of the state's fuel pool and accelerate new technology and alternatives to petroleum fuel. The LCFS has also served as an extremely valuable incentive program, helping advance zero-emission vehicles (e.g., cars, trucks, and buses) and infrastructure adoption in the state. As described below, CALSTART strongly encourages CARB to expeditiously finalize the rulemaking and initiate implementation of the amendments.

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CALSTART, headquartered in California, is a globally renowned 501(c)3 nonprofit organization dedicated to the advancement of zero emission vehicle and infrastructure technology. With a global member consortium of nearly 300 technology, government, industry, and community partners, CALSTART has worked for 30+ years to accelerate the commercialization and deployment of advanced technologies and solutions. Through policy development, incentive program administration, and first-of-its-kind deployment partnerships, CALSTART has designed and managed programs that drive the market for clean transportation technologies needed to achieve critical greenhouse gas and criteria pollutant emission reduction goals.

Over the course of two years, CARB staff have been working diligently to amend the LCFS and make critical changes that will ensure the program's continued success. CALSTART supports these amendments. While the non-substantive and administrative disapproval of the amendments from the Office of Administrative Law (OAL) has unfortunately delayed the implementation of these much needed amendments, CALSTART would like to urge CARB to swiftly address the concerns presented in OAL's disapproval notice, resubmit the package for approval, and begin implementation of the program asap. Any further delay jeopardizes the state's climate goals and investment in clean fuels including zero-emission technologies.

Thank you to the staff for their hard work and for the opportunity to comment.

Sincerely, Trisha Dello Iacono Head of Policy

CC:

Matthew Botill, Division Chief, Industrial Strategies Division Jordan Ramalingam, Manager, Alternative Fuels Section Dillon Miner, LCFS Program



Matthew Botill California Air Resources Board 1001 I Street Sacramento, California 95814

April 21, 2025

Re: Mercuria Energy's comments on the Low Carbon Fuel Standard Third 15-Day Amendments

Dear Mr. Botill:

Mercuria Energy America, a Delaware corporation, is an independent energy marketing and trading company. The company is a long-time participant in the California Low Carbon Fuel Standard, and Mercuria is also a regulated entity within the cap-and-trade program.

We appreciate the opportunity to submit these comments in response to the April 4, 2025, Third Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information Proposed Low Carbon Fuel Standard (LCFS) Amendments (Third 15-Day Package).

The company firmly supports the current program and believes the following:

- California should seek to implement the revised carbon intensity as quickly as possible despite the administrative delay
- Program will help stabilize the market amid federal uncertainty

Technicality should not delay necessary reductions to the carbon intensity

California cannot afford for technical or clerical errors to keep the state from enacting the carbon intensity revisions by Q1 2025, as these necessary changes are required to provide further stringency to the existing program.

In their disapproval of the regulation, the Office of Administrative Law <u>found no fault</u> with the proposed changes to the carbon intensity. Rather, the OAL found administrative errors in other areas of the text.

These errors should not hold back the regulation from being implemented on time as they would conflict with the agency's stated goal of addressing the surplus bank as soon as possible.

The proposed changes received broad support from a variety of market stakeholders during the regulatory process as numerous entities commented that the state's initial proposal did not adequately address the issue.

In addition, these changes have been known since August, giving entities ample time to prepare for this proposed change. Some of these participants have likely prepared as if this regulation was going to be implemented on April 1.

Delaying this regulation any further would unduly burden those who prepared in good faith for a more stringent program.

Revisions are needed to provide clarity amid federal uncertainty



Low carbon fuel suppliers are currently facing significant uncertainty at the federal level, and California moving ahead with this regulation will provide clarity about future demand of these fuels.

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Currently, the federal government has not finalized guidance on the Clean Fuels Production Tax Credit (45**Z**), while the Environmental Protection Agency (EPA) has not outlined long-term renewable volume obligations.

In addition, the federal government's proposed tariffs, which could affect feedstocks, may place further costs onto these suppliers who may have little clarity about the value of their product.

Coupled with the OAL decision, all of these pending actions are creating significant uncertainty for low-carbon fuel suppliers.

California can provide much needed certainty to this sector, and at the same time, the state can show leadership on climate as it has done so many times before.

Conclusion

After more than four years of discussion about this rule, the ARB should look to implement this regulation as soon as possible to provide certainty to the market and drive more reductions within the transportation sector.

California does not have the luxury of time if intends to achieve its bold climate goals in 2030 and 2045.

Sincerely,

Adam Raphaely

Managing Director

April 21, 2025

The Honorable Liane M. Randolph, Chair California Air Resources Board 1001 I St. Sacramento, CA 95814

RE: 3Degrees Comments in Response to Third Notice of Public Availability of Modified Text and Availability of Additional Documents and Information

Dear Chair Randolph and California Air Resources Board (CARB) Staff,

Thank you for the opportunity to provide comments in response to the Modified Text of the Low Carbon Fuel Standard (LCFS) Regulation published April 4, 2025. 3Degrees Group Inc. ("3Degrees") is a global climate and clean energy solutions provider and is a strong supporter of the LCFS program. We participate in the program as a designated reporting entity on behalf of a variety of opt-in parties with light-duty electric vehicle (EV) chargers, electric forklifts, hydrogen forklifts, and heavy-duty EV fleets. We are also an active fuel pathway developer.

3Degrees appreciates the time and effort that Staff has put into engaging the public and crafting these updates to the program over the last few years and for considering our comments that were submitted in response to the 45-Day and 15-Day draft rule packages published last year. We recognize that CARB must address OAL's concerns regarding the Proposed Amendments and we support the changes CARB has made.

We urge CARB to prioritize the prompt finalization and resubmission of the Modified Text with the earliest possible effective date.

The extended rulemaking process has created uncertainty and deterioration in the credit market. Regulatory stability enhances market efficiency by minimizing price volatility and allowing market participants to allocate resources optimally. A swift resubmission to OAL will signal CARB's commitment to the LCFS program and its goals, which will support more efficient and stable market operation. Additional delay could cause further market disruption and undermine the program's effectiveness by eroding confidence and impeding future market development.

3Degrees appreciates this opportunity to provide feedback and we look forward to continuing to work with CARB on the success of the LCFS program. Please reach out with any questions or for further discussion.

Sincerely,

/s/ Lexi Concannon

Lexi Concannon Associate Director, Regulatory Affairs lconcannon@3degreesinc.com



April 21, 2025

Chair Liane Randolph & Members of the Board California Air Resources Board 1001 I Street, Sacramento, CA 95814

Via Electronic Submission

Re: Third 15-Day Changes to the Proposed LCFS Regulation Order

Dear Chair Randolph and Members of the California Air Resources Board:

The Missouri Soybean Association (MSA) appreciates the opportunity to comment on the proposed modifications (Third 15-Day Changes) to the Low Carbon Fuel Standard (LCFS) program. MSA has welcomed engagement with the California Air Resources Board (CARB) and staff throughout this multi-year process to update the LCFS program. MSA was founded in 1966 as a not-for-profit, representing Missouri soybean farmers. After more than 50 years, the Association continues to be the voice for soybean farmers and all who are part of the soybean value chain.

CARB's Third 15-Day Changes to revise the LCFS did not address our major concerns with provisions included in the final amendments approved by CARB. In addition to the new proposals in the Third 15-Day Changes package, MSA remains deeply concerned with the drastic and inequitable pivot CARB has made related to agricultural feedstocks used for biofuels. MSA continues to encourage that updates to the LCFS program are based on up-to-date and sound science, as required by AB-32. Outlined below are our concerns and proposed solutions that will enable CARB to meet its climate goals, protect the environment and all Californians, while also supporting American soybean farmers and processors who are investing in the future of low-carbon energy.

Serious Feedstock Cap Concerns and Proposed Solutions

MSA still has significant concerns with the vegetable oil feedstock cap that was included in the initial 15-Day Changes posted in August 2024. The current proposal restricts the amount of soybean oil, canola oil and sunflower seed oil that is allowed to generate credits in the program at an inequitable 20% by company. CARB's own data demonstrates that vegetable oil feedstocks, including soy, have consistently exceeded the proposed cap since 2021.

Capping these proven, sustainable, and scalable feedstocks would suppress the supply of renewable diesel, increase reliance on fossil fuels, and raise fuel prices for California consumers. Even CARB staff acknowledged in the April 2024 workshop that a cap would reduce air quality benefits and likely increase NOx and PM2.5 emissions. All of this, including the recent tariffs on imported feedstocks greatly increase costs and further substantiate U.S. based



feedstocks as the clear-cut choice. MSA urges CARB to remove the cap on U.S. based vegetable oil feedstocks to provide a more economically feasible, locally produced and sustainable, climate smart option for the people and the planet.

Agricultural feedstocks for biofuel production are already held to a high standard for participation in the U.S. Renewable Fuel Standard (RFS). Rather than adding sustainable U.S. based feedstocks to its arbitrary proposed cap, CARB needs to update carbon intensity analysis and oversight of imported feedstocks, which are not held to the same level of accountability. Recent actions by the European Union in response to fraudulent Chinese biodiesel imports underscore this concern¹. The EU committee recently met at the request of a member state to discuss alleged fraud in biodiesel imports from China. Fraud continues to be an issue with imported feedstocks and needs to be addressed further. MSA strongly encourages CARB to adopt enforceable traceability and verification standards, including origin disclosures, documentation audits, and physical testing. Without implementing sustainable solutions to the above and not eliminating a cap on U.S. vegetable oil feedstock, CARB is essentially putting the feedstocks from foreign countries (i.e., China) above those of the United States.

Sustainability Guardrails and Traceability Concerns

MSA remains very concerned about the sustainability guardrails. The sustainability guardrails are more onerous than the specified source requirements used for non-U.S. waste feedstock imports. Palm oil in Southeast Asia has had forced labor concerns², but CARB does not require used cooking oil derived from palm to track social or economic sustainability. Concerningly, petroleum does have to track these criteria. CARB's proposal makes it administratively easier to use non-sustainable petroleum³ in the state than biofuels that have lower carbon intensity (CI) scores and are produced from sustainable feedstocks grown in the United States. Land use change is already captured in the indirect land use change (ILUC) score, which still makes it unclear what actual purpose the guardrails serve.

If CARB insists on agricultural feedstock traceability, then it should reward sustainable practices beyond what is already assumed in the lifecycle analysis (LCA). The U.S. Department of Agriculture (USDA) has developed a tool to quantify the CI reductions for no-till, cover crops and nitrogen inhibitors. Considering this integral information, the carbon intensity of soy-based biofuels could improve through the mentioned climate smart ag practices on the field where the soybeans were produced. Other farming practices like low-till, nutrient management, enhanced efficiency fertilizers, buffers, wetland and grassland management, tree planting on working lands, planting for higher carbon sequestration, and soil amendments all could and

¹ EU industry demands answers as 'fraudulent' Chinese biofuels continue to flow - Euractiv

 $^{^2\}underline{\text{https://apnews.com/article/virus-outbreak-only-on-ap-indonesia-financial-markets-malaysia-7b634596270cc6aa7578a062a30423bb}$

 $^{{\}tt attps://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.858512/full}$



should be accounted to assign a lower CI score to an agricultural feedstock. USDA already tracks all these practices through several of their managed conservation programs. In addition, there are a variety of other practices that scientifically lower the CI score of soybean feedstocks for biofuels, and USDA is actively working to develop mechanisms to account for those. If CARB insists on tracing feedstocks back to the farm, then it should also acknowledge when those feedstocks are produced with lower CI practices.

Moreover, USDA has recognized the CI reduction benefits of certain sustainable or climate-smart practices for the purposes of clean fuel transportation programs and is undertaking a rulemaking process to develop final guidelines for the quantification of these practices. Through planting decisions, soil management, and other practices, soybean farmers can continuously reduce environmental impacts. In addition, some soybeans are double cropped meaning they are grown as a secondary crop following a primary crop within a growing season. They are not displacing other crops or land uses. Double-crop soybeans should be eligible to have the ILUC component of the CI score removed or at least shared with the other crop in the rotation. MSA proposes the aforementioned issues to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Modernized, Accurate, Climate Smart Carbon Intensity Modeling and Scoring

MSA remains concerned that without a comprehensive update to the Global Trade Analysis Project model for biofuels (GTAP-BIO) that CARB utilizes, U.S. soy-based feedstocks will be phased out of the LCFS even without the additional limitations included in the Second and Third 15-Day Changes. Current data indicates a much lower CI score for U.S. soybeans, as growers continue to improve soil practices, limit water use, lower on-farm emissions and more. CARB is recommending stringent sustainability guardrails for U.S. soy but is still on track to likely phase-out U.S. soy-based biofuels from credit generation by approximately 2035 or sooner.

As CARB looks to develop a more aggressive auto acceleration mechanism to reach CI reduction benchmarks sooner, using outdated methodologies will only limit the output of actual improvement over time in terms of emissions reductions. As CARB updates all other major lifecycle emissions models through this rulemaking, MSA once again urges action to update the GTAP-BIO model so that the most current, climate smart and science-based data may be used to determine carbon intensity reductions. The reasoning and sources indicated in the Third 15-Day Changes do not address this concern and need to be revised to ensure accuracy. MSA proposes this issue to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Equitable Entities Eligible to Apply for Fuel Pathways

MSA is very concerned about CARB's decision to give the Executive Officer authority to stop accepting new pathways for biomass-based diesel starting in January 2031. MSA does not



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understand how this benefits the LCFS. Under AB-32, CARB must under statute minimize costs and maximize GHG reductions. It is unclear how this is served by rejecting new pathways. In fact, the LCFS is best served by allowing the most available and equitable pathways. If these pathways cannot achieve cost-effective GHG savings, they will not be utilized by the market in the LCFS. In essence, an increase in pathways can only serve to improve GHG benefits in California. Singling out a single fuel for prejudicial treatment is baffling given the goals of the LCFS and the authority that establishes it. MSA urges CARB to continue to allow equitable pathways forward with no date of denial.

Recommended Climate Enhancing Solutions for CARB

As CARB finalizes its update to the LCFS, MSA recommends several actions that will likely prevent an increase in fossil diesel use, improve carbon intensity calculations, and improve market access for sustainable U.S. agricultural feedstock providers.

First, CARB should not apply the vegetable oil feedstock cap proposal to U.S. feedstocks. As noted, these feedstocks are already subject to federal guardrails to ensure production on land not converted since 2008. The RFS was designed specifically to prevent land conversion for biofuel production, and USDA data shows a decrease in farmland over the same period.

Second, CARB should convene an expert working group to consider issues related to the sustainability provisions and indirect land use change (ILUC). MSA recommends that this expert working group convene before the end of 2025 and provide recommendations by the end of Fall 2026.

Third, MSA retains strong concerns about the ability of supply chains to comply with the sustainability guardrails. If CARB does move forward with the guardrails, they must reconsider its proposed sustainability requirements to allow soybean growers the opportunity to participate in the California biofuels market through innovative and climate smart agriculture practices. If traceability can be used to show additional benefits in CI scoring, CARB must look to programs already developed through farmer input and provide improved scoring for feedstocks that employ sustainability practices to minimize the changes in comparative costs (i.e., USDA accredited programs and practices). CARB should work with USDA to develop an aligned scheme to quantify climate-smart agricultural practices for the purposes of biofuel feedstocks. USDA has already engaged with CARB regarding this project, which could be applied to the work that CARB is doing on traceability and carbon quantification of agricultural biofuel feedstocks.

Lastly, CARB must undertake a comprehensive update of the GTAP-BIO model for soybean oil used in biofuel production. Without using the most up-to-date and accurate data, CARB is doing a disservice to the U.S. feedstock producers and California's citizens by calculating carbon intensity scores not rooted in current facts. Through CARB's own analysis we know prejudicial



feedstock treatment will lead to more emissions in the California transportation sector, harming the environment.

Concluding Thoughts/Pathway Forward

MSA is encouraged by the continued successes of programs that support the development of cleaner, low-carbon fuels. However, it is critical that CARB finalizes updates in a way that equitably include U.S. agricultural feedstocks through policies that are science-based aligning with the most up to date information as well as promoting the sustainability of U.S. based products and businesses; including the elimination of capping on U.S. vegetable oil feedstocks and applying sustainability guardrails that are economically feasible for farmers while rewarding their practices that lower CI.

CARB's Third 15-Day Changes did not address any of the fundamental issues raised by MSA in the First and Second 15-Day Changes and fails to acknowledge the potential unintentional consequences of a feedstock outlined by its own employees in previous discussions. CARB is required under the law to achieve the maximum technically feasible and cost-effective reductions in greenhouse gas emissions. The most recent 15-Day Changes show a lack of willingness to achieve the statutory obligations set forth in AB-32 and neglect modernized, climate smart, science-based solutions, ultimately disregarding the protection of U.S. based feedstocks, the people, and the planet. MSA also asks that CARB respond in writing to further substantiate their decisions regarding our concerns expressed in this letter. We look forward to your written responses as a state regulatory body, whose responsibility is to protect its' citizens and the environment by providing transparency on decisions made for those of impact.

MSA is eager to continue working with CARB to support the role of agriculture in diversifying the fuel supply while reducing carbon intensity and increasing clean air in California and beyond. On behalf of U.S. soybean farmers, we appreciate the opportunity to comment and look forward to collaborating with CARB and other relevant stakeholders on implementation of policies that expand the use of U.S. soy-based biofuels and market opportunities for U.S. soybean farmers.

Sincerely,

033.2

Renee Fordyce

Missouri Soybean Association President 734 South Country Club Dr., Jefferson City, MO 65109



April 21, 2025

SUBMITTED ELECTRONICALLY https://ww2.arb.ca.gov/applications/public-comments

Clerks' Office California Air Resources Board 1001 | Street Sacramento, California 95814

Subject: Low Carbon Fuel Standard – Third 15-Day Notice Comments

The Alliance for Automotive Innovation (Auto Innovators)¹ and our members appreciate the opportunity to comment on the third proposed 15-Day changes to the Low Carbon Fuel Standard (LCFS).² We oppose the changes related to light-duty (LD) vehicles and continue to recommend using funding generated by LD electric vehicles (EVs) to promote and expand the LD EV market to all California communities, rather than using that funding for unrelated mediumand heavy-duty (MD and HD) and motorcycle EV projects.

In 2024, EV sales represented 26% of light-duty vehicles sales in California.³ Far more EVs must be sold in the next few years to meet the growing EV regulatory requirements of 43% in 2027, 51% in 2028, or 68% in 2030. Reaching these levels requires sales far beyond the affluent single-family homeowners that currently purchase most EVs. The substantial resources associated with the LCFS program should promote EVs and expand the EV market to all communities. However, this is not the case with the proposed changes that use LCFS proceeds from LD EVs to fund MD, HD, and motorcycle EV projects.

We have continued to support regulatory provisions that allow up to 45 percent of the base credits generated by LD EV residential charging to the automakers (aka, "OEMs") producing

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¹ Auto Innovators represents the full auto industry, including the manufacturers producing most vehicles sold in the U.S., equipment suppliers, battery producers, semiconductor makers, technology companies, and autonomous vehicle developers. Our mission is to work with policymakers to realize a cleaner, safer, and smarter transportation future and to maintain U.S. competitiveness in cutting-edge automotive technology. Representing approximately 5 percent of the country's GDP, responsible for supporting nearly 10 million jobs, and driving \$1 trillion in annual economic activity, the automotive industry is the nation's largest manufacturing sector. (www.autosinnovate.org)

² California Air Resources Board. (2024). *Third 15-day notice of public availability of modified text and availability of additional documents and information: Proposed amendments to the Low Carbon Fuel Standard regulation.* https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/3rd 15day notice.pdf

³ https://www.autosinnovate.org/posts/papersreports/Get%20Connected%20EV%20Quarterly%20Report%202024%20Q4.pdf

034.2 cont.

those vehicles, since OEMs are in the best position to promote EV sales. Unfortunately, the latest 15-Day Notice has removed any opportunity for revenue generated by LD EVs to be used to promote the LD EV market. We oppose this change. Instead, to address the concern raised by the Office of Administrative Law (OAL) in its Decision of Disapproval,⁴ we recommend modifying subsection (c)(1)(B) of section 95483 to read:

Base Credits to OEMs. The Executive Officer may shall direct up to 45% of base credits to eligible OEMs of light-duty battery- electric or plug-in hybrid electric vehicles, if the statewide share of all new zero emission vehicle sales for model year 2024 zero emission vehicles certified under California Code of Regulations, title 13, section 1962.2 is less than 30 percent of total light-duty vehicle sales for all OEMs in California, based on data reported pursuant to that regulation. If the Executive Officer directs base credits to eligible OEMs, the requirements of section 95483(c)(1)(A)2. do not apply. The OEM is the credit generator for base credits for the portion of residential EV charging assigned to that OEM by the Executive Officer pursuant to 95486.1(c)(1)(A)1. The OEM must meet the requirements set forth in paragraphs (D)1. through 3. of this subsection 95483(c)(1) below, and 95491(e)(5).

Even with limited incremental LCFS credits, automakers have proven that the revenue generated is invested to advance electrification in California. Below is a sampling of projects that vehicle manufacturers have already invested in with LCFS funds.

- Installing DCFC stations in Baldwin Park and Sacramento.
- Subsidizing zero-emission car sharing fees for college students at California State
 University Dominguez Hills.
- Returning proceeds directly to EV customers in the form of a digital Amazon gift card. At the peak of this program, nearly 4,000 customers were enrolled and received gift cards.
- Funding broader business initiatives like SmartCharge (a home charging demand response program for nearly 4,500 customers) and advancing technologies to help reach sustainability goals.
- Expanding the telematics capabilities of EVs to continue to evolve and innovate new energy management and charging solutions for our drivers.

⁴ California Office of Administrative Law. (2025, February 3). Notice of disapproval of regulatory action: OAL Matter No. 2025-0103-01S. https://oal.ca.gov/wp-content/uploads/sites/166/2025/02/LINDSEY-2025-0103-01S.pdf

- 034.2 cont. Additionally, below are some examples of how vehicle manufacturers could use base credits to support electrification:
 - Support mobility hub initiative at California State University Dominguez Hills as part of LA28 Olympics.
 - Support funding of hydrogen-based community car sharing initiatives in Central / Southern California.

Instead of eliminating the opportunity for OEMs to generate base credits, Auto Innovators would like to work with CARB to develop metrics, tied to the Advanced Clean Cars II ZEV mandate, that would have provided clear reasoning for directing base credits to OEMs. For example, if ZEV sales are less than 75 percent of meeting the ZEV mandate, OEMs could receive 45 percent of the base credits. The percentage of base credits to OEMs would go down as ZEV sales moved closer to the ZEV mandate.

We appreciate the opportunity to provide the above feedback. Please don't hesitate to contact me if you have any questions or need additional information.

Sincerely,

Dan Bowerson

Vice President, Energy & Environment

dbowerson@autosinnovate.org

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Concerned Scientists

To: California Air Resources Board

From: Jeremy Martin

Date: April 21, 2025

Subject: Comments on Low Carbon Fuel Standard April 2025 15-day changes

Thank you for the opportunity to comment on this important regulation. The vast majority of the changes proposed are appropriate clarifications and are responsive to the problems identified by the Office of Administrative Law (OAL).

However, the changes in subsection 95482(h) that make fossil hydrogen with carbon capture and sequestration eligible for the 80 percent renewable hydrogen (CCS) renewable hydrogen requirement by 2030 is a substantial policy change. It is not appropriate to make such a change without stakeholder feedback and Board approval.

Board resolution 24-14 directs the Executive Office to monitor hydrogen fuel availability and to report back and propose any adjustments to the Board as part of the next scoping plan update. This language does not authorize the Executive Office to make changes to the regulation without Board approval.

We suggest this change be removed and changes to the regulation following the board vote be limited to addressing issues raised by OAL.



April 21, 2025

VIA ELECTRONIC FILING Submitted via LCFS Comments Upload Link

The Honorable Liane M. Randolph, Chair California Air Resources Board 1001 I Street Sacramento, CA 95814

RE: Gevo, Inc.'s Comments on the Third 15-Day Notice of Changes to the Proposed Low Carbon Fuel Standard Amendments

Dear Chair Randolph:

Gevo, Inc. ("Gevo") appreciates this opportunity to comment on the California Air Resources Board ("CARB") Third 15-Day Notice of Changes to the Proposed Low Carbon Fuel Standard ("LCFS") Amendments, issued on April 4, 2025 (hereinafter "Third 15-Day Notice") in response to the California Office of Administrative Law's "Decision of Disapproval of Regulatory Action" ("OAL Decision"). Gevo submitted comments on CARB's proposed LCFS amendments on February 20, 2024, on the content of the CARB Workshop held on April 10, 2024, on the first 15-Day notice on August 27, 2024, and on the second 15-Day notice on October 15, 2024, and we incorporate each of those comments here by reference. Although we continue to urge CARB's consideration of all of the comments we previously submitted, the comments here relate to areas elaborated in the Third 15-Day Notice in response to the OAL Decision, as specified by CARB in that notice.

¹ State of California, Office of Administrative Law, "Decision of Disapproval of Regulatory Action," (February 25, 2025).

² See Gevo, Inc.'s "Comments on Proposed Amendments to the Low Carbon Fuel Standard" (February 20, 2024) (available as Comment #196 in CARB's Public Comments Received portal); Gevo, Inc.'s "Comments on the Low Carbon Fuel Standard Workshop, April 10, 2024" (May 10, 2024) (available in CARB's LCFS Meetings and Workshops portal); Gevo, Inc's "Comments on 15-Day Notice of Changes to the Proposed Low Carbon Fuel Standard Amendments" (August 27, 2024); and Gevo, Inc's "Comments on the Second 15-Day Notice of Changes to the Proposed Low Carbon Fuel Standard Amendments" (October 15, 2024).

³ Third 15-Day Notice, at 3 (April 4, 2025) (noting that "staff will only address comments received during this 15-day comment period that are responsive to this notice, documents added to the record, or the changes detailed" in attachments to the notice).

As a refresher, Gevo's mission is to produce low-carbon, renewable energy-dense liquid hydrocarbons for drop-in transportation fuels such as gasoline, jet fuel, and diesel. Gevo currently is participating in the LCFS through our production of renewable natural gas ("RNG") from three dairies, for which we installed dairy-manure biomethane capture and upgrading equipment, thereby producing pipeline quality RNG rather than allowing the methane from the manure to continue to be released from the dairy lots. In addition, Gevo also has plans to participate in the LCFS with low-carbon products from our alcohol-to-hydrocarbons production process, which uses a combination of decarbonization technologies and sustainably farmed feedstock to produce fuels with substantially reduced carbon intensity ("CI") compared to fossil fuel equivalents.

We broke ground on our first alternative jet fuel ("AJF")/sustainable aviation fuel ("SAF")⁴ production facility, "Gevo ATJ-60" ("ATJ-60"), which was previously known as Net-Zero 1, in Lake Preston, South Dakota, in September 2022. This facility will use a three-part strategy to produce low-CI SAF: 1) use locally-sourced corn feedstock from farmers engaged in sustainable agriculture to both reduce on-farm greenhouse gas ("GHG") emissions and sequester carbon dioxide ("CO₂") in the soil; 2) decarbonize the fuel production process by replacing conventional fossil fuel inputs with wind energy, renewable natural gas, and green hydrogen; and 3) use carbon capture and sequestration ("CCS") technology to reduce emissions from the production process further. The Gevo approach is aimed at decarbonizing every step in our SAF's life cycle, which we track all the way from the farm field through to the aircraft using our Verity Tracking platform. Upon completion of our ATJ-60 production facility, we intend to submit a Tier 2 LCFS Provisional Pathway application for the SAF, renewable diesel, and renewable naphtha fuels that will be produced at the ATJ-60 facility, utilizing our field corn starch feedstock and alcohol-to-jet ("ATJ")/alcohol-to-hydrocarbons production process.

Also, Gevo has purchased an ethanol plant in North Dakota that has a Class VI CCS well, which has a pathway application pending at CARB. While this facility will continue to operate as an ethanol facility for some time, Gevo has announced our intention to add SAF production capability to the facility in the future.

⁴ Gevo typically uses the term "sustainable aviation fuel" or "SAF" to refer to our fuel. This fuel meets the definition of "alternative jet fuel" (AJF) as set forth in the LCFS regulations. Accordingly, our references to SAF in this comment letter should be deemed synonymous with AJF.

I. Gevo Urges CARB to Move Forward in Finalizing the LCFS Revision Package with the Proposed Strengthening of the Compliance Curve, Stepdown, and Automatic Acceleration Mechanism

Gevo urges CARB to move forward to promptly finalize the LCFS revision package. As Gevo has noted in our previous comments, key elements of that package, including the near-term CI stringency increase (i.e., "stepdown"), the strengthening of the overall compliance curve, and the adoption of an Automatic Acceleration Mechanism ("AAM") are needed to help meet the State's climate objectives.

Up to now, the LCFS has been a successful program, exceeding its initially projected carbon reductions through what CARB has referred to as "overperformance." Although the LCFS has supported the production of a greater quantity of low-carbon fuels during a certain timeframe than originally projected, Gevo notes that labelling this phenomenon as "overperformance" is a bit of a misnomer. In actuality, given the State's aggressive carbon emissions reduction and climate goals, and the challenges associated with meeting them, the situation might better be referred to as underperformance of the CI targets and implementing mechanisms. As CARB has recognized, because the volume of low-carbon fuel has exceeded projections, the credit prices have been reduced and the credit bank is unduly large, thereby threatening continuing success. Implementing the proposed near-term CI stepdown and AAM alongside the compliance curve/benchmarks revisions is necessary to address this. Accordingly, we urge CARB to move forward in adopting the LCFS revision package including these provisions.

II. Gevo Supports CARB's Confirmation of Three Ten-Year Crediting Periods for Early Adopters of Avoided Methane Projects (Section 95488.9(f)(3)(A))

In its OAL Decision, the OAL objected to the provision in Section 95488.9(f)(3)(A) stating that the Executive Officer of CARB "may" renew crediting periods for already certified avoided methane emissions projects from dairy and swine manure and landfill-diverted organic waste disposal for three 10-year periods, as the OAL found that the conditions under which the Executive Officer "may" do so were unclear. (OAL Decision, at 9). Gevo always understood the provision to mean that the Executive Officer "shall" do so as long as the avoided methane emissions projects meet applicable LCFS compliance requirements. CARB's explicit use of the word "shall" in the proposed revision to Section 95488.9(f)(3)(A), coupled with the clarification that the "shall" is conditioned on the requirement that avoided emissions projects must "otherwise continue to meet applicable eligibility requirements," is a helpful clarification and fully responsive to the OAL's comment. Accordingly, while Gevo continues to believe, as we spelled out in our previous comments, that no time limits should be placed on crediting periods for avoided methane projects, we support CARB's clarification that the

Executive Officer "shall" at least renew crediting for already certified avoided methane emissions projects for three 10-year periods.

III. The Land Use Change Accounting Approach in Section 95488.3(d) Overstates Potential Impacts and Has Internal Inconsistencies

The method CARB cites in 95488.3(d)(1) for accounting for land use change ("LUC," which, in CARB's usage addresses the potential for indirect land use change, or "iLUC") employs the GTAP-BIO model, which uses economic modeling to estimate LUC rather than empirical land change data. This is a modeled, not observed, land-use effect. It assumes that using agricultural land for biofuel feedstocks in one area indirectly causes agricultural expansion into other areas. ILUC modeling is highly speculative and riddled with inconsistencies. A 2022 review from IEA Bioenergy found that past iLUC models of corn ethanol were poor predictors of future land use change and suggested that assumptions underlying iLUC predictions needed to be fundamentally revisited (IEA Bioenergy, 2022). Indeed, the U.S. Environmental Protection Agency's ("EPA") data from the National GHG Inventory suggest that total U.S. cropland is decreasing despite higher volumes of biofuel production, demonstrating that empirical data do not support the conclusions of most iLUC models. Accordingly, in 2024, the U.S. Department of Energy's Argonne National Laboratory ("ANL"), along with EPA and the U.S. Department of Agriculture ("USDA"), updated iLUC and indirect emission values for implementation of the Section 45Z Clean Fuel Production tax credit. While the LUC value asserted for U.S. corn ethanol in Section 95488.3(d) stands at ~19.8 g CO2e/MJ, the iLUC value ANL determined in 2024 for U.S. corn ethanol is ~5.75 g CO2e/MJ, a significant decrease. In light of the most recent data, CARB should revise its LUC factor.

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Further, while Gevo appreciates the clarifications CARB has made regarding when a new LUC assessment will be made, the new revisions have further confused the method that will be used to do the assessment. While subsection 95488.3(d)(2) stipulates that a conservative LUC value will be calculated "based on the same modeling framework specified in subsection 95488.3(d)(1)", it goes on to say that the Executive Officer will use satellite-based, empirical estimates of land cover change for the calculation. These two statements are at odds with one another. The method cited in 95488.3(d)(1) refers to the GTAP-BIO model, which uses economic modeling to estimate LUC rather than empirical land change data. Economic modeling accounts for induced land use change effects outside the feedstock being analyzed, for example, among other crops and among non-biofuel sectors. Hence, the scope of LUC considered in an economic model is broader than if one simply looks at the land footprint of the feedstock in question using empirical data. Applying an economic modeling approach to some feedstocks and an empirical approach to others will mean that feedstocks are not being assessed fairly and consistently and could disadvantage existing feedstocks that have already been assessed through economic modeling.

Conclusion

Thank you for the opportunity to comment on the Third 15-Day Notice of additional changes to the Low Carbon Fuel Standard amendments proposal. Please let us know if you have any questions regarding our comments.

Respectfully,

Kent Hartwig

Director of State Government Affairs

Gevo, Inc.

Nancy N. Young

Chief Sustainability Officer

Namy N You

Gevo, Inc.



April 21, 2025

Chair Liane Randolph & Members of the Board California Air Resources Board 1001 I Street, Sacramento, CA 95814

Via Electronic Submission

Re: Third 15-Day Changes to the Proposed LCFS Regulation Order

Dear Chair Randolph and Members of the California Air Resources Board:

The American Soybean Association (ASA) appreciates the opportunity to comment on the proposed modifications (Third 15-Day Changes) to the Low Carbon Fuel Standard (LCFS) program. ASA has welcomed engagement with the California Air Resources Board (CARB) and staff throughout this multi-year process to update the LCFS program.

ASA represents approximately 500,000 U.S. soybean farmers on domestic and international policy issues important to the soybean industry and has 26 affiliated state associations representing 30 soybean-producing states. U.S. soybean growers have long been committed to producing the world's food, feed, fuel, and thousands of bioproducts in a sustainable and climate-smart way.

CARB's Third 15-Day Changes to revise the LCFS did not address ASA's major concerns with provisions included in the final amendments approved by CARB. In addition to the new proposals in the Third 15-Day Changes package, ASA remains deeply concerned with the drastic and inequitable pivot CARB has made related to agricultural feedstocks used for biofuels. ASA continues to encourage that updates to the LCFS program are based on up-to-date and sound science, as required by AB-32. Outlined below are our concerns and proposed solutions that will enable CARB to meet its climate goals, protect the environment and all Californians, while also supporting American soybean farmers and processors who are investing in the future of low-carbon energy.

Serious Feedstock Cap Concerns and Proposed Solutions

ASA still has significant concerns with the vegetable oil feedstock cap that was included in the initial 15-Day Changes posted in August 2024. The current proposal restricts the amount of soybean oil, canola oil and sunflower seed oil that is allowed to generate credits in the program at an inequitable 20% by company. CARB's own data demonstrates that vegetable oil feedstocks, including soy, have consistently exceeded the proposed cap since 2021.

Capping these proven, sustainable, and scalable feedstocks would suppress the supply of renewable diesel, increase reliance on fossil fuels, and raise fuel prices for California consumers. Even CARB staff acknowledged in the April 2024 workshop that a cap would reduce air quality benefits and likely increase NOx and PM2.5 emissions. All of this, including the recent tariffs on imported feedstocks greatly increase costs and further substantiate U.S. based feedstocks as the clear-cut choice. ASA urges CARB to remove the cap on U.S. based vegetable oil feedstocks to provide a more economically feasible, locally produced and sustainable, climate smart option for the people and the planet.

Agricultural feedstocks for biofuel production are already held to a high standard for participation in the U.S. Renewable Fuel Standard (RFS). Rather than adding sustainable U.S. based feedstocks to its arbitrary proposed cap, CARB needs to update carbon intensity analysis and oversight of imported feedstocks, which are not held to the same level of accountability. Recent actions by the European Union in response to fraudulent Chinese biodiesel imports underscore this concern¹. The EU committee recently met at the request of a member state to discuss alleged fraud in biodiesel imports from China. Fraud continues to be an issue with imported feedstocks and needs to be addressed further. ASA strongly encourages CARB to adopt enforceable traceability and verification standards, including origin disclosures, documentation audits, and physical testing. Without implementing sustainable solutions to the above and not eliminating a cap on U.S. vegetable oil feedstock, CARB is essentially putting the feedstocks from foreign countries (i.e., China) above those of the United States.

Sustainability Guardrails and Traceability Concerns

ASA remains very concerned about the sustainability guardrails. The sustainability guardrails are more onerous than the specified source requirements used for non-U.S. waste feedstock imports. Palm oil in Southeast Asia has had forced labor concerns², but CARB does not require used cooking oil derived from palm to track social or economic sustainability. Concerningly, petroleum does have to track these criteria. CARB's proposal makes it administratively easier to use non-sustainable petroleum³ in the state than biofuels that have lower carbon intensity (CI) scores and are produced from sustainable feedstocks grown in the United States. Land use change is already captured in the indirect land use change (ILUC) score, which still makes it unclear what actual purpose the guardrails serve.

¹ EU industry demands answers as 'fraudulent' Chinese biofuels continue to flow - Euractiv

²https://apnews.com/article/virus-outbreak-only-on-ap-indonesia-financial-markets-malaysia-7b634596270cc6aa7578a062a30423bb

³ https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.858512/full

If CARB insists on agricultural feedstock traceability, then it should reward sustainable practices beyond what is already assumed in the lifecycle analysis (LCA). The U.S. Department of Agriculture (USDA) has developed a tool to quantify the CI reductions for no-till, cover crops and nitrogen inhibitors. Considering this integral information, the carbon intensity of soy-based biofuels could improve through the mentioned climate smart ag practices on the field where the soybeans were produced. Other farming practices like low-till, nutrient management, enhanced efficiency fertilizers, buffers, wetland and grassland management, tree planting on working lands, planting for higher carbon sequestration, and soil amendments all could and should be accounted to assign a lower CI score to an agricultural feedstock. USDA already tracks all these practices through several of their managed conservation programs. In addition, there are a variety of other practices that scientifically lower the CI score of soybean feedstocks for biofuels, and USDA is actively working to develop mechanisms to account for those. If CARB insists on tracing feedstocks back to the farm, then it should also acknowledge when those feedstocks are produced with lower CI practices.

Moreover, USDA has recognized the CI reduction benefits of certain sustainable or climate-smart practices for the purposes of clean fuel transportation programs and is undertaking a rulemaking process to develop final guidelines for the quantification of these practices. Through planting decisions, soil management, and other practices, soybean farmers can continuously reduce environmental impacts. In addition, some soybeans are double cropped meaning they are grown as a secondary crop following a primary crop within a growing season. They are not displacing other crops or land uses. Double-crop soybeans should be eligible to have the ILUC component of the CI score removed or at least shared with the other crop in the rotation. ASA proposes the aforementioned issues to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Modernized, Accurate, Climate Smart Carbon Intensity Modeling and Scoring

ASA remains concerned that without a comprehensive update to the Global Trade Analysis Project model for biofuels (GTAP-BIO) that CARB utilizes, U.S. soy-based feedstocks will be phased out of the LCFS even without the additional limitations included in the Second and Third 15-Day Changes. Current data indicates a much lower CI score for U.S. soybeans, as growers continue to improve soil practices, limit water use, lower on-farm emissions and more. CARB is recommending stringent sustainability guardrails for U.S. soy but is still on track to likely phase-out U.S. soy-based biofuels from credit generation by approximately 2035 or sooner.

As CARB looks to develop a more aggressive auto acceleration mechanism to reach CI reduction benchmarks sooner, using outdated methodologies will only limit the output of actual improvement over time in terms of emissions reductions. As CARB updates all other major lifecycle emissions models through this rulemaking, ASA once again urges action to update the GTAP-BIO model so that the most current, climate smart and science-based

data may be used to determine carbon intensity reductions. The reasoning and sources indicated in the Third 15-Day Changes do not address this concern and need to be revised to ensure accuracy. ASA proposes this issue to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Equitable Entities Eligible to Apply for Fuel Pathways

ASA is very concerned about CARB's decision to give the Executive Officer authority to stop accepting new pathways for biomass-based diesel starting in January 2031. ASA does not understand how this benefits the LCFS. Under AB-32, CARB must under statute minimize costs and maximize GHG reductions. It is unclear how this is served by rejecting new pathways. In fact, the LCFS is best served by allowing the most available and equitable pathways. If these pathways cannot achieve cost-effective GHG savings, they will not be utilized by the market in the LCFS. In essence, an increase in pathways can only serve to improve GHG benefits in California. Singling out a single fuel for prejudicial treatment is baffling given the goals of the LCFS and the authority that establishes it. ASA urges CARB to continue to allow equitable pathways forward with no date of denial.

Recommended Climate Enhancing Solutions for CARB

As CARB finalizes its update to the LCFS, ASA recommends several actions that will likely prevent an increase in fossil diesel use, improve carbon intensity calculations, and improve market access for sustainable U.S. agricultural feedstock providers.

First, CARB should not apply the vegetable oil feedstock cap proposal to U.S. feedstocks. As noted, these feedstocks are already subject to federal guardrails to ensure production on land not converted since 2008. The RFS was designed specifically to prevent land conversion for biofuel production, and USDA data shows a decrease in farmland over the same period.

Second, CARB should convene an expert working group to consider issues related to the sustainability provisions and indirect land use change (ILUC). ASA recommends that this expert working group convene before the end of 2025 and provide recommendations by the end of Fall 2026.

Third, ASA retains strong concerns about the ability of supply chains to comply with the sustainability guardrails. If CARB does move forward with the guardrails, they must reconsider its proposed sustainability requirements to allow soybean growers the opportunity to participate in the California biofuels market through innovative and climate smart agriculture practices. If traceability can be used to show additional benefits in CI scoring, CARB must look to programs already developed through farmer input and provide improved scoring for feedstocks that employ sustainability practices to minimize the changes in comparative costs (i.e., USDA accredited programs and practices). CARB should work with USDA to develop an aligned scheme to quantify climate-smart agricultural practices for the purposes of biofuel feedstocks. USDA has already engaged with CARB regarding this project, which could be applied to the work that CARB is doing on traceability and carbon quantification of agricultural biofuel feedstocks.

Lastly, CARB must undertake a comprehensive update of the GTAP-BIO model for soybean oil used in biofuel production. Without using the most up-to-date and accurate data, CARB is doing a disservice to the U.S. feedstock producers and California's citizens by calculating carbon intensity scores not rooted in current facts. Through CARB's own analysis we know prejudicial feedstock treatment will lead to more emissions in the California transportation sector, harming the environment.

Concluding Thoughts/Pathway Forward

ASA is encouraged by the continued successes of programs that support the development of cleaner, low-carbon fuels. However, it is critical that CARB finalizes updates in a way that equitably include U.S. agricultural feedstocks through policies that are science-based aligning with the most up to date information as well as promoting the sustainability of U.S. based products and businesses; including the elimination of capping on U.S. vegetable oil feedstocks and applying sustainability guardrails that are economically feasible for farmers while rewarding their practices that lower CI.

CARB's Third 15-Day Changes did not address any of the fundamental issues raised by ASA in the First and Second 15-Day Changes and fails to acknowledge the potential unintentional consequences of a feedstock outlined by its own employees in previous discussions. CARB is required under the law to achieve the maximum technically feasible and cost-effective reductions in greenhouse gas emissions. The most recent 15-Day Changes show a lack of willingness to achieve the statutory obligations set forth in AB-32 and neglect modernized, climate smart, science-based solutions, ultimately disregarding the protection of U.S. based feedstocks, the people, and the planet. ASA also asks that CARB respond in writing to further substantiate their decisions regarding our concerns expressed in this letter. We look forward to your written responses as a state regulatory body, whose responsibility is to protect its' citizens and the environment by providing transparency on decisions made for those of impact.

ASA is eager to continue working with CARB to support the role of agriculture in diversifying the fuel supply while reducing carbon intensity and increasing clean air in California and beyond. On behalf of U.S. soybean farmers, we appreciate the opportunity to comment and look forward to collaborating with CARB and other relevant stakeholders on implementation of policies that expand the use of U.S. soy-based biofuels and market opportunities for U.S. soybean farmers.

Sincerely,

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Caleb Ragland, President

Caleb Ragland

American Soybean Association



Tanya M. DeRivi

Senior Director, California Climate and Fuels

April 21, 2025

Clerks' Office California Air Resources Board 1001 I Street Sacramento, CA 95814

Uploaded at: https://ww2.arb.ca.gov/applications/ public-comments

Re: WSPA Comments on Third 15-Day Low Carbon Fuel Standard Amendments Package

The Western States Petroleum Association (WSPA) appreciates the opportunity to comment on the California Air Resources Board's (CARB) proposed third "15-day" Low Carbon Fuel Standard (LCFS) program amendments released on April 4, 2025. WSPA is a non-profit trade association representing companies that import and export, produce, refine, transport, and market petroleum, petroleum products, alternative fuels, natural gas, and other energy supplies in California and four other western states, and has actively participated in air quality planning issues for over 30 years.

WSPA is proud of the technological advancements our member companies have made to bring more alternative fuels and electricity to California's transportation market since LCFS came into effect. We believe a well-designed LCFS program that protects a diverse energy portfolio is essential to support a successful lower-carbon fuels market and offers Californians a reliable supply of affordable fuels. It remains essential for CARB to incorporate clearly defined and achievable final revisions that align with statutory requirements.

In light of the Office of Administrative Law's (OAL) disapproval of the previous rulemaking package, WSPA urges CARB to issue implementation guidance – including a workshop or webinar – to address potential delays in implementation of the revised program requirements and to solicit additional stakeholder feedback on changes made to address this disapproval decision.

As detailed below, WSPA highlights the following concerns with the third 15-day amendments:

- CARB should extend compliance and reporting deadlines to account for delays associated with OAL's disapproval;
- CARB should remove provisions categorically excluding new fuel pathway applications for biomass-based diesel;
- CARB should retain provisions allowing it to update data and modeling for "Tier 1 CI Calculators" between LCFS rulemakings;
- CARB should evaluate further revisions to its Land Use Change provisions to account for OAL concerns and to provide for stakeholder feedback;
- CARB should retain a technology-neutral approach to the LCFS program by removing restrictions for certain hydrogen-based fuels;
- CARB should clarify requirements for credit true-ups; and
 - 038.8 CARB should exempt aviation gasoline from program requirements.

WSPA has been engaged throughout this LCFS rulemaking process and previously submitted comments in response to prior workshops, the three prior sets of proposed regulatory updates, and the recirculated environmental analysis. Those comments are incorporated by reference and

¹ State of California Office of Administrative Law's Decision of Disapproval (File Number 2025-0103-O1S), February 25, 2025, at: https://oal.ca.gov/wp-content/uploads/sites/166/2025/02/LINDSEY-2025-0103-01S.pdf

are also attached. ^{2,3,4,5,6,7,8,9,10,11,12} California faces significant challenges in meeting its ambitious climate goals through various electrification programs across the transportation, building, and industrial sectors, including barriers to implementation, uncertainties driven by changing Federal policies (including CARB's recent withdrawal of waivers to implement various Zero Emission Vehicle (ZEV) requirements across the transportation sector), and limited State funding. A well-devised LCFS program can help mitigate these challenges by using a market-based, technology-neutral approach that reduces burdens in light of the ongoing affordability challenges facing many Californians. As WSPA previously emphasized, the proposed revisions to the LCFS program instead exacerbate these existing challenges by imposing technologically infeasible mandates and non-cost-effective requirements, which will likely create greater market volatility and higher prices, disproportionately impacting economically disadvantaged individuals.

1. CARB Should Delay Forthcoming Compliance Deadlines in Response to Implementation Delays Associated with OAL's Decision of Disapproval.

OAL issued a disapproval of CARB's LCFS Program Amendments on February 25, 2025, which has delayed the effective date of these amendments by nearly six months. This unexpected – and significant – delay requires corresponding extensions of forthcoming compliance deadlines in order to allow regulated entities sufficient time to meet new program requirements. WSPA urges CARB to adjust any future reporting provisions in accordance with the forthcoming effective date of the revised regulation. In particular, WSPA recommends the following updates:

- CI Benchmarks: WSPA reminds CARB that they should not move the new 2025 Carbon Intensity (CI) target back to the start of this year. Indeed, in CARB's Notice of Public Availability for the first set of 15-day changes, ¹³ CARB explicitly stated that "[t]he proposed compliance target for 2025 will take effect for Quarter 1, 2025 reporting if the Proposed Amendments become effective prior to April 1, 2025, which marks the beginning of the Quarter 1 2025 reporting period." WSPA recommends that the new benchmarks take effect only after the effective date of the rule, i.e. July 1, 2025. In accordance with the Market Notice posted by CARB after OAL's disapproval, ¹⁴ regulated entities have relied on the currently effective LCFS regulation for activities occurring in Q1 and Q2 of 2025. In addition to being a potential violation of due process principles under the U.S. and California Constitutions, retroactive CI targets would likely result in retroactive impacts to fuel transactions which have already occurred, substantial administrative burden, and quarterly reporting challenges.
- **Sustainability Criteria**: The sustainability criteria are benchmarked upon a still-unknown effective date. WSPA recommends that compliance with these provisions be delayed by six months or one full calendar year to account for the delay caused by OAL's disapproval, given that the window to prepare for such changes has been significantly shortened. Furthermore,

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² WSPA, "WSPA Comments on CARB Workshop to Discuss Potential Changes to the LCFS," August 8, 2022.

³ WSPA, "WSPA Comments on the August 18th CARB Workshop to Discuss Potential Changes to the LCFS," September 19, 2022.

⁴ WSPA, "WSPA Comments on the November 9th CARB Workshop regarding Potential Changes to LCFS," December 21, 2022.

⁵ WSPA, "WSPA Comments on CARB Preliminary Discussion Draft of Potential Low Carbon Fuel Standard Regulation Amendments and February 22, 2023 LCFS Workshop," March 15, 2023.

⁶ WSPA, "WSPA Comments on CARB's Proposed Low Carbon Fuel Standard Auto-Acceleration Mechanism and May 23, 2023 Workshop," June 6, 2023.

WSPA, "WSPA Comments on the Low Carbon Fuel Standard Modeling Updates Workshop," September 12, 2023.

⁸ WSPA, "WSPA Comments on Proposed 2024 Low Carbon Fuels Standard Amendments," February 20, 2024.

⁹ WSPA, "WSPA Comments on April 10, 2024, Low Carbon Fuel Standard Workshop," May 10, 2024.

¹⁰ WSPA, "WSPA Comments on 15-Day Low Carbon Fuel Standard (LCFS) Amendments Package," August 27, 2024.

¹¹ WSPA, "WSPA Comments on LCFS Recirculated Draft Environmental Impact Analysis," September 30, 2024.

¹² WSPA, "WSPA's Second LCFS 15-Day Comments," October 18, 2024.

¹³ See CARB's "Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information, Proposed Low Carbon Fuel Standard Amendments," August 12, 2024, at page 5 [emphasis added]: https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/15day notice.pdf

¹⁴ See CARB's "Information Regarding Low Carbon Fuel Standard Regulation Updates", February 26, 2025: https://ww2.arb.ca.gov/sites/default/files/2025-02/LCFS%20OAL%20Market%20Notice_2.pdf

038.10 cont.

WSPA recommends that CARB explicitly clarify that the new attestation requirements are only effective once the amended regulation is made effective by OAL. WSPA urges CARB to delay the effective date for these requirements to January 1, 2026, to avoid compliance risk and to allow sufficient time for regulated entities to complete these verifications, given the significant burden associated with reviewing performance under two different sets of procedures. Section 95488.9(g)(5)(C)(1) clarifies that fuel pathway applicants, in addition to fuel pathway holders, must maintain attestation letters certifying compliance with the revised sustainability requirements. Under the current provision, pathway applicants would essentially be required to immediately demonstrate compliance based on the delays in finalizing the program revisions, even though CARB has not currently issued any implementation guidance. The attestation requirements will require substantial time to implement – which CARB acknowledges by giving pathway holders until January 1, 2026 – and pathway applicants should not be required to maintain attestation letters any earlier than fuel pathway holders.

- 038.11
- Reporting Requirements: §95488(c) updated the transition period for fuel pathway holders to use CA-GREET 4.0 for new pathway applications from January 1, 2025 (as was adopted in November 2024) to the yet-unknown effective date of the final amendments. For such provisions that were otherwise to have become effective on January 1, CARB should provide a reasonable transition period such as transitioning new pathway applications from CA-GREET 3.0 to CA-GREET 4.0. A transition schedule described in a table or plain language would provide program participants with important clarity if they are considering a fuel pathway submission in 2025.
- 2. CARB Should Remove the Categorical Exclusion of New Fuel Pathway Applications for Biomass-Based Diesel.

OAL's disapproval identified concerns regarding the Executive Officer's (EO) discretion to decline new pathway applications for biomass-based diesel if the number of unique Class 3-8 ZEVs reported or registered in California exceeds 132,000 ZEVs or near-zero emission vehicles (NZEV) on December 31, 2029, in accordance with §95488(d). CARB is proposing to address this concern by removing the EO's discretion and instead stating that it "shall not" accept new applications if the conditions in §95488(d) are met. This creates a risk of limiting the EO's flexibility to respond appropriately to future conditions that are not foreseeable at this time and may limit innovative technologies that could have significant greenhouse gas (GHG) reduction benefits both in California and in other LCFS markets where ZEV/NZEVs are not as prevalent. This rigid approach is fundamentally inconsistent with LCFS's foundational principles of using market-based mechanisms to incentivize emission reductions in a technology-neutral manner. Further, by constraining potential pathway applications, CARB is failing to achieve the "maximum technologically feasible and cost-effective greenhouse gas emission reductions" in accordance with California Health & Safety Code (HSC) §38560 and is foregoing new fuel pathways which may be more efficient and lower CI than existing pathways. This flexibility is particularly important for developing diesel substitute products as older fuel pathways may be retired. A technologyneutral approach would better align with CARB's rulemaking obligations under Gov. Code §11346.2(b)(4)(A), which requires CARB to consider performance standards as an alternative to mandating the use of specific technologies or equipment, or prescribing specific actions or procedures.

WSPA requests that §95488(d) be stricken in its entirety. If there are in fact a critical mass of Class 3-8 ZEV/NZEVs in the market in the future, the demand of biomass-based diesel will naturally drop, with no need to preempt the review of fuel pathway applications.

3. CARB Should Retain the Ability to Create New, and Update Existing, Tier 1 Cl Calculators Between LCFS Rulemakings.

CARB's Third Notification of Public Availability of Modified Text and Availability of Additional Documents and Information indicates that §95488.3(b)(9) is "unnecessary." However, this section provides important flexibility for CARB to modify the LCFS Tier 1 Calculators between rulemakings – especially if errors are identified – as data availability and modeling methodologies are continuously updated and improved for new and existing feedstocks. Without the ability to create new, and update existing, Tier 1 CI calculators, or correct incorrect or out-of-date data, feedstock sourcing will suffer – leading to inefficiencies and higher costs. Striking §95488.3(b)(9) eliminates an opportunity for the Executive Officer to approve new and updated Tier 1 CI calculators between rulemakings.

4. CARB Should Evaluate Additional Revisions to the Proposed Land Use Change (LUC) Provisions to Address OAL's Concerns.

OAL's disapproval identified various concerns with the proposed revisions to CARB's determination of LUC values in accordance with §95488.3(d), including a lack of clarity for certain key terms and failure to respond to comments. While CARB is proposing revisions to partially address these concerns, WSPA urges CARB to evaluate additional revisions in order to sufficiently respond to OAL's disapproval:

- Clarifying Appropriate Scope of Underlying Data: CARB has endeavored to define certain terms that OAL determined were vague, such as "satellite-based empirical estimates of land cover change" and "empirical data on biomass feedstock yields." However, these revisions do not provide further clarity on which estimates, datasets, and peer-reviewed research articles or reports the Executive Officer would utilize in making a LUC determination. There is significant debate in the scientific community about the proper methods of measuring land use change in general, and as related to renewable fuels programs in particular. As such, the EO must have clear guidance on what resources to utilize. WSPA urges CARB to rely on the most recently available data in making LUC determinations. In addition, WSPA urges CARB to allow for stakeholder feedback on these resources by making information the EO is proposing to rely upon publicly available and providing for a public notice and comment period. This approach would better align with CARB's typical process for soliciting feedback on data informing its various assumptions about fuels, feedstocks, and pathway applications.
- Public Oversight Mechanism: OAL's disapproval expressed concern that CARB did not
 address several comments related to the LUC revisions, including CARB's failure to provide a
 mechanism for public oversight and involvement. Rather than address this concern, CARB's
 proposed revisions have only further solidified the sole discretion in the hands of the EO.
- **Novel Pathways**: WSPA members are concerned by the language in §95488.3(d), which now states that the Executive Officer "shall calculate a conservative LUC value" for pathways not represented in Table 6. Applying a conservative LUC factor for novel pathways without any stated cap or percentage in addition to the calculated score may lead to inaccurate or unrepresentative LUC determinations for these pathways. Additionally, CARB's proposed revisions remove any ability for the fuel applicant to participate or provide feedback in determining LUC scores. WSPA recommends that CARB clarify what a conservative LUC score would be relative to a non-conservative score to ensure there is not an excessive CI burden placed on novel pathways. In addition, WSPA requests that the biomass sustainability requirements guidance document be updated shortly following publication of the final LCFS regulation to clarify the iterative relationship between CARB staff and novel fuel pathway applicants to ensure that a fair and accurate LUC calculation process is undertaken.

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Page **5** of **6**

038.17

Scope of Determinations: CARB's proposed revisions do not specify whether the new LUC value established by the EO would be specific to an individual fuel pathway applicant or if it would be added to the table such that other fuel pathway applicants may take advantage of the new LUC value, should it meet their needs. WSPA is concerned that this lack of clarity will cause future implementation challenges.

038.18

- **Timing of Determinations**: Given the complexity of calculating LUC scores, there is a real concern that there may be an excessive delay to arrive at a LUC determination. WSPA recommends that CARB include a timing component to the LUC calculations.
- 5. CARB Must Ensure That the LCFS Revisions Accurately Account for Hydrogen Production CI Scores.

038.19

WSPA had previously expressed concerns that the second proposed 15-day amendments would effectively ban LCFS from crediting hydrogen produced using fossil natural gas as a feedstock and assign any volumes of such hydrogen the default ultra-low sulfur diesel (ULSD) CI beginning in 2031. This constraint ran counter to CARB's 2022 Scoping Plan Update, as hydrogen must play a critical role in achieving California's ambitious carbon neutrality by 2045 goal. Yet the third 15day amendments retain the proposed use of the ULSD CI factor regardless of technological advancements that reduce the CI of fossil-based hydrogen: §95482(h) would require qualifying hydrogen beginning in 2030 to be from 80% renewables, hydrogen with carbon capture, utilization and sequestration technology, or a combination thereof (increasing to 100% in 2035) – or be assigned a ULSD CI from Table 7-1. Replacing a calculated hydrogen CI with the ULSD CI lacks a scientific basis and arbitrarily penalizes fossil-based hydrogen, foregoing potential GHG emissions reductions. Similarly, CARB's proposal to apply an Energy Economy Ratio (EER) value of "1" for hydrogen technologies that go into fuel cells that have an EER value greater than 1 artificially gives preferential treatment to certain technologies. Traditional hydrogen is projected to become a deficit generator under these proposed revisions, even though it represents a lowercarbon alternative to ULSD. By constraining production eligibility, CARB is failing to achieve the "maximum technologically feasible and cost-effective greenhouse gas emission reductions" in accordance with HSC §38560. A technology-neutral approach would better align with CARB's rulemaking obligations under Gov. Code §11346.2(b)(4)(A), which requires CARB to consider performance standards as an alternative to mandating the use of specific technologies or equipment, or prescribing specific actions or procedures. Rather than artificially lowering the Cl score of traditional hydrogen or prescribing specific technologies for participation, the LCFS should continue to allow hydrogen to participate based on a calculated, science-based CI score.

6. CARB Should Clarify the Role of the Margin of Safety in Assessing Credit True Ups.

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CARB is proposing to revise §95488.10(b) to remove the Executive Officer's discretionary authority to perform credit true ups after an annual verification, and instead base credit true ups on "the previously certified CI, including any margin of safety, that was used for credit generation during the compliance year." This language is ambiguous and unclear. WSPA requests that CARB clarify whether the "margin of safety" newly referenced is meant to mean that a regulated entity must first exceed that margin and then only receives credit above that, or if that newly referenced margin is part of the difference that would be awarded – and provide example scenarios for regulated entities.

7. The Program Revisions Should Exempt Aviation Gasoline.

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WSPA urges CARB to revise §95482(c)(2) to exempt both jet fuel and aviation gasoline, rather than just jet fuel. CARB previously proposed to include intrastate jet fuel in the revised regulations, but later removed this provision. At that time, staff informed WSPA that "aviation"

Page 6 of 6

- 038.21 cont.
- gasoline" should *not* be stricken from this exemption. Consistent with this interpretation, WSPA requests that aviation gasoline be expressly listed as an exempted fuel. Currently, the rule defines "aviation gasoline" in §95481 but does not make use of that definition.
- Stakeholders Should Be Notified of Certification System Modification, Revocation, or Approval.
- Section 95488.9(g)(8)(K) states that affected certification systems will be notified within seven days of modification, revocation, or approval. WSPA requests that regulated entities are also notified of changes to a certification system's status within a timely manner.
 - 9. Specified Sourced Feedstocks Not Intentionally Produced.
- CARB should exempt Distiller's Corn Oil (DCO) from the reference in §95488.8(g)(1)(D)(3)(e), because DCO is a co-product of an ethanol plant, so it could be construed as "intentionally produced."

WSPA appreciates the opportunity to provide these comments.

Sincerely,

Tanya DeRivi

Senior Director, California Climate and Fuels



April 21, 2025

VIA ELECTRONIC FILING

Ms. Rajinder Sahota Deputy Executive Officer - Climate Change & Research California Air Resources Board 1001 | Street Sacramento, Ca 95814

Re: Neste Comments on Proposed Low Carbon Fuel Standard (LCFS) Regulation Published on April 4, 2025

Dear Ms. Sahota:

Neste appreciates the opportunity to provide these comments to the California Air Resources Board (CARB) regarding the draft LCFS regulation 15-day package published on April 4, 2025. These comments are in addition to the comments submitted by Neste for the 45-day regulatory package¹, the April 10, 2024 LCFS Workshop², the August 12, 2024 15-day package³, the recirculated EIR⁴ and the October 1, 2024 15-day package⁵, and all of our recommendations should be considered as part of this LCFS rulemaking.

Neste appreciates the work that has been done on this rulemaking and remains in strong support of the LCFS program. The LCFS program has an outstanding record of success in reducing emissions from the transportation sector in the state of California. The new proposed targets will ensure that the program continues to attract high levels of investments in renewable energy. We urge the rule's adoption as soon as possible and we support the rule becoming effective <u>January 1, 2025</u> to shore up the LCFS credit market and overall investments in renewable energy. Neste also appreciates CARB's efforts to address in a timely manner concerns raised by the California Office of Administrative Law (OAL)⁶.

For consideration for improvement, we raise concern with the new proposal to effectively end new biodiesel (BD) and renewable diesel (RD) pathway applications under Section 95488(d). This new proposal introduces uncertainty that will impact investment decisions in new, long-term innovations such as the development of new feedstocks and energy efficient operations. It also brings uncertainty to existing pathway holders renewing or updating an existing pathway. Uncertainty impacts production decisions or investments in not only RD but also SAF. Additionally, this proposal essentially favors those that use older technologies and not those that produce the lowest cost fuel. This can lead to potentially higher costs for the California consumer. Neste recommends that CARB reprioritize technology neutrality to ensure that California consumers receive renewable energy at the lowest cost possible and the lowest CI.

Below is a detailed discussion of the analysis presented in this April 2025 15-day package. Neste also supports the comments from the Low Carbon Fuels Coalition (LCFC) and ICF on this rulemaking. We appreciate your consideration.

3040 Post Oak Blvd, Suite 1700, Houston, TX 77056

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¹ https://www.arb.ca.gov/lists/com-attach/6974-lcfs2024-B2IUN1YkACcLaARb.pdf

² https://ww2.arb.ca.gov/form/public-comments/submissions/11066

³ https://www.arb.ca.gov/lists/com-attach/7564-lcfs2024-AG4HZFUnACcGZQNc.pdf

⁴ https://www.arb.ca.gov/lists/com-attach/16-eiarecirc_lcfs2024-WjRUN10vUnULaAlW.pdf

⁵ https://www.arb.ca.gov/lists/com-attach/88-lcfs2024-2nd15day-AmwAY1wuBSIHZFUK.pdf

⁶ https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/disapproval_decision.pdf

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Reject the Proposal to Stop Accepting New RD Pathway Applications (95488(d))

Neste opposes the proposal to stop accepting new pathway applications for biomass-based diesel starting in 2031 if certain ZEV mandates are met in 2029 (95488(d)). This proposal is arbitrary and brings uncertainty to the RD market precisely when companies are evaluating further investments, for example in SAF production. Given the interconnectivity between the economics of SAF and RD, this proposal could discourage SAF development in the long-term.

This provision also creates uncertainty for those with existing BD or RD pathways (and SAF pathways). It is unclear how CARB will handle existing pathways that are being renewed and/or updated to account for new calculation methodologies and/or renewable fuel production changes. Fuel production changes could be as simple as changes in feedstock sourcing and, if this proposal is adopted, it is unclear if CARB will deem these as new fuel pathways. It is also unclear if changes in ownership would result in existing pathways being deemed new fuel pathways.

Given the lack of clarity on how this new provision will apply to existing BD/RD pathways and the uncertainty it creates for future SAF production, Neste therefore recommends that CARB reject this proposed provision.

Proposed Land Use Change (LUC) Methodologies in 95488.3(d) are an Opportunity to Drive Innovation

Neste appreciates CARB clarifying in section 95488.3(d)(2) how it will determine LUC values for regions/biomass/fuel combinations not currently contemplated in Table 6 of the LCFS regulation. Neste supports the use of best available and peer reviewed data to ensure LUC is accurately accounted for, especially for innovative feedstocks that apply climate smart agricultural (CSA) practices. By accurately evaluating LUC for innovative feedstocks CARB will help drive production of renewable energy such as SAF, while also addressing concerns with deforestation and most other concerns with crop-based feedstocks. Neste looks forward to CARB applying the best available data on LUC values developed in the future.

Neste is concerned by the changes to section 95488.3(d)(1) that now seem to make LUC evaluations apply to all biomass-feedstocks and not just to crop-based feedstocks. This is a new change that is outside the scope of the concerns raised by OAL, as OAL's only issue was that section 95488.3(d)(2) did not state the methodologies that will be used to evaluate LUC. This proposed change to 95488.3(d)(1) also goes against all scientific research regarding LUC, including CARB's own 2015 research⁷, that have all concluded that only crop-based feedstocks result in LUC. Neste therefore recommends that CARB remove its proposed change to 95488.3(d) as it pertains to which feedstocks are subject to LUC evaluations.

General Recommendations:

Neste makes the following general comments that apply to more administrative requirements in the LCFS regulation:

- 1. Transition to CA-GREET 4.0 (95488(c)): Neste supports the proposal to begin use of the CA-GREET 4.0 model with the 2025 Annual Fuel Pathway Report.
- 2. Sustainability Certification System Approval/Disapproval (95488.9(g)): Neste appreciates CARB adding clarity as to how sustainability certification systems will be approved for use. Should a certification system be disapproved, Neste appreciates knowing how that will be managed.

¹ https://ww3.arb.ca.gov/fuels/lcfs/iluc_assessment/iluc_analysis.pdf

April 21, 2025

Thank you for considering our comments. We look forward to continuing to work with CARB on this rulemaking and urge its adoption as soon as possible.

Oscar Garcia

Sr. Regulatory Affairs Manager

Oscan A

Neste US, Inc.



900 7th St. NW, Suite 820 Washington, D.C. 20001 Ph: (605) 965-2200 **poet.com**

April 21, 2025

Clerk of the Board California Air Resources Board P.O. Box 2815 Sacramento, CA 95812

Submitted electronically via: https://ww2.arb.ca.gov/applications/public-comments

RE: POET COMMENTS ON APRIL 4, 2025 REVISIONS TO PROPOSED LOW CARBON FUEL STANDARD AMENDMENTS

Dear CARB Members:

POET appreciates the opportunity to provide comments on the California Air Resources Board's ("CARB") April 4, 2025 Revisions to its Proposed Low Carbon Fuel Standard ("LCFS") Amendments ("Third Revised Proposed Amendments"). POET has participated actively in CARB's ongoing rulemaking and submitted detailed <u>comments</u> on its own behalf and as part of a <u>coalition</u> on February 20, 2024, regarding the Amendments initially proposed in December 2023 ("Original Proposed Amendments"). POET also attended the LCFS rulemaking workshop held on April 10, 2024, and submitted written <u>comments</u> regarding the matters discussed and presented during the workshop. POET also offered <u>comments</u> in response to CARB's August 12, 2024 Revised Proposed Amendments and <u>commented</u> on CARB's October 1, 2024 Second Revised Proposed Amendments.

POET remains opposed to CARB's biofuel-related amendments, which abandon technology-neutrality in the LCFS program, cut off practical pathways to decarbonization, impose needless and costly burdens on biofuel production, and undermine the primary objectives of both the LCFS and California's Global Warming Solutions Act ("AB 32").

Although we continue to hold and assert the views expressed in our prior comments, we write separately here to address specific legal and administrative problems presented by the breadth and ambiguity of CARB's "sustainability" related amendments, which suffer from the same defects identified by the State of California's Office of Administrative Law ("OAL") in its Decision of Disapproval of Regulatory Action dated February 25, 2025 ("Disapproval Decision").² In its

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¹ California Global Warming Solutions Act, Cal. Health & Safety Code § 38500-38599.

² OAL Decision of Disapproval of Regulatory Action, OAL Matter No. 2025-0103-01S at 2, https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/disapproval decision.pdf

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Disapproval Decision, OAL determined that CARB had violated the California Administrative Procedure Act's clarity standard in several respects. OAL explained that "the meaning of regulations [must] be easily understood by those persons directly affected by them," and directed CARB to correct twenty-six instances in which the Proposed Amendments failed to meet this requirement.

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Although CARB has now acted to address the specific issues named in the Disapproval Decision, the agency has left in place fundamentally ambiguous language at the heart of its proposed "Sustainability Requirements," creating costly risks and uncertainties for "directly affected" stakeholders like POET. Compounding matters, CARB's lengthy rulemaking process, which remains incomplete, has compressed the time period for compliance with the Proposed Amendments, which still feature implementation deadlines starting in January 2026. This leaves biofuel producers facing new and uncertain feedstock certification requirements applicable within mere months of the effective date of the regulations, should OAL now approve them.

POET again urges CARB to refrain from adopting its proposed sustainability requirements and to instead address the issue of feedstock sustainability in a future rulemaking. In the alternative, POET urges CARB to clarify the standards it intends to impose and to postpone the proposed implementation dates for feedstock sustainability requirements.

1. CARB Should Eliminate the Impermissibly Vague Requirement That "Biomass Must Be Cultivated and Harvested in Accordance with All Local, State, and Federal Rules and Permits."

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Beginning in 2026, CARB's Sustainability Requirements for biomass-based fuel pathways require an attestation from biofuel producers guaranteeing that the feedstocks used to produce their fuel were "cultivated and harvested in accordance with all local, State, and federal rules and permits." On its face, the scope of this attestation is incredibly broad and could be construed to mean that biofuel producers must guarantee to CARB that the farmers who grow their feedstocks have not deviated from *any law in any way*. A requirement of that breadth and reach is not rationally related to CARB's intended goal of ensuring that biofuel feedstocks are grown sustainably. Furthermore, it is impossible to know what type of due diligence activities CARB expects biofuel producers to engage in to determine whether the farmers from whom they source their feedstocks have followed "all local, State, and federal rules and permits" that may apply to the seeds, fertilizers, labor, equipment, fuel, and other supplies and activities required to cultivate and harvest their crops. Without knowing what specific legal requirements CARB has in mind, and without knowing whether and to what extent CARB intends to require on-farm compliance

³ *Id*. at 3.

⁴ §95488.9(g)(5)(C).

audits, the meaning of CARB's regulatory language is not "easily understood" and therefore fails to comply with the California APA's clarity standard.

2. CARB Should Clarify or Eliminate the Impermissibly Vague Requirement that Biomass-Based Feedstocks Be Produced Under the "Best Environmental Management Practices"

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Beginning in 2028, biofuel producers are required to source feedstocks "produced according to best environmental management practices that reduce GHG emissions or increase GHG sequestration." But CARB does not clearly define this requirement. Despite feedback from various stakeholders across multiple rounds of comments that the term "best environmental management practices" is too vague and does not allow biofuel producers to understand and plan for compliance, the Third Revised Proposed Amendments continue to offer only *examples* of such practices, and not a clear set of rules. And those examples, which "include *but are not limited to*" "[m]aintain[ing] or enhance[ing] biodiversity habitat on agricultural or forested lands," "[e]nhanc[ing] soil fertility and avoid[ing] erosion or compaction," "[a]pply[ing] fertilizers in a manner that minimizes runoff, and soil and water contamination," and [r]educ[ing] unsustainable water use, and minimize[ing] diffuse and localized pollution from chemical residues, fertilizers, soil erosion, or other sources of ground and surface water contamination," are themselves too vague to offer clear guidance regarding how those "directly affected" by the regulation are obliged to follow it. This language too, therefore, fails the California APA's clarity standard.

3. CARB Should Postpone the Implementation Dates for Feedstock Sustainability Requirements

040.5

Given the protracted length of this rulemaking, which began with proposed new regulatory language in December 2023, and the delays occasioned by OAL's February 18, 2025 rejection of CARB's Proposed Amendments, CARB should postpone the implementation dates for feedstock sustainability requirements which are currently slated to begin in 2026, leaving stakeholders mere months to prepare for compliance with new and ambiguously defined rules that represent a complex and onerous paradigm shift in California's LCFS program.

⁵ §95488.9(g)(3).

⁶ *Id.* (emphasis added).

* * *

POET appreciates the opportunity to comment and looks forward to working with CARB to make the LCFS a continued success for California. If you have any questions, please contact me at Josh.Wilson@POET.com or (202) 756-5612.

Sincerely,

Joshua P. Wilson

WPM

Senior Regulatory Counsel



IETA Comments on CARB's Third 15-Day Proposed Changes to the LCFS Regulation

21 April 2025

The <u>International Emissions Trading Association</u> (IETA) appreciates the opportunity to comment on the California Air Resources Board's (CARB) recently released <u>Third Notice of Public Availability of Modified Text and Availability of Additional Documents and Information</u> for the Low Carbon Fuel Standard (LCFS).

IETA believes the LCFS is a key strategy in California's suite of greenhouse gas **(GHG)** focused reduction measures and supports its approval by the Office of Administrative Law **(OAL)**. Since the LCFS program's implementation in 2011, California's LCFS has proven to be a successful market-based policy that drives investments in lower-carbon emission fuels while delivering millions of tonnes of GHG reductions. The LCFS, reflecting the proposed amendments, is a model for effective policy building on the program's history of success to reduce emissions because it: 1) sets clear, science-based targets; 2) establishes clear regulations for program implementation; and 3) provides the market with clear and consistent signals that support innovation and drive down costs.

The OAL's recent administrative disapproval of certain proposed amendments to strengthen the program has unfortunately delayed implementation of critical program amendments. IETA would like to underscore the importance of concluding the LCFS rulemaking as soon as possible. Further delay diminishes the necessary signal the market needs to facilitate and encourage continued investments in clean fuels. IETA strongly encourages CARB to swiftly address the concerns laid out in the disapproval, consider stakeholder feedback, resubmit the package to OAL, and ultimately begin prompt implementation of the new amendments.

Thank you to the staff for their hard work and for this opportunity to comment.

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VIA ELECTRONIC POSTING

https://ww2.arb.ca.gov/lispub/comm/bclist.php Comment List: lcfs2024

April 21, 2025

Clerk of the Board California Air Resources Board 1001 | Street Sacramento CA, 95814

Dear Chair Randolph and Board Members:

Kern Energy (Kern) appreciates the opportunity to provide comments on the California Air Resources Board's (CARB) proposed amendments to the Low Carbon Fuel Standard (LCFS) regulation released on April 4, 2025. Kern again urges CARB to reconsider the addition of subsection 95482(h), which imposes restrictions to hydrogen crediting, in favor of a more comprehensive, inclusive approach to ensure the state can meet the hydrogen needs of a clean energy future.

Kern Energy is an independent, family-owned and operated transportation fuel producer located in the Southern San Joaquin Valley that has proudly fueled California for 90 years. Kern is the only refiner between the major refining complexes in the Bay Area and Los Angeles producing both gasoline and diesel. At a capacity of 26,000 barrels per day, Kern serves as a critical fuel supplier, reliably supplying the needs of the agricultural breadbasket and major transportation corridors of the state. As a renewable fuel pioneer, Kern embraced the challenge presented by California's LCFS and the federal Renewable Fuel Standard, becoming just the second refinery in the U.S. to produce renewable diesel by co-processing bio-feed and the first small refiner in California to blend biodiesel.

Kern has been an active participant in the development and evolution of the LCFS since program inception, actively engaging in the policy-making process and reliably serving the California market as a provider of liquid transportation fuels. Kern appreciates CARB staff's work throughout the rulemaking process and continues to urge CARB that any LCFS changes support logical and attainable CI reduction targets while continuing to incentivize fuel producers, like Kern, to ensure the reliable delivery of cleaner and lower carbon transportation fuels to our communities.

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In earlier rulemaking packages, staff proposed to add a new subsection 95482(h) to remove LCFS credit generation eligibility for hydrogen produced using fossil gas as a feedstock.

Staff is now proposing edits that would allow for hydrogen produced with accompanying carbon capture and sequestration (CCS) to count as renewable hydrogen. Kern appreciates this newly incorporated recognition of the benefits and strategic importance of layering CCS in hydrogen production to achieve climate goals. Nonetheless, these new provisions do not go far enough and continue to pick winners and losers (e.g., other fossil fuel-based hydrogen production) rather than allowing space for innovation and inclusive solutions.

CARB has consistently acknowledged the need for advanced technologies and a broad portfolio of fuels to meet the state's climate goals, so it is imperative that policy and associated regulatory frameworks remain technology-neutral and open to emerging innovation. The elimination of crediting for fossil hydrogen produced without CCS is short-sighted and stifles innovation by eliminating other technological advancements before they can be realized. California cannot rely on the forecasted operational timeline for projects funded under the hydrogen hubs grants to meet hydrogen demand post-2030, particularly while uncertainty looms over the future of federal funding.

The production of fossil hydrogen with other advanced technologies that reduce carbon intensity should be seen as a positive contribution to expanding the supply of low-carbon hydrogen in California. Refineries co-produce hydrogen within the process of naphtha reforming. This co-produced hydrogen can be separated from other refinery gases and used to produce energy without producing any additional emissions. The co-production of hydrogen from naphtha reforming is distinct from other hydrogen production processes, such as steam methane reforming (SMR), which specifically targets hydrogen as the main product of the process. Co-produced hydrogen would have no associated greenhouse gas emissions as the carbon intensity would be allocated to the reformed naphtha used to produce gasoline.

Kern is actively working on an advanced technology that would capture this co-produced hydrogen for use in on-site fuel cells to produce low-CI electricity. Preserving crediting opportunities within LCFS would maintain the option of dispensing co-produced low-CI hydrogen as a transportation fuel. Imposing barriers and prohibitions to the mobilization of existing industry and infrastructure only serves to hamper the development of key solutions and discourage contributors focused on improving our shared climate improvement goals. Kern again urges CARB to eliminate this new subsection before final approval of LCFS amendments.

Kern Energy April 21, 2025 Page 3 of 3

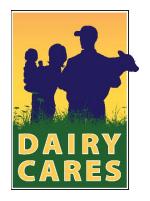
In conclusion, Kern appreciates CARB's consideration of Kern's comments. As always, Kern is committed to working with staff throughout this regulatory process. Please do not hesitate to reach out to me at (661) 845-0761 with any questions.

Sincerely,

Melinda Palmer

VP – Regulatory & Public Affairs

Kern Energy



Dairy Cares Comments on the Proposed Low Carbon Fuel Standard Amendments (Third Set of 15-Day Changes)

April 21, 2025

Dairy Cares¹ appreciates the opportunity to provide these comments on the third notice of public availability of modified text and availability of additional documents and/or information pertaining to the California Air Resources Board's ("CARB") proposed Low Carbon Fuel Standard ("LCFS") amendments. Dairy Cares represents the California dairy sector, including dairy producer organizations, leading cooperatives, and major dairy processors.

Dairy Cares generally supports CARB's Third Set of 15-day Changes which respond to the Office of Administrative Laws ("OAL") Decision of Deficiency. We appreciate CARB's thoughtful responses to the OAL to ensure this rulemaking process timely concludes. In that vein, we urge CARB to respond continual stakeholder commentary throughout the rulemaking emphasizing the need for regulatory resolution as soon as feasibly possible. For example, the Final Statement of Reasons responds to significant stakeholder support in the efficient resolution of the rulemaking process. CARB should seek to implement the LCFS amendments effective January 1, 2025. This is necessary to respond to LCFS credit market instability due to the "record amount of renewable energy generating significantly more credits than are required to offset deficits created by the currently outdated CI targets," and the need to "send clear and stable market signals," to name a few.²

OAL's comments on the rulemaking package, and CARB's 15-day changes, are relatively narrow in scope and mostly non-substantive. We encourage CARB to efficiently review public comments and promptly submit its revised rulemaking package to OAL as soon as possible. CARB should encourage OAL to complete its review and file the regulations with the Secretary of State to ensure an effective date before the end of the reporting period for the first quarter of 2025.³

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¹ For more information about Dairy Cares, please visit <u>www.dairycares.com</u>.

² Final Statement of Reasonings for Rulemaking, Appendix A – Summary of Comments and Agency Response, Section S-1, pp. 540-551, <u>Link</u>.

³ California Government Code Section 11343.4(a)(3).



April 21, 2025

Rajinder Sahota California Air Resources Board 1001 | Street Sacramento, CA 95814

RE: AMP AMERICAS COMMENTS ON THE THIRD 15-DAY CHANGES TO THE LOW CARBON FUEL STANDARD REGULATION

Dear Ms. Sahota:

Thank you for the opportunity to comment on the Third Proposed 15-Day Changes to the Low Carbon Fuel Standard ("LCFS"). Amp Americas ("Amp") strongly supports the LCFS and rapid finalization and implementation of the adopted amendments. We appreciate the California Air Resource Board's ("CARB's") leadership on this program, quick release of these proposed minor changes for public comment, and ongoing work to rapidly finalize amendments so that the market for low carbon fuels can continue to move forward in California.

ABOUT AMP

Founded in 2011, Amp develops, owns, and operates renewable natural gas ("RNG") facilities that convert dairy waste into renewable energy. Over our history, Amp's projects have prevented over 2 million metric tons of carbon equivalent emissions, and we plan to rapidly expand our impact over the next several years.

As a pioneer in the dairy RNG industry, Amp registered the first 5 dairy RNG-to-CNG pathways in California's LCFS program, and we were the RNG supplier for the first 11 dairy RNG-to-hydrogen pathways. Our experience developing, operating, and reporting on these and other assets gives us a unique perspective on the impact CARB policy has on investment and project development activity related to low carbon fuels. Our projects and resulting methane and carbon dioxide reductions have been made possible by CARB's leadership in decarbonizing transportation, and we encourage CARB to continue to support the technology-neutral, performance-based policy framework that has made the LCFS so unique and successful.

RAPID FINALIZATION OF REGULATION SHOULD ENABLE RULE TO APPLY TO Q1 REPORTING

We strongly support CARB and the Office of Administrative Law ("OAL") finalizing this package as soon as possible to provide clarity to the market and clean fuels investors. Provided that CARB and OAL finalize the rule before Q1 reporting is due, we anticipate the step down in 2025 stringency and new benchmarks would apply to Q1 reporting. We strongly support the rapid finalization of this rulemaking process to enable this outcome and bolster the market for clean fuels. We support comments from the RNG Coalition and agree that all stakeholders have received adequate notice and are prepared to implement the amendments as soon as they are finalized through OAL.

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INVESTMENT CERTAINTY NEEDED TO SUPPORT INVESTMENTS IN LOW CARBON FUELS

We strongly support the LCFS program, which has been critical in advancing a wide array of climate and environmental priorities for California, including reducing methane from dairies. While we remain concerned about the program's evolution away from its successful technology-neutral, performance-based framework – including through artificial limitations on avoided methane crediting and book-and-claim accounting for biomethane – we are generally supportive of the amendments adopted at the November 8, 2024 Board Meeting and the minor adjustments reflected in the 3rd 15-Day Changes. At this point, the most important thing to support California's clean fuels market is to rapidly finalize and implement the proposed amendments, in order to provide certainty to the market and allow ongoing investment to support California's clean transportation objectives.

SPECIFIC COMMENTS ON THE 3RD 15-DAY CHANGES

We appreciate CARB releasing the minor proposed adjustments to the rule via a 3rd 15-Day Change package, and offer the following comments on some of the changes:

- We appreciate and support clarification around timing and use of the CA-GREET4.0 model and associated Tier 1 CI Calculators.
 - As we have previously stated, we support efforts to expand carbon capture and sequestration (CCS) in California and the role of the technology in California's climate change policies. We support clarification around the renewable hydrogen provisions, including that biomethane and other renewable pathways should apply to non-CCS hydrogen pathways. We urge CARB to work through implementation to ensure biomethane is utilized in relevant hydrogen pathways (e.g., steam methane reformation processes) to ensure these goals are met and California advances its renewable hydrogen goals.
- We support added clarification proposed on key elements of the program, including changing provisions related to avoided methane crediting and credit true up from "may" to "shall."
 - We appreciate the addition of a definition of "Break ground" to add additional clarity to the rule.

MAINTAINING IMPLEMENTATION DISCRETION IS CRITICAL

We appreciate OAL's efforts to ensure clarity of the regulations, as well as CARB's rapid and thoughtful response. However, we note that with a market-wide policy like the LCFS, where innovation is taking place all the time and new and unforeseen variables arising, it is critical that CARB maintain discretion in implementing the program moving forward. While some of the clarifying changes limit some implementation flexibility, we urge CARB to continue proactive stakeholder outreach throughout the implementation process, providing ongoing market guidance as appropriate, and exercising discretion in implementation and enforcement of the rule to ensure that the rules remain clear and to avoid unintended or unnecessary burdens on project developers that do not advance the program's objectives. Ongoing stakeholder engagement and timely guidance on implementation issues remains essential to ensuring proper compliance planning, accurate credit generation, and maintain market certainty for regulated parties.



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For example, we note that the 3rd 15-Day Changes removes text related to updates to Tier 1 Calculators, as that text is deemed unnecessary. We support that change and agree it is unnecessary, however that does not mean that CARB should not retain the ability to update Tier 1 calculators through a deliberate public process, should there be good rationale for doing so. We would appreciate future guidance on this point, describing how Tier 1 calculators will be updated moving forward, and we look forward to continuing to work with CARB on this and other provisions, to ensure the program is implemented in the most streamlined and effective manner possible.

MAINTAINING TECHNOLOGY NEUTRALITY WILL BE CRITICAL

Amp looks forward to continuing to work with CARB and stakeholders to bolster the program and its unique, powerful, technology-neutral and performance-based approach. In particular, as we have detailed in our previous comments throughout this process, the following items are especially to critical to ensuring an even playing field for all low carbon fuels and thereby increasing competition, reducing costs, and accelerating emissions reductions. We look forward to continuing to work on these issues with CARB and stakeholders once the current amendments are finalized:

- Maintain avoided methane crediting for dairy digester and other biomethane projects,
- Maintain book-and-claim accounting for biogas and avoid arbitrarily restricting market opportunities for methane reductions,
- Enable biogas-to-electricity pathways, including pathways utilizing non-fuel cell technology,
- Ensure streamlined reporting requirements that align with other state and federal reporting requirements wherever possible, and
- Maintain discretion and implementation flexibility to account for unique attributes of various fuel pathways, and avoid unnecessarily penalizing investors acting in good faith.

Thank you again for the opportunity to comment on the 3rd 15-Day Changes and your work to rapidly finalize and implement these critical regulatory amendments. We look forward to continuing to support California low carbon fuels goals, and working with CARB and stakeholders an on ongoing basis to ensure the LCFS remains a durable driver of investment in the clean fuels projects for California.

Sincerely,

Cassandra Farrant

Head of Environmental Credit Compliance

Cassandra Farrant

Amp Americas



World Energy

www.worldenergy.net

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- (ii) @World Energy LLC
- @@officialworldenergy
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PARAMOUNT FACILITY Alt Air Paramount, LLC

14700 Downey Avenue Paramount, CA 90723 p: 562.531.2060 (main) e: info@worldenergy.net

045.1

April 21, 2025

Rajinder Sahota Deputy Executive Officer for Climate Change & Research California Air Resources Board 1001 | Street Sacramento, CA 95814

RE: World Energy's Comments on the Third 15-Day Changes for the Low Carbon Fuel Standard

Dear Ms. Sahota and CARB Staff,

World Energy appreciates the opportunity to provide comments on the Third 15-Day Changes for the Low Carbon Fuel Standard (LCFS). We would like to thank CARB staff for their ongoing work throughout the rulemaking process, and the swift turnaround to address the Office of Administrative Law's concerns regarding the rulemaking package submitted in January 2025. World Energy is supportive of CARB's forward progress in finalizing the LCFS rulemaking. An expeditious resubmission to OAL is crucial to grant long-awaited market clarity to LCFS participants.

World Energy is one of the largest and longest-serving advanced clean energy suppliers in North America. We were the world's first producer of sustainable aviation fuel (SAF) and remain leaders in the field of renewable fuels. Our facility in Paramount, CA is in the final stages of conversion from a petroleum refinery to a 100% renewable fuels bio-refinery. When completed, World Energy's Paramount facility is projected to increase production capacity to approximately 350 million gallons of low carbon fuels (primarily SAF) per year.



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The LCFS plays a major role in driving investments in the low carbon fuel market. The stringent, long-term signals are crucial to developing technologies and low carbon fuels, including World Energy's SAF. These investments support further developments and innovations for additional carbon intensity (CI) reductions. The LCFS is a technology neutral, cost-effective approach to reducing the GHG emissions from transportation, and pursuing the cleanest fuels possible for off-road uses, like aviation.

We continue to support the 2025 CI benchmark as previously proposed in the January 2025 rulemaking package, § 95484(d) through (f). We hope to see the adoption and finalization of this rulemaking as soon as possible so that the anticipated reductions from the amendments can be captured. The completion of this rulemaking will provide LCFS participants with long-term certainty needed to invest in new technologies and right-size the currently overflowing credit bank to ensure the program remains an effective driver of emissions reductions in California's transportation sector.

Thank you for the opportunity to provide comments.

Sincerely,

Scott Lewis

President, World Energy Net-Zero Services



April 21, 2025

Chair Liane Randolph & Members of the Board California Air Resources Board 1001 I Street, Sacramento, CA 95814

Via Electronic Submission

Re: Third 15-Day Changes to the Proposed LCFS Regulation Order

Dear Chair Randolph and Members of the California Air Resources Board:

The Biodiesel Coalition of Missouri (BCM) appreciates the opportunity to comment on the proposed modifications (Third 15-Day Changes) to the Low Carbon Fuel Standard (LCFS) program. BCM has welcomed engagement with the California Air Resources Board (CARB) and staff throughout this multi-year process to update the LCFS program.

The Biodiesel Coalition of Missouri is an organization dedicated to the commercial success of biodiesel. We have five biodiesel plant members in Missouri, some of whom have sold biodiesel in the California market. We also have Missouri farmers, fuel suppliers and industry stakeholders as members of our organization. Missouri is home to four (4) soybean processing facilities co-located with biodiesel plants. Missouri's soybean farmers provide critical feedstock to our members, allowing the biodiesel plants, soybean processing facilities and farmers to be deeply united in the effort to enhance markets for soy-based biodiesel.

CARB's Third 15-Day Changes to revise the LCFS did not address our major concerns with provisions included in the final amendments approved by CARB. In addition to the new proposals in the Third 15-Day Changes package, BCM is deeply concerned with the drastic and inequitable pivot CARB has made related to agricultural feedstocks used for biofuels. BCM continues to encourage that updates to the LCFS program are based on up-to-date and sound science, as required by AB-32. Outlined below are our concerns and proposed solutions that will enable CARB to meet its climate goals, protect the environment and all Californians, while also supporting biodiesel plants in the United States, and the farmers and processors who are investing in the future of low-carbon energy.

Serious Feedstock Cap Concerns and Proposed Solutions

BCM has significant concerns with the vegetable oil feedstock cap that was included in the initial 15-Day Changes posted in August 2024. The current proposal restricts the amount of soybean oil, canola oil and sunflower seed oil that is allowed to generate credits in the



program at an inequitable 20% by company. CARB's own data demonstrates vegetable oil feedstocks, including soy, have consistently exceeded the proposed cap since 2021.

Capping these proven, sustainable, and scalable feedstocks would suppress the supply of biodiesel, increase reliance on fossil fuels, and raise fuel prices for California consumers. Even CARB staff acknowledged in the April 2024 workshop that a cap would reduce air quality benefits and likely increase NOx and PM2.5 emissions. All of this, including the recent tariffs on imported feedstocks greatly increase costs and further substantiate U.S. based feedstocks as the clear-cut choice. BCM urges CARB to remove the cap on U.S. based vegetable oil feedstocks to provide a more economically feasible, locally produced and sustainable, climate smart option for the people and the planet.

Agricultural feedstocks for biofuel production are already held to a high standard for participation in the U.S. Renewable Fuel Standard (RFS). Rather than adding sustainable U.S. based feedstocks to its arbitrary proposed cap, CARB needs to update carbon intensity analysis and oversight of imported feedstocks, which are not held to the same level of accountability. Recent actions by the European Union in response to fraudulent Chinese biodiesel imports underscore this concern¹. The EU committee recently met at the request of a member state to discuss alleged fraud in biodiesel imports from China. Fraud continues to be an issue with imported feedstocks and needs to be addressed further. BCM strongly encourages CARB to adopt enforceable traceability and verification standards, including origin disclosures, documentation audits, and physical testing. Without implementing sustainable solutions to the above and not eliminating a cap on U.S. vegetable oil feedstock, CARB is essentially putting the feedstocks from foreign countries (i.e., China) above those of the United States.

Sustainability Guardrails and Traceability Concerns

BCM remains very concerned about the sustainability guardrails. The sustainability guardrails are more onerous than the specified source requirements used for non-U.S. waste feedstock imports. Palm oil in Southeast Asia has had forced labor concerns², but CARB does not require used cooking oil derived from palm to track social or economic sustainability. Concerningly, petroleum does have to track these criteria. CARB's proposal makes it administratively easier to use non-sustainable petroleum³ in the state than biofuels that have lower carbon intensity (CI) scores and are produced from sustainable feedstocks grown in the United States. Land use change is already captured in the indirect land use change (ILUC) score, which still makes it unclear what actual purpose the guardrails serve.

¹ EU industry demands answers as 'fraudulent' Chinese biofuels continue to flow - Euractiv

² https://apnews.com/article/virus-outbreak-only-on-ap-indonesia-financial-markets-malaysia-7b634596270cc6aa7578a062a30423bb

https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.858512/full



If CARB insists on agricultural feedstock traceability, then it should reward sustainable practices beyond what is already assumed in the lifecycle analysis (LCA). The U.S. Department of Agriculture (USDA) has developed a tool to quantify the CI reductions for no-till, cover crops and nitrogen inhibitors. Considering this integral information, the carbon intensity of soy-based biofuels could improve through the mentioned climate smart ag practices on the field where the soybeans were produced. Other farming practices like low-till, nutrient management, enhanced efficiency fertilizers, buffers, wetland and grassland management, tree planting on working lands, planting for higher carbon sequestration, and soil amendments all could and should be accounted to assign a lower CI score to an agricultural feedstock. USDA already tracks all these practices through several of their managed conservation programs. In addition, there are a variety of other practices that scientifically lower the CI score of soybean feedstocks for biofuels, and USDA is actively working to develop mechanisms to account for those. If CARB insists on tracing feedstocks back to the farm, then it should also acknowledge when those feedstocks are produced with lower CI practices.

Moreover, USDA has recognized the CI reduction benefits of certain sustainable or climate-smart practices for the purposes of clean fuel transportation programs and is undertaking a rulemaking process to develop final guidelines for the quantification of these practices. Through planting decisions, soil management, and other practices, soybean farmers can continuously reduce environmental impacts. In addition, some soybeans are double cropped meaning they are grown as a secondary crop following a primary crop within a growing season. They are not displacing other crops or land uses. Double-crop soybeans should be eligible to have the ILUC component of the CI score removed or at least shared with the other crop in the rotation. BCM proposes the aforementioned issues to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Modernized, Accurate, Climate Smart Carbon Intensity Modeling and Scoring

BCM remains concerned that without a comprehensive update to the Global Trade Analysis Project model for biofuels (GTAP-BIO) that CARB utilizes, U.S. soy-based feedstocks will be phased out of the LCFS even without the additional limitations included in the Second and Third 15-Day Changes. Current data indicates a much lower CI score for U.S. soybeans, as growers continue to improve soil practices, limit water use, lower onfarm emissions and more. CARB is recommending stringent sustainability guardrails for U.S. soy but is still on track to likely phase-out U.S. soy-based biofuels from credit generation by approximately 2035 or sooner.

As CARB looks to develop a more aggressive auto acceleration mechanism to reach CI reduction benchmarks sooner, using outdated methodologies will only limit the output of



actual improvement over time in terms of emissions reductions. As CARB updates all other major lifecycle emissions models through this rulemaking, BCM once again urges action to update the GTAP-BIO model so that the most current, climate smart and science-based data may be used to determine carbon intensity reductions. The reasoning and sources indicated in the Third 15-Day Changes do not address this concern and need to be revised to ensure accuracy. BCM proposes this issue to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Recommended Climate Enhancing Solutions for CARB

As CARB finalizes its update to the LCFS, BCM recommends several actions that will likely prevent an increase in fossil diesel use, improve carbon intensity calculations, and improve market access for sustainable U.S. agricultural feedstock providers.

First, CARB should not apply the vegetable oil feedstock cap proposal to U.S. feedstocks. As noted, these feedstocks are already subject to federal guardrails to ensure production on land not converted since 2008. The RFS was designed specifically to prevent land conversion for biofuel production, and USDA data shows a decrease in farmland over the same period.

Second, CARB should convene an expert working group to consider issues related to the sustainability provisions and indirect land use change (ILUC). BCM recommends that this expert working group convene before the end of 2025 and provide recommendations by the end of Fall 2026.

Third, BCM retains strong concerns about the ability of supply chains to comply with the sustainability guardrails. If CARB does move forward with the guardrails, they must reconsider its proposed sustainability requirements to allow biodiesel producers and soybean producers who provide the feedstock the opportunity to participate in the California biofuels market through innovative and climate smart agriculture practices. If traceability can be used to show additional benefits in CI scoring, CARB must look to programs already developed through biodiesel plant and farmer input and provide improved scoring for feedstocks that employ sustainability practices to minimize the changes in comparative costs (i.e., USDA accredited programs and practices). CARB should work with USDA to develop an aligned scheme to quantify climate-smart agricultural practices for the purposes of biofuel feedstocks. USDA has already engaged with CARB regarding this project, which could be applied to the work that CARB is doing on traceability and carbon quantification of agricultural biofuel feedstocks.

Lastly, CARB must undertake a comprehensive update of the GTAP-BIO model for soybean oil used in biofuel production. Without using the most up-to-date and accurate data, CARB is doing a disservice to the U.S. feedstock producers and California's citizens by calculating carbon intensity scores not rooted in current facts. Through CARB's own



analysis we know prejudicial feedstock treatment will lead to more emissions in the California transportation sector, harming the environment.

Concluding Thoughts/Pathway Forward

BCM is encouraged by the continued successes of programs that support the development of cleaner, low-carbon fuels. However, it is critical that CARB finalizes updates in a way that equitably include U.S. agricultural feedstocks through policies that are science-based aligning with the most up to date information as well as promoting the sustainability of U.S. based products and businesses; including the elimination of capping on U.S. vegetable oil feedstocks and applying sustainability guardrails that are economically feasible for farmers while rewarding their practices that lower CI.

CARB is required under the law to achieve the maximum technically feasible and cost-effective reductions in greenhouse gas emissions. The most recent 15-Day Changes show a lack of willingness to achieve the statutory obligations set forth in AB-32 and neglect modernized, climate smart, science-based solutions, ultimately disregarding the protection of U.S. based feedstocks, the people, and the planet. BCM also asks that CARB respond in writing to further substantiate their decisions regarding our concerns expressed in this letter. We look forward to your written responses as a state regulatory body, whose responsibility is to protect its' citizens and the environment by providing transparency on decisions made for those of impact.

BCM is eager to continue working with CARB to support the role of biodiesel producers in diversifying the fuel supply while reducing carbon intensity and increasing clean air in California and beyond. On behalf of Missouri's biodiesel industry, we appreciate the opportunity to comment and look forward to collaborating with CARB and other relevant stakeholders on implementation of policies that expand the use of Missouri biodiesel in California.

Sincerely,

046.1

James Greer

Chairman

Biodiesel Coalition of Missouri



April 21, 2025

Chair Liane Randolph & Members of the Board California Air Resources Board 1001 I Street, Sacramento, CA 95814

Via Electronic Submission

Re: Third 15-Day Changes to the Proposed LCFS Regulation Order

Dear Chair Randolph and Members of the California Air Resources Board:

The Kentucky Soybean Association appreciates the opportunity to comment on the proposed modifications (Third 15-Day Changes) to the Low Carbon Fuel Standard (LCFS) program. KSA has welcomed engagement with the California Air Resources Board (CARB) and staff throughout this multi-year process to update the LCFS program.

The Kentucky Soybean Association represents soybean farmers from across the Commonwealth of Kentucky on public policy issues important to the soybean industry.

CARB's Third 15-Day Changes to revise the LCFS did not address our major concerns with provisions included in the final amendments approved by CARB. In addition to the new proposals in the Third 15-Day Changes package, KSA remains deeply concerned with the drastic and inequitable pivot CARB has made related to agricultural feedstocks used for biofuels. KSA continues to encourage that updates to the LCFS program are based on upto-date and sound science, as required by AB-32. Outlined below are our concerns and proposed solutions that will enable CARB to meet its climate goals, protect the environment and all Californians, while also supporting American soybean farmers and processors who are investing in the future of low-carbon energy.

Serious Feedstock Cap Concerns and Proposed Solutions

KSA still has significant concerns with the vegetable oil feedstock cap that was included in the initial 15-Day Changes posted in August 2024. The current proposal restricts the amount of soybean oil, canola oil and sunflower seed oil that is allowed to generate credits in the program at an inequitable 20% by company. CARB's own data demonstrates that vegetable oil feedstocks, including soy, have consistently exceeded the proposed cap since 2021.

Capping these proven, sustainable, and scalable feedstocks would suppress the supply of renewable diesel, increase reliance on fossil fuels, and raise fuel prices for California consumers. Even CARB staff acknowledged in the April 2024 workshop that a cap would reduce air quality benefits and likely increase NOx and PM2.5 emissions. All of this, including the recent tariffs on imported feedstocks greatly increase costs and further substantiate U.S. based feedstocks as the clear-cut choice. KSA urges CARB to remove the cap on U.S. based vegetable oil feedstocks to provide a more economically feasible, locally produced and sustainable, climate smart option for the people and the planet.

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KSA remains very concerned about the sustainability guardrails. The sustainability guardrails are more onerous than the specified source requirements used for non-U.S. waste feedstock imports. Palm oil in Southeast Asia has had forced labor concerns², but CARB does not require used cooking oil derived from palm to track social or economic sustainability. Concerningly, petroleum does have to track these criteria. CARB's proposal makes it administratively easier to use non-sustainable petroleum³ in the state than biofuels that have lower carbon intensity (CI) scores and are produced from sustainable feedstocks grown in the United States. Land use change is already captured in the indirect land use change (ILUC) score, which still makes it unclear what actual purpose the guardrails serve.

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³https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.858512/full

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Moreover, USDA has recognized the CI reduction benefits of certain sustainable or climate-smart practices for the purposes of clean fuel transportation programs and is undertaking a rulemaking process to develop final guidelines for the quantification of these practices. Through planting decisions, soil management, and other practices, soybean farmers can continuously reduce environmental impacts. In addition, some soybeans are double cropped meaning they are grown as a secondary crop following a primary crop within a growing season. They are not displacing other crops or land uses. Double-crop soybeans should be eligible to have the ILUC component of the CI score removed or at least shared with the other crop in the rotation. KSA proposes the aforementioned issues to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

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KSA remains concerned that without a comprehensive update to the Global Trade Analysis Project model for biofuels (GTAP-BIO) that CARB utilizes, U.S. soy-based feedstocks will be phased out of the LCFS even without the additional limitations included in the Second and Third 15-Day Changes. Current data indicates a much lower CI score for U.S. soybeans, as growers continue to improve soil practices, limit water use, lower on-farm emissions and more. CARB is recommending stringent sustainability guardrails for U.S. soy but is still on track to likely phase-out U.S. soy-based biofuels from credit generation by approximately 2035 or sooner.

As CARB looks to develop a more aggressive auto acceleration mechanism to reach CI reduction benchmarks sooner, using outdated methodologies will only limit the output of actual improvement over time in terms of emissions reductions. As CARB updates all other major lifecycle emissions models through this rulemaking, KSA once again urges action to update the GTAP-BIO model so that the most current, climate smart and science-based

data may be used to determine carbon intensity reductions. The reasoning and sources indicated in the Third 15-Day Changes do not address this concern and need to be revised to ensure accuracy. KSA proposes this issue to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Equitable Entities Eligible to Apply for Fuel Pathways

KSA is very concerned about CARB's decision to give the Executive Officer authority to stop accepting new pathways for biomass-based diesel starting in January 2031. KSA does not understand how this benefits the LCFS. Under AB-32, CARB must under statute minimize costs and maximize GHG reductions. It is unclear how this is served by rejecting new pathways. In fact, the LCFS is best served by allowing the most available and equitable pathways. If these pathways cannot achieve cost-effective GHG savings, they will not be utilized by the market in the LCFS. In essence, an increase in pathways can only serve to improve GHG benefits in California. Singling out a single fuel for prejudicial treatment is baffling given the goals of the LCFS and the authority that establishes it. KSA urges CARB to continue to allow equitable pathways forward with no date of denial.

Recommended Climate Enhancing Solutions for CARB

As CARB finalizes its update to the LCFS, KSA recommends several actions that will likely prevent an increase in fossil diesel use, improve carbon intensity calculations, and improve market access for sustainable U.S. agricultural feedstock providers.

First, CARB should not apply the vegetable oil feedstock cap proposal to U.S. feedstocks. As noted, these feedstocks are already subject to federal guardrails to ensure production on land not converted since 2008. The RFS was designed specifically to prevent land conversion for biofuel production, and USDA data shows a decrease in farmland over the same period.

Second, CARB should convene an expert working group to consider issues related to the sustainability provisions and indirect land use change (ILUC). KSA recommends that this expert working group convene before the end of 2025 and provide recommendations by the end of Fall 2026.

Third, KSA retains strong concerns about the ability of supply chains to comply with the sustainability guardrails. If CARB does move forward with the guardrails, they must reconsider its proposed sustainability requirements to allow soybean growers the opportunity to participate in the California biofuels market through innovative and climate smart agriculture practices. If traceability can be used to show additional benefits in CI scoring, CARB must look to programs already developed through farmer input and provide improved scoring for feedstocks that employ sustainability practices to minimize the changes in comparative costs (i.e., USDA accredited programs and practices). CARB should work with USDA to develop an aligned scheme to quantify climate-smart agricultural practices for the purposes of biofuel feedstocks. USDA has already engaged

with CARB regarding this project, which could be applied to the work that CARB is doing on traceability and carbon quantification of agricultural biofuel feedstocks.

Lastly, CARB must undertake a comprehensive update of the GTAP-BIO model for soybean oil used in biofuel production. Without using the most up-to-date and accurate data, CARB is doing a disservice to the U.S. feedstock producers and California's citizens by calculating carbon intensity scores not rooted in current facts. Through CARB's own analysis we know prejudicial feedstock treatment will lead to more emissions in the California transportation sector, harming the environment.

Concluding Thoughts/Pathway Forward

KSA is encouraged by the continued successes of programs that support the development of cleaner, low-carbon fuels. However, it is critical that CARB finalizes updates in a way that equitably include U.S. agricultural feedstocks through policies that are science-based aligning with the most up to date information as well as promoting the sustainability of U.S. based products and businesses; including the elimination of capping on U.S. vegetable oil feedstocks and applying sustainability guardrails that are economically feasible for farmers while rewarding their practices that lower CI.

CARB's Third 15-Day Changes did not address any of the fundamental issues raised by KSA in the First and Second 15-Day Changes and fails to acknowledge the potential unintentional consequences of a feedstock outlined by its own employees in previous discussions. CARB is required under the law to achieve the maximum technically feasible and cost-effective reductions in greenhouse gas emissions. The most recent 15-Day Changes show a lack of willingness to achieve the statutory obligations set forth in AB-32 and neglect modernized, climate smart, science-based solutions, ultimately disregarding the protection of U.S. based feedstocks, the people, and the planet. KSA also asks that CARB respond in writing to further substantiate their decisions regarding our concerns expressed in this letter. We look forward to your written responses as a state regulatory body, whose responsibility is to protect its' citizens and the environment by providing transparency on decisions made for those of impact.

KSA is eager to continue working with CARB to support the role of agriculture in diversifying the fuel supply while reducing carbon intensity and increasing clean air in California and beyond. On behalf of U.S. soybean farmers, we appreciate the opportunity to comment and look forward to collaborating with CARB and other relevant stakeholders on implementation of policies that expand the use of U.S. soy-based biofuels and market opportunities for U.S. soybean farmers.

Sincerely.

Lowthan Reynold

Jonathan Reynolds, Kentucky Soybean Association President and Hickman County Soybean Farmer

Air Products and Chemicals, Inc. 4000 MacArthur Boulevard, Suite 420, East Tower Newport Beach, CA 92660



www.airproducts.com

April 21, 2025

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Chair, Liane Randolph Members of the Board California Air Resources Board 1001 I Street Sacramento, CA 95814

Comments submitted electronically

RE: Comments Related to the April 4th, 2025, Third 15-Day Changes

Dear Chair Randolph and fellow board members,

Air Products is pleased to provide comments in support of the California Air Resources Board (CARB) rulemaking for the Low Carbon Fuel Standard (LCFS). We appreciate how quickly CARB staff has responded to the Office of Administrative Law (OAL) disapproval feedback and urge CARB to prepare the final package to return to OAL as expeditiously as possible following this 15-day public comment period. It is paramount that this LCFS amendment package be approved and made effective as soon as possible in 2025 with respect to the carbon intensity (CI) targets and the market signal they provide. In addition, there are many practical changes that should be implemented as soon as possible to promote the growth of the low-carbon hydrogen market.

Air Products is a global company providing essential industrial gases, related equipment, and end-use market applications expertise to customers in more than 50 countries. As the world's largest producer of hydrogen, Air Products is committed to driving the energy transition through global investment in clean hydrogen production capacity.

Renewable Hydrogen for Mobility Requirements

We strongly support the revised provision 95482(h) to recognize emission reductions associated with carbon capture & sequestration (CCS) as eligible in the context of the 2030 and 2035 renewable hydrogen provisions. This change will send an important market signal to decarbonize fossil-based hydrogen as renewable hydrogen production develops concurrently and recognizes the importance of all substantive decarbonization strategies. This amendment also promotes more low-carbon hydrogen supply for the California market and helps bring down the costs to the consumer.

Hydrogen Refueling Infrastructure Crediting

We are generally supportive of the amendments proposed in the Hydrogen Refueling Infrastructure (HRI)

1048.3 crediting for both the light- and medium-duty (LMD) vehicle and the heavy-duty (HD) vehicle provisions. With removal of the capital expenditure-based credit value limitations in Sections 95486(a)(4)(H) and 95486.4(a)(4)(I), we request CARB also eliminate Sections 95486.3(a)(6)(C) and 95486.4(a)(6)(C) and related sub-sections from the LCFS regulation. These sections address cost and revenue recordkeeping and reporting for LMD and HD and are only relevant to the capital expenditure-based credit value limitations proposed to be eliminated, respectively. This is highly competitively sensitive information which should not be collected if it is no longer required for the regulation.

Improve Low-CI Hydrogen Book-and-Claim Provisions

Air Products appreciates CARB's willingness to provide a 'book-and-claim' accounting approach for low-CI hydrogen. A robust book-and-claim system for hydrogen will leverage existing infrastructure to support development of new low CI hydrogen supply, reduce costs, and ensure that the low-carbon attributes of a hydrogen pathway are retained and applied to end-uses where the most environmental benefit can be derived.

One impediment that remains in the current low-CI hydrogen book-and-claim language is the in-state pipeline requirement that places an unnecessary constraint on a nascent market and will stifle investments at a time when significant capital outlays are needed to bring low-carbon hydrogen to scale. We are not aware of any other fuel, much less a low carbon fuel that is just beginning to ramp up production and use in California, being subject to such a requirement in the near-term that discriminates against out-of-state projects. Biomethane, as an example, is enabled without directionality requirements until 2040 – and even then, it must flow to California only 50% of the time. Based on the proposed provisions, low-CI hydrogen must flow to California 100% of the time once these amendments become effective. For the best emissions outcomes, lowest cost, access to a larger pool of low CI hydrogen supplies and thus a reliable supply chain, California should support the use of low CI hydrogen in multiple fuel value chains and geographies if the finished fuel is consumed in state and creditable under the LCFS.

To provide near-term opportunities for low-CI hydrogen to rapidly increase supply, we request that the Board ask CARB staff to modify §95488.8(i)(3)(A) as follows:

"Low-CI hydrogen is injected into a dedicated hydrogen pipeline physically connected to California a distribution system or a production facility that provides transportation fuel to California."

Extend Clean Fuel Reward to Fuel-Cell Vehicles

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To help spur demand for hydrogen fuel-cell vehicles concurrently with battery-electric vehicles, particularly medium- and heavy-duty vehicles considering the pause on Advanced Clean Fleet implementation, and maintain the technology-neutral approach of the regulation, we suggest opening the Clean Fuel Reward program to all zero-emission vehicles. Fuel cell electric vehicles are electric vehicles, and should be included in the Clean Fuel Reward along with battery electric vehicles. We also believe that modifying the definition to not preclude rebates for high-priority and federal fleets given the paused status of the Advanced Clean Fleets regulation is prudent. We suggest modifying the definition as follows:

§95481(a)(29): "Clean Fuel Reward" is a statewide program established by EDUs to provide a reduction in price for new and/or used commercial medium- or heavy-duty electric and fuel-cell vehicles that are not subject to the High Priority and Federal Fleets requirements as specified in, title 13, California Code of Regulations, section 2015(a)(1) in California. The Clean Fuel Reward is funded exclusively through LCFS proceeds generated by EDUs from electricity fuel.

In addition to the definitional change above, we request CARB work with the California Public Utilities Commission (CPUC) to ensure that utility Clean Fuel Reward filings include fuel-cell vehicle incentive.

¹ As just one example, CARB's DriveClean website's page, "Electric Car Overview," includes fuel cell electric vehicles and describes them as follows: "A fuel cell electric car runs on electricity, but does so differently than battery-electric cars or plug-in hybrids...An additional benefit for fuel cell drivers is that auto manufacturers provide three years' worth of free hydrogen fuel. Incentives like this are why many Californian's are choosing to drive electric."

Air Products appreciates the opportunity to provide this feedback on the third 15-day package and we would be happy to meet with CARB to discuss any of these topics further. Please feel free to contact me at hellermt@airproducts.com.

Respectfully,

Miles Heller

Director, Greenhouse Gas, Hydrogen, and Utility Regulatory Policy

April 21, 2025

Chair Liane Randolph & Members of the Board California Air Resources Board 1001 I Street, Sacramento, CA 95814

Via Electronic Submission

Re: Proposed LCFS Changes Miss the Mark for Domestic Fuels, Science-Based Directive

Dear Chair Randolph and Members of the California Air Resources Board:

The Kansas Soybean Association (KSA) appreciates the opportunity to comment on the proposed modifications (Third 15-Day Changes) to the Low Carbon Fuel Standard (LCFS) program. KSA has welcomed engagement with the California Air Resources Board (CARB) and staff throughout this multi-year process to update the LCFS program.

KSA represents soybean farmers across Kansas on public policy issues important to the soybean industry. Growers across the state have long been committed to producing the world's food, feed, fuel, fiber, and thousands of bioproducts in an environmentally and economically sustainable way.

CARB's Third 15-Day Changes to revise the LCFS did not address our major concerns with provisions included in the final amendments approved by CARB. In addition to the new proposals in the Third 15-Day Changes package, KSA remains deeply concerned with the drastic and inequitable pivot CARB has made related to agricultural feedstocks used for biofuels. Updates to the LCFS program must be based on up-to-date and sound science, as required by AB-32. Outlined below are our concerns and proposed solutions that will enable CARB to meet its climate goals, protect the environment and all Californians, while also supporting American soybean farmers and processors who are investing in the future of low-carbon energy.

Serious Feedstock Cap Concerns and Proposed Solutions

The Kansas Soybean Association (KSA) still has significant concerns with the vegetable oil feedstock cap that was included in the initial 15-Day Changes posted in August 2024. The current proposal restricts the amount of soybean oil, canola oil and sunflower seed oil that is allowed to generate credits in the program at an inequitable 20% by company. CARB's own data demonstrates that vegetable oil feedstocks, including soy, have consistently exceeded the proposed cap since 2021.

Capping these proven, sustainable, and scalable feedstocks would suppress the supply of renewable diesel, increase reliance on fossil fuels, and raise fuel prices for California consumers. Even CARB staff acknowledged in the April 2024 workshop that a cap would reduce air quality benefits and likely increase NOx and PM2.5 emissions. All of this, including the recent tariffs on imported feedstocks greatly increase costs and further substantiate U.S. based feedstocks as the clear-cut choice. We urge CARB to **remove the**

cap on U.S. based vegetable oil feedstocks to provide a more economically feasible, locally produced and sustainable, climate smart option for the people and the planet.

Agricultural feedstocks for biofuel production are already held to a high standard for participation in the U.S. Renewable Fuel Standard (RFS). Rather than adding sustainable U.S. based feedstocks to its arbitrary proposed cap, CARB needs to update carbon intensity analysis and oversight of imported feedstocks, which are not held to the same level of accountability. Without implementing sustainable solutions to the above and not eliminating a cap on U.S. vegetable oil feedstock, CARB is essentially putting the feedstocks from foreign countries above those of the United States.

Sustainability Guardrails and Traceability Concerns

The Kansas Soybean Association (KSA) remains very concerned about the unscientific "sustainability guardrails" that remain in the proposal. These guardrails do nothing more than penalize domestically grown, US feedstocks. For example, the requirements are more onerous than the specified source requirements used for non-U.S. waste feedstock imports. Palm oil in Southeast Asia has had forced labor concerns, among many environmental issues, but CARB does not require used cooking oil derived from palm to track social or economic sustainability. Concerningly, petroleum doesn't even have to track these criteria.

CARB's proposal makes it administratively easier to use non-sustainable petroleum in the state than biofuels that have lower carbon intensity (CI) scores and are produced from sustainable feedstocks grown in the United States. Land use change is already captured in the indirect land use change (ILUC) score, which still makes it unclear what actual purpose the guardrails serve.

If CARB insists on agricultural feedstock traceability, then it should reward sustainable practices beyond what is already assumed in the lifecycle analysis (LCA). The U.S. Department of Agriculture (USDA) has developed a tool to quantify the CI reductions for no-till, cover crops and nitrogen inhibitors. Considering this integral information, the carbon intensity of soy-based biofuels could improve through climate smart ag practices on the field where the soybeans were produced. Other farming practices like low-till, nutrient management, enhanced efficiency fertilizers, buffers, wetland and grassland management, tree planting on working lands, planting for higher carbon sequestration, and soil amendments all could and should be accounted to assign a more accurate CI score to any agricultural feedstock. USDA already tracks all these practices through several of their managed conservation programs.

If CARB insists on tracing feedstocks back to the farm, then it should also acknowledge when those feedstocks are produced with lower CI practices.

Modernized, Accurate, Climate Smart Carbon Intensity Modeling and Scoring

The Kansas Soybean Association (KSA) remains concerned that without a comprehensive update to the Global Trade Analysis Project model for biofuels (GTAP-BIO), U.S. soy-based feedstocks will be unscientifically phased out of the LCFS even without the additional limitations included in the Second and Third 15-Day Changes. Current data indicates a much lower CI score for U.S. soybeans, as growers continue to improve soil practices, limit water use, lower on-farm emissions and more. CARB is recommending stringent

sustainability guardrails for U.S. soy but is still on track to likely phase-out U.S. soy-based biofuels from credit generation by approximately 2035 or sooner.

As CARB looks to develop a more aggressive auto acceleration mechanism to reach CI reduction benchmarks sooner, using outdated methodologies will only limit the output of actual improvement over time in terms of emissions reductions. As CARB updates all other major lifecycle emissions models through this rulemaking, KSA once again urges action to update the GTAP-BIO model so that the most current, climate smart and science-based data may be used to determine carbon intensity reductions for fuels in the program.

With so many issues remaining in this space, we encourage CARB to convene an ILUC modeling work group as soon as possible.

Equitable Entities Eligible to Apply for Fuel Pathways

The Kansas Soybean Association (KSA) is very concerned about CARB's decision to give the Executive Officer authority to stop accepting new pathways for biomass-based diesel starting in January 2031. We do not understand how this benefits the LCFS in any way.

Under AB-32, CARB must under statute minimize costs and maximize GHG reductions. It is unclear how this is served by rejecting new pathways. In fact, the LCFS is best served by allowing the most available and equitable pathways. If these pathways cannot achieve cost-effective GHG savings, they will not be utilized by the market in the LCFS. In essence, an increase in pathways can only serve to improve GHG benefits in California. Singling out a single fuel for prejudicial treatment is baffling given the goals of the LCFS and the authority that establishes it. KSA urges CARB to continue to allow equitable pathways forward with no arbitrary date of denial.

Recommended Climate Enhancing Solutions for CARB

As CARB finalizes its update to the LCFS, KSA recommends several actions that will likely prevent an increase in fossil diesel use, improve carbon intensity calculations, and improve market access for sustainable U.S. agricultural feedstock providers.

First, *CARB* should not apply the vegetable oil feedstock cap proposal to *U.S.* feedstocks. As noted, these feedstocks are already subject to federal guardrails to ensure production on land not converted since 2008. The RFS was designed specifically to prevent land conversion for biofuel production, and USDA data shows a decrease in farmland over the same period.

Second, *CARB* should convene an expert working group to consider issues related to the sustainability provisions and indirect land use change (ILUC). KSA recommends that this expert working group convene before the end of 2025 and provide recommendations by the end of Fall 2026.

Third, KSA retains strong concerns about the need for additional "Sustainability guardrails" within the program. If CARB does move forward with the guardrails, they must reconsider its proposed sustainability requirements to allow soybean growers the opportunity to participate in the California biofuels market through innovative and climate smart agriculture practices. If traceability can be used to show additional benefits in CI scoring, CARB must look to programs already developed through farmer input and provide improved scoring for feedstocks that employ sustainability practices to minimize the

changes in comparative costs (i.e., USDA accredited programs and practices). CARB should work with USDA to develop an aligned scheme to quantify climate-smart agricultural practices for the purposes of biofuel feedstocks. USDA has already engaged with CARB regarding this project, which could be applied to the work that CARB is doing on traceability and carbon quantification of agricultural biofuel feedstocks.

Lastly, *CARB must undertake a comprehensive update of the GTAP-BIO model* for soybean oil used in biofuel production. Without using the most up-to-date and accurate data, CARB is doing a disservice to the U.S. feedstock producers and California's citizens by calculating carbon intensity scores not rooted in current facts. Through CARB's own analysis we know prejudicial feedstock treatment will lead to more emissions in the California transportation sector, harming the environment.

Conclusion

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The Kansas Soybean Association (KSA) is encouraged by the continued successes of programs that support the development of cleaner, low-carbon fuels. However, it is critical that CARB finalizes updates in a way that equitably include U.S. agricultural feedstocks through policies that are science-based, aligning with the most up to date information as well as promoting the sustainability of U.S. based products and businesses.

CARB's Third 15-Day Changes did not address any of the fundamental issues raised by the biodiesel and renewable diesel industry in the First and Second 15-Day Changes and fails to acknowledge the potential unintentional consequences of a feedstock cap outlined by CARB's own employees in previous discussions. CARB is required under the law to achieve the maximum technically feasible and cost-effective reductions in greenhouse gas emissions – and this proposal fails to meet that.

KSA is eager to work with CARB to support the role of agriculture in diversifying the fuel supply while reducing carbon intensity and increasing clean air in California and beyond. On behalf of soybean farmers across Kansas, we appreciate the opportunity to comment and look forward to collaborating with CARB and other relevant stakeholders on implementation of policies that expand the use of U.S. soy-based biofuels and market opportunities for U.S. soybean farmers.

Sincerely,

Kaleb Little

Chief Executive Officer

Kansas Soybean Association

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SUBMITTED VIA ELECTRONIC FILING

April 21, 2025

Mr. Matthew Botill Chief, Industrial Strategies Division California Air Resources Board 1001 | Street Sacramento, California 95814

RE: Comments on the Third 15-Day Changes to the Proposed Low Carbon Fuel Standard Amendments, Released April 4, 2025

Dear Mr. Botill.

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The California Renewable Transportation Alliance (CRTA) is a diverse coalition of renewable fuel producers, fleet operators, engine manufacturers, consumers, and utilities who, in long partnership with California, have invested millions of dollars in providing cost-effective, low-carbon fuel options to decarbonize California's transportation sector. We are committed to helping California meet its ambitious climate change goals. It is with that intent in mind that we welcome the opportunity to provide these comments on the Third 15-Day Changes to the Proposed Low Carbon Fuel Standard Amendments (Third 15-Day Changes) that were released on April 4, 2025.

The Low Carbon Fuel Standard (LCFS) is internationally recognized as an effective mechanism for decarbonizing transportation fuel and reducing California's dependence on fossil fuel. It has also proven to be a key driver for the effective capture and reuse of otherwise unabated methane emissions, particularly from dairy operations. As you know, methane is a powerful greenhouse gas and Short-Lived Climate Pollutant that is 80 times more potent than carbon dioxide over a 20-year period. The efficient and abundant capture of methane today is essential to limiting the plant's warming.

CRTA members are grateful for CARB staff's prompt response to the concerns raised in the Office of Administrative Law's (OAL) notice of disapproval dated February 18, 2025. Addressing the concerns raised in less than the 120 days permitted by statute helps to restore the market confidence that was shaken after the OAL decision.

As noted in our comments from October 16, 2024, we believe that the LCFS amendments proposed and subsequently adopted by the CARB Board on November 8, 2024 (hereafter referred

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050.1 cont. to as the adopted amendments), achieved an appropriate balance in the treatment of biomethane under the LCFS. They enable renewable natural gas (RNG) to provide significant emission reductions in the near-term while remaining a source of energy to power zero-emission platforms like electricity and hydrogen in the future.

Consequently, CRTA declared the adopted amendments supportable because they prioritized the capture and reuse of methane while taking the necessary steps to reinvigorate a restless investment market and continue California's leadership on its signature climate change policy.

The adopted amendments brought much-needed stability to the LCFS market. In response to the prolonged three year discussion surrounding the changes, the LCFS credit market was experiencing historic lows that dropped credit prices into the low-\$40s, threatening the program's viability. Credit prices had shown positive improvement, increasing into the low \$70 once the amendments were adopted. However, the OAL disapproval decision caused them to once again plunge into the mid-to-low \$50s.

Prolonged consideration of OAL's decision would have only worsened this deteriorating situation, which is why we appreciate CARB staff moving quickly on its revisions.

Further, we believe the adopted amendments to the LCFS represents CARB staff's effort to develop a data-driven, science-based strategy for aligning the LCFS program with California's broader emission reduction objectives. We also disagree with Program opponents notion that the LCFS is the primary driver of overall retail fuel prices in California. Despite recent criticisms, market experts have concluded that the LCFS is not a major driver of consumer gas prices in California¹. Despite historically low credit prices in 2024, California's gas prices have remained among the highest in the nation².

The adopted LCFS amendments are needed to maintain investment confidence and allow the state to continue expanding the availability of affordable, lower-carbon fuels to improve air quality and enhance public health in California. We trust OAL will move as quickly to approve the adopted amendments to ensure the continued availability of affordable, lower-carbon transportation fuel to improve air quality and enhance public health in California.

Thank you for your work on this important matter. Please feel free to contact me at nicolerice@ca-rta.org if you have any questions.

¹ Based on the conclusions drawn in the Bates White analysis, "The primary driver of fuel price movements is the cost of crude oil, while other California-specific factors, such as taxes and the Cap-and-Trade Program for greenhouse gas emissions have readily-quantifiable impacts on retail fuel prices. The combination of crude oil price, Cap-and-Trade costs and taxes explains fully 90% of regular gasoline pricing over time. An examination of historical data on the components of retail gasoline prices in California shows that the residual "unexplained" price, which encompasses all pricing factors that cannot be directly quantified, has grown in recent years, but is not linked to the implementation of LCFS or administration of the program over time. Compared to the four years prior to LCFS implementation, the first four years of the program saw a decrease in the margin of retail gasoline price over wholesale spot price, indicating clearly that LCFS was not responsible for increasing retail prices. An assessment of observed market prices shows conclusively that the LCFS program price effect at the pump is not a significant driver of retail fuel prices in California. Though retail fuel prices in California are high relative to other states, there is no statistically significant correlation between the price of LCFS credits and the price of retail gasoline, which are shown in Figure 1 for the period 2013 through March 2022." Bates White Economic Consulting. (2022). Low Carbon Fuels Standards: Market impacts and evidence for retail fuel price effects (p. 1-2).

² https://gasprices.aaa.com/todays-state-averages/

Respectfully,

Nicole Rice, President

California Renewable Transportation Alliance

cc: CARB Board Members

Hazel Miranda, Chief of Staff and Policy Advisor to Chair Randolph, CARB Rajinder Sahota, Deputy Executive Officer for Climate Change and Research, CARB Lauren Sanchez, Senior Advisor for Climate, Office of the Governor Jamie Callahan, Deputy Chief of Staff and Senior Counselor on Infrastructure,

Office of the Governor

Grant Mack, Deputy Legislative Secretary, Office of the Governor



April 21, 2025

Chair Liane Randolph & Members of the Board California Air Resources Board 1001 | Street, Sacramento, CA 95814

Via Electronic Submission

Re: Third 15-Day Changes to the Proposed LCFS Regulation Order

Dear Chair Randolph and Members of the California Air Resources Board:

The Minnesota Soybean Growers Association (MSGA) appreciates the opportunity to comment on the proposed modifications (Third 15-Day Changes) to the Low Carbon Fuel Standard (LCFS) program. MSGA has welcomed engagement with the California Air Resources Board (CARB) and staff throughout this multi-year process to update the LCFS program.

MSGA advocates on behalf of Minnesota's nearly 27,000 soybean farmers and in 2018 we became the first state to move to a B20 (20% biodiesel) blend. As such, biodiesel contributes nearly 5,400 jobs and \$1.7 billion toward the state's economy.

CARB's Third 15-Day Changes to revise the LCFS did not address our major concerns with provisions included in the final amendments approved by CARB. In addition to the new proposals in the Third 15-Day Changes package, MSGA remains deeply concerned with the drastic and inequitable pivot CARB has made related to agricultural feedstocks used for biofuels. MSGA continues to encourage that updates to the LCFS program are based on up-to-date and sound science, as required by AB-32. Outlined below are our concerns and proposed solutions that will enable CARB to meet its climate goals, protect the environment and all Californians, while also supporting American soybean farmers and processors who are investing in the future of low-carbon energy.

Serious Feedstock Cap Concerns and Proposed Solutions

MSGA still has significant concerns with the vegetable oil feedstock cap that was included in the initial 15-Day Changes posted in August 2024. The current proposal restricts the amount of

soybean oil, canola oil and sunflower seed oil that is allowed to generate credits in the program at an inequitable 20% by company. CARB's own data demonstrates that vegetable oil feedstocks, including soy, have consistently exceeded the proposed cap since 2021.

Capping these proven, sustainable, and scalable feedstocks would suppress the supply of renewable diesel, increase reliance on fossil fuels, and raise fuel prices for California consumers. Even CARB staff acknowledged in the April 2024 workshop that a cap would reduce air quality benefits and likely increase NOx and PM2.5 emissions. All of this, including the recent tariffs on imported feedstocks greatly increase costs and further substantiate U.S. based feedstocks as the clear-cut choice. MSGA urges CARB to remove the cap on U.S. based vegetable oil feedstocks to provide a more economically feasible, locally produced and sustainable, climate smart option for the people and the planet.

Agricultural feedstocks for biofuel production are already held to a high standard for participation in the U.S. Renewable Fuel Standard (RFS). Rather than adding sustainable U.S. based feedstocks to its arbitrary proposed cap, CARB needs to update carbon intensity analysis and oversight of imported feedstocks, which are not held to the same level of accountability. Recent actions by the European Union in response to fraudulent Chinese biodiesel imports underscore this concern¹. The EU committee recently met at the request of a member state to discuss alleged fraud in biodiesel imports from China. Fraud continues to be an issue with imported feedstocks and needs to be addressed further. MSGA strongly encourages CARB to adopt enforceable traceability and verification standards, including origin disclosures, documentation audits, and physical testing. Without implementing sustainable solutions to the above and not eliminating a cap on U.S. vegetable oil feedstock, CARB is essentially putting the feedstocks from foreign countries (i.e., China) above those of the United States.

Sustainability Guardrails and Traceability Concerns

MSGA remains very concerned about the sustainability guardrails. The sustainability guardrails are more onerous than the specified source requirements used for non-U.S. waste feedstock imports. Palm oil in Southeast Asia has had forced labor concerns², but CARB does not require used cooking oil derived from palm to track social or economic sustainability. Concerningly, petroleum does have to track these criteria. CARB's proposal makes it administratively easier to use non-sustainable petroleum³ in the state than biofuels that have lower carbon intensity (CI) scores and are produced from sustainable feedstocks grown in the United States. Land use change is already captured in the indirect land use change (ILUC) score, which still makes it unclear what actual purpose the guardrails serve.

¹ EU industry demands answers as 'fraudulent' Chinese biofuels continue to flow - Euractiv

 $^{^2 \}underline{\text{https://apnews.com/article/virus-outbreak-only-on-ap-indonesia-financial-markets-malaysia-7b634596270cc6aa7578} \underline{\text{8a062a30423bb}}$

³ https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.858512/full

If CARB insists on agricultural feedstock traceability, then it should reward sustainable practices beyond what is already assumed in the lifecycle analysis (LCA). The U.S. Department of Agriculture (USDA) has developed a tool to quantify the CI reductions for no-till, cover crops and nitrogen inhibitors. Considering this integral information, the carbon intensity of soy-based biofuels could improve through the mentioned climate smart ag practices on the field where the soybeans were produced. Other farming practices like low-till, nutrient management, enhanced efficiency fertilizers, buffers, wetland and grassland management, tree planting on working lands, planting for higher carbon sequestration, and soil amendments all could and should be accounted to assign a lower CI score to an agricultural feedstock. USDA already tracks all these practices through several of their managed conservation programs. In addition, there are a variety of other practices that scientifically lower the CI score of soybean feedstocks for biofuels, and USDA is actively working to develop mechanisms to account for those. If CARB insists on tracing feedstocks back to the farm, then it should also acknowledge when those feedstocks are produced with lower CI practices.

Moreover, USDA has recognized the CI reduction benefits of certain sustainable or climate-smart practices for the purposes of clean fuel transportation programs and is undertaking a rulemaking process to develop final guidelines for the quantification of these practices. Through planting decisions, soil management, and other practices, soybean farmers can continuously reduce environmental impacts. In addition, some soybeans are double cropped meaning they are grown as a secondary crop following a primary crop within a growing season. They are not displacing other crops or land uses. Double-crop soybeans should be eligible to have the ILUC component of the CI score removed or at least shared with the other crop in the rotation. MSGA proposes the aforementioned issues to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Modernized, Accurate, Climate Smart Carbon Intensity Modeling and Scoring

MSGA remains concerned that without a comprehensive update to the Global Trade Analysis Project model for biofuels (GTAP-BIO) that CARB utilizes, U.S. soy-based feedstocks will be phased out of the LCFS even without the additional limitations included in the Second and Third 15-Day Changes. Current data indicates a much lower CI score for U.S. soybeans, as growers continue to improve soil practices, limit water use, lower on-farm emissions and more. CARB is recommending stringent sustainability guardrails for U.S. soy but is still on track to likely phase-out U.S. soy-based biofuels from credit generation by approximately 2035 or sooner.

As CARB looks to develop a more aggressive auto acceleration mechanism to reach CI reduction benchmarks sooner, using outdated methodologies will only limit the output of actual improvement over time in terms of emissions reductions. As CARB updates all other major lifecycle emissions models through this rulemaking MSGA once again urges action to update the GTAP-BIO model so that the most current, climate smart and science-based data may be used to determine carbon intensity reductions. The reasoning and sources indicated in the Third 15-Day Changes do not address this concern and need to be revised to ensure accuracy.

MSGA proposes this issue to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Equitable Entities Eligible to Apply for Fuel Pathways

MSGA is very concerned about CARB's decision to give the Executive Officer authority to stop accepting new pathways for biomass-based diesel starting in January 2031. MSGA does not understand how this benefits the LCFS. Under AB-32, CARB must under statute minimize costs and maximize GHG reductions. It is unclear how this is served by rejecting new pathways. In fact, the LCFS is best served by allowing the most available and equitable pathways. If these pathways cannot achieve cost-effective GHG savings, they will not be utilized by the market in the LCFS. In essence, an increase in pathways can only serve to improve GHG benefits in California. Singling out a single fuel for prejudicial treatment is baffling given the goals of the LCFS and the authority that establishes it. MSGA urges CARB to continue to allow equitable pathways forward with no date of denial.

Recommended Climate Enhancing Solutions for CARB

As CARB finalizes its update to the LCFS, MSGA recommends several actions that will likely prevent an increase in fossil diesel use, improve carbon intensity calculations, and improve market access for sustainable U.S. agricultural feedstock providers.

First, CARB should not apply the vegetable oil feedstock cap proposal to U.S. feedstocks. As noted, these feedstocks are already subject to federal guardrails to ensure production on land not converted since 2008. The RFS was designed specifically to prevent land conversion for biofuel production, and USDA data shows a decrease in farmland over the same period.

Second, CARB should convene an expert working group to consider issues related to the sustainability provisions and indirect land use change (ILUC). MSGA recommends that this expert working group convene before the end of 2025 and provide recommendations by the end of Fall 2026.

Third, MSGA retains strong concerns about the ability of supply chains to comply with the sustainability guardrails. If CARB does move forward with the guardrails, they must reconsider its proposed sustainability requirements to allow soybean growers the opportunity to participate in the California biofuels market through innovative and climate smart agriculture practices. If traceability can be used to show additional benefits in CI scoring, CARB must look to programs already developed through farmer input and provide improved scoring for feedstocks that employ sustainability practices to minimize the changes in comparative costs (i.e., USDA accredited programs and practices). CARB should work with USDA to develop an aligned scheme to quantify climate-smart agricultural practices for the purposes of biofuel feedstocks. USDA has already engaged with CARB regarding this project, which could be applied to the work that CARB is doing on traceability and carbon quantification of agricultural biofuel feedstocks.

Lastly, CARB must undertake a comprehensive update of the GTAP-BIO model for soybean oil used in biofuel production. Without using the most up-to-date and accurate data, CARB is doing

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a disservice to the U.S. feedstock producers and California's citizens by calculating carbon intensity scores not rooted in current facts. Through CARB's own analysis we know prejudicial feedstock treatment will lead to more emissions in the California transportation sector, harming the environment.

Concluding Thoughts/Pathway Forward

MSGA is encouraged by the continued successes of programs that support the development of cleaner, low-carbon fuels. However, it is critical that CARB finalizes updates in a way that equitably include U.S. agricultural feedstocks through policies that are science-based aligning with the most up to date information as well as promoting the sustainability of U.S. based products and businesses; including the elimination of capping on U.S. vegetable oil feedstocks and applying sustainability guardrails that are economically feasible for farmers while rewarding their practices that lower CI.

CARB's Third 15-Day Changes did not address any of the fundamental issues raised by MSGA in the First and Second 15-Day Changes and fails to acknowledge the potential unintentional consequences of a feedstock outlined by its own employees in previous discussions. CARB is required under the law to achieve the maximum technically feasible and cost-effective reductions in greenhouse gas emissions. The most recent 15-Day Changes show a lack of willingness to achieve the statutory obligations set forth in AB-32 and neglect modernized, climate smart, science-based solutions, ultimately disregarding the protection of U.S. based feedstocks, the people, and the planet. MSGA also asks that CARB respond in writing to further substantiate their decisions regarding our concerns expressed in this letter. We look forward to your written responses as a state regulatory body, whose responsibility is to protect its' citizens and the environment by providing transparency on decisions made for those of impact.

MSGA is eager to continue working with CARB to support the role of agriculture in diversifying the fuel supply while reducing carbon intensity and increasing clean air in California and beyond. On behalf of U.S. soybean farmers, we appreciate the opportunity to comment and look forward to collaborating with CARB and other relevant stakeholders on implementation of policies that expand the use of U.S. soy-based biofuels and market opportunities for U.S. soybean farmers.

Sincerely,

Darin Johnson

President, Minnesota Soybean Growers Associaiton

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Carolyn Lozo
Chief, Transportation Fuels Branch
California Air Resources Board
1001 "I" Street
Sacramento, CA 95814

Via electronic submission

Re: Proposed Low Carbon Fuel Standard 15-Day Changes

Transportation Fuels Branch Chief Lozo:

Thank you for the opportunity to comment in response to the California Air Resources Board's (CARB) additional modifications to the Proposed Amendments to the Low Carbon Fuel Standard (LCFS) Regulation (Third 15-Day Package or Proposal). The National Oilseed Processors Association (NOPA) appreciates the opportunity to provide additional insights.

NOPA continues to urge CARB to reject the proposed vegetable oil cap and instead support science-based solutions that promote sustainable feedstocks, recognize existing certification frameworks, and keep the LCFS achievable. The cap risks increasing reliance on foreign feedstocks with weaker environmental standards. Additionally, given the ongoing rulemaking delays, we strongly recommend extending the 2026 sustainability criteria timeline.

Background

Organized in 1930, the National Oilseed Processors Association (NOPA) represents the U.S. soybean, canola, flaxseed, safflower seed, and sunflower seed-crushing industries. NOPA's membership is engaged in the processing of oilseeds for meal and oil that are utilized in the manufacturing of food, feed, renewable fuels, and industrial products. NOPA's 18 member companies operate 70 softseed and soybean solvent extraction plants across 21 states, crushing over 95% of all soybeans processed in the United States, the equivalent to more than 2 billion bushels annually.

Soybeans are made up of approximately 80% high protein meal and 20% oil, meaning that as more oil becomes available for renewable energy use, even more meal will become available for food and feed use. NOPA members have been building capacity to process domestic row crops into biofuel feedstocks in line with state and federal renewable fuel provisions. NOPA members - and new entrants into the soy processing sector - have invested approximately \$6 billion to expand U.S. crushing capacity by over 25% relative to 2023 installed capacity.

Continued Concerns with the Vegetable Oil Cap

NOPA strongly opposes CARB's continued pursuit of a cap on vegetable oils. The proposed limit is arbitrary, unsupported by market realities, and directly conflicts with California's climate goals.

CARB's own data demonstrates that vegetable oil feedstocks, primarily soybean and canola oil, have consistently exceeded the proposed cap since 2021. Capping these proven, sustainable, and scalable feedstocks would throttle the supply of renewable diesel, increase reliance on fossil fuels, and raise fuel prices for California consumers. Even CARB staff acknowledged in the April 2024 workshop that the cap would reduce air quality benefits and likely increase NOx and PM2.5 emissions.

Placing an artificial constraint on domestic feedstocks will undermine fuel availability, destabilize investments, and threaten California's decarbonization targets. We urge CARB to abandon this flawed approach and instead adopt a targeted, risk-based policy that differentiates high-risk feedstocks from those with verifiable sustainability attributes.

Concerns with the 2026 Sustainability Criteria Implementation Timeline

Given the likely delay in final rulemaking and the scope of change required across the supply chain, we strongly urge CARB to extend the implementation date to 2027 or later for the sustainability criteria to ensure effective and fair rollout.

Prior to the recent rulemaking delays, NOPA previously commented that the proposed 2026 implementation timeline does not adequately account for U.S. agriculture's real-world planning and production cycles. Farmers are already planting the 2025 crop which will be used to produce biofuels in 2026, and any data requirements tied to these crops must be communicated well in advance.

Further, the continued lack of clarity around terms like "farm" and how on-farm storage will be treated introduces additional complexity that could disrupt compliance. Education and outreach efforts required for certification system adoption takes time and must begin well before the implementation date.

Recognition of Other Certification Schemes

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NOPA strongly supports the continued mention of Canada's Clean Fuel Regulations (CFR) in the Third 15-Day Package and urges CARB to formally recognize the CFR as an "Approved Certification System" in the final rule. Mutual recognition of robust, government-administered programs—such as the CFR and the U.S. Renewable Fuel Standard (RFS)—would streamline compliance and promote alignment across major jurisdictions.

These programs already incorporate thorough sustainability verification processes for crop-based feedstocks and would help CARB achieve its environmental goals without duplicating effort or creating unnecessary barriers.

Support for Clarifications to Land Use Change (LUC) Values

NOPA supports CARB's refinements in Subsection 95488.3(d), which bring greater clarity and predictability to how Land Use Change (LUC) values will be determined. Specifically, the clarification that a conservative LUC value will only be used when no applicable Table 6 value exists is a welcome improvement. We also support the shift from the term "crop" to "biomass" for improved regulatory consistency.

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These changes enhance transparency and provide greater certainty for fuel pathway applicants, helping reduce unnecessary regulatory risk.

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To further support certainty for fuel pathway applicants, NOPA encourages CARB to clarify that the Canola Biomass-Based Diesel value in Table 6 is for "Spring Canola Biomass-Based Diesel." Argonne National Lab (ANL) recently qualified the canola included in its 2024 R&D GREET Model, which also references the 2024 Carbon Calculator for Land Use and Land Management Change from Biofuels Production (CCLUB), as "Spring Canola." NOPA urges CARB to adopt consistent terminology.

Strengthening Oversight of Waste Feedstocks

NOPA remains concerned that neither the Second nor Third 15-Day Packages include specific new measures to address fraud risks tied to waste feedstocks. As CARB's own Recirculated EIA and workshop presentations acknowledged, increasing pressure on crop-based feedstocks will heighten demand for waste materials, which in turn raises the risk of fraud—especially from imports.

Recent actions by the European Union in response to fraudulent Chinese biodiesel imports underscore this concern. Additionally, while imported renewable diesel is exempt from tariffs, extra precautions should be taken to prevent finished fuel made from potentially fraudulent waste feedstocks from circumventing existing LCFS safeguards. NOPA strongly encourages CARB to adopt enforceable traceability and verification standards, including origin disclosures, documentation audits, and—when appropriate—physical testing.

Conclusion

NOPA urges CARB to reconsider the proposed vegetable oil cap, extend the 2026 sustainability implementation date, and officially recognize established sustainability systems like Canada's CFR and the U.S. RFS. We support the clarifications made to the LUC methodology and continue to recommend enhanced oversight of waste feedstocks to protect the integrity of the LCFS. These steps would enable CARB to meet its climate goals while also supporting American farmers and processors who are investing in the future of low-carbon energy.

Thank you again for the opportunity to comment. We look forward to continued engagement with CARB and our partners in advancing a more sustainable and resilient fuel supply.

Sincerely,

Devin Mogler

President & CEO

Devin Mogler

NOPA

Via Electronic Submittal

Clerk of the Board California Air Resources Board 1001 I. Street Sacramento, CA 95814

Re: Comments on the Third Notice of Public Availability of Modified Text and Availability of Additional Documents and Information

Dear Honorable Members of the California Air Resources Board:

Leadership Counsel for Justice and Accountability, Defensores Del Valle Central Para El Aire Y Agua Limpio, Animal Legal Defense Fund, Food & Water Watch, and Center for Food Safety (collectively, "Commenters") submit the following comments on the Third Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information regarding amendments to the Low Carbon Fuel Standard ("Third 15-Day Changes").¹

Commenters have submitted multiple sets of comments explaining that the Amendments to the Low Carbon Fuel Standard ("LCFS") greatly increase the incentives for the dairy and livestock sectors to consolidate into ever larger confinement operations utilizing highly polluting practices like liquid manure handling systems (*i.e.*, "factory farms") and to expand their herd sizes in order to take advantage of lucrative LCFS crediting. The original Draft Environmental Impact Analysis ("DEIA")², the Recirculated Draft Impact Analysis ("Recirculated DEIA")³, and the Final Draft Impact Analysis

¹ CARB, Third Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information, Proposed Low Carbon Fuel Standard Amendments (released Apr. 4, 2025) (hereinafter "Third 15-Day Changes"), https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/3rd_15day_notice.p df.

² CARB, Draft Environmental Impact Analysis for the Proposed Low Carbon Fuel Standard Regulation (January 2, 2024) ("DEIA"), https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/appd.pdf.

³ CARB, Recirculated Draft Environmental Impact Analysis for the Proposed Low Carbon Fuel Standard Regulation (August 16, 2024) ("Recirculated DEIA"), https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/recirculated_draft_eia.pdf.

("FEIA")⁴ intentionally omitted *any* analysis of the environmental impacts of herd expansion and included an insufficient, cursory analysis of the impacts associated with digesters. Commenters also explained that CARB could not lawfully adopt the LCFS Amendments without significant changes, including eliminating the false baseline of unregulated manure methane emissions that forms the foundation of CARB's avoided methane crediting policy. Commenters further objected to CARB's attempt to use the LCFS to achieve post-2030 greenhouse gas reductions and as the policy mechanism to develop hydrogen fuel and infrastructure for stationary sources.

Despite the myriad flaws in the LCFS Amendments and CARB's environmental analysis, on November 8, 2024, CARB adopted the LCFS Amendments and certified the EIA.

On February 18, 2024, the Office of Administrative Law ("OAL") issued a Notice of Disapproval of the LCFS Amendments because the amendments lacked clarity and CARB failed to follow the correct procedure. OAL followed up its Notice with a Decision of Disapproval of Regulatory Action that explained the basis for its disapproval of the LCFS Amendments. OAL took issue with two provisions governing avoided methane crediting for fuel derived from livestock manure: Section 95488.9(f)(3)(A) (governing the renewal of avoided methane crediting periods for projects that have broken ground before 2030) and Section 95481 (definition of "Break Ground").

In response to OAL's Disapproval, CARB made changes to Sections 95488.9(f)(3)(A) and 95481 that significantly modified the effect of the LCFS Amendments to provide an even greater incentive for factory farms to expand their herd sizes, manage their waste in ways that maximize methane emissions, and install anaerobic digesters, while simultaneously failing to clarify the confusing language OAL took issue with in the first instances. The changes made to these Sections trigger the requirement delineated in Government Code Section 11349.4 for CARB to re-adopt the

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⁴ CARB, Final Environmental Impact Analysis for the Proposed Low Carbon Fuel Standard Regulation (November 6, 2024),

https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/lcfs_final_eia.pdf.

⁵ Office of Administrative Law, Notice of Disapproval of Regulatory Action (February 18, 2025),

https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/lcfs_oal_disapproval_notice.pdf.

⁶ Office of Administrative Law, Decision of Disapproval of Regulatory Action (February 25, 2025) ("Disapproval Decision"),

 $[\]underline{https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/disapproval_decision.pdf.}$

LCFS Amendments in a properly noticed public hearing. Additionally, because the 053.1 cont. changes will worsen the already-significant environmental impacts of the LCFS, CARB cannot approve these changes without first preparing a subsequent environmental impact analysis pursuant to Public Resources Code Section 21166.⁷

> CARB further proposes changes to Section 95482(h) to increase its reliance on the LCFS as CARB's preferred policy mechanism to build out hydrogen fuels and hydrogen infrastructure for the post-2030 period, including for use by stationary sources. CARB amends Section 95482(h) to authorize hydrogen transportation fuels after January 1, 2030 to include "hydrogen produced with accompanying carbon capture and sequestration technology, or a combination of renewable hydrogen and hydrogen produced with accompanying carbon capture and sequestration technology." CARB has already acknowledged, as it must, that it wants to use hydrogen as a fuel for stationary sources and that so-called low-carbon hydrogen faces a number of obstacles including high cost, low generation capacity, and pipeline infrastructure bottlenecks. The proposed 15-day changes increase CARB's reliance on the LCFS to incentivize hydrogen production by authorizing LCFS credits for hydrogen fuels produced using carbon capture and sequestration ("CCS") or produced using CCS in combination with avoided methane credits via book-and-claim accounting. CARB lacks the statutory authority to use the LCFS for its hydrogen policy objectives and as such the amendments to section 95482(h) are ultra vires.

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⁷ CARB acts pursuant to a certified regulatory program which exempts the agency from preparing an Environmental Impact Report ("EIR") because the environmental analysis CARB is required to undertake is deemed the functional equivalent of an EIR. 17 Cal. Code Regs. §§ 60000-60007; POET, LLC v. State Air Resources Bd. (2013) 218 Cal.App.4th 681, 710. CARB's actions are subject to all other substantive provisions of California Environmental Quality Act ("CEQA"). 14 Cal. Code Regs. § 15250; POET, LLC, 218 Cal.App.4th at 710.

⁸ CARB, STAFF REPORT: INITIAL STATEMENT OF REASONS 30 (released Dec. 19, 2023), https://perma.cc/FJ9B-3UXD; CARB, Draft Net-Zero Greenhouse Gas Emissions Strategy for the California Cement Sector, at 48-49 (released March 19, 2025), available at https://ww2.arb.ca.gov/sites/default/files/2025-03/Draft%20Net-Zero%20GHG%20Emissions%20Strategy%20for%20the%20Cement%20Sector.pdf (Exhibit A).

⁹ The proposed amendments would allow book-and-claim accounting to allow the avoided methane credits to greenwash hydrogen production into renewable hydrogen. See Section 95488.8(i)(2).

I. CARB's Changes to the Proposed Amendments Increase the Incentive for Factory Farms to Expand Their Herds and Install Anaerobic Digesters, Triggering a Requirement for More Environmental Review and a Noticed Public Hearing.

The California Administrative Procedure Act ("APA") and California Environmental Quality Act ("CEQA"), respectively, require CARB to re-adopt the LCFS Amendments in a noticed public hearing and conduct further environmental review of the impact of the changes made in response to OAL's Disapproval. The APA generally requires OAL to review amendments to regulations adopted by state agencies and authorizes OAL to issue disapproval decisions where, as here, the amendments lack sufficient clarity. Gov't Code § 11349.1. After receiving a disapproval decision from OAL, the agency must rewrite and resubmit the regulations. *Id.* § 11349.3(a). If the agency makes significant changes to any substantive provisions of the regulation, the agency must readopt the amendments in a noticed public hearing. *Id.* Here, CARB made significant changes that altered the effect of provisions governing the treatment of avoided methane crediting for fuel derived from livestock manure, requiring CARB to readopt the LCFS Amendments.

CARB's obligation to readopt the LCFS Amendments triggers a distinct requirement to adequately analyze the environmental impacts of the changes made in response to OAL's Disapproval Decision. Where a public agency makes a subsequent decision to approve a portion of a project that the agency has previously approved, CEQA requires the agency to supplement its previously-certified EIR/EIA if "substantial changes are proposed in the project which will require major revisions of the previous EIR ... due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects." 14 Cal. Code Regs. § 15162(a)(1). In these circumstances, the lead agency must prepare a Subsequent EIR/EIA (*id.*), unless the changes are relatively minor, in which case the lead agency may prepare a Supplemental EIR/EIA (*id.* § 15163). Here, the changes CARB made to the provisions governing avoided methane crediting for fuel derived from livestock manure will intensify the already-significant impacts of the LCFS Amendments, necessitating supplemental environmental review.

A. Section 95488.9(f)(3)(A): Making Excessive Factory Farm Avoided Methane Crediting Mandatory.

Section 95488.9(f)(3)(A) governs the duration for which a certified factory farm gas fuel pathway is eligible for avoided methane crediting. The LCFS Amendments added language to Section 95488.9(f)(3)(A) providing that the Executive Director of CARB "may" renew avoided methane crediting periods for factory farm fuel pathways as

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follows: pathways certified before the effective date of the regulation are eligible for three, consecutive 10-year crediting periods; pathways certified after the effective date of the regulation but before January 1, 2030 are eligible for two, consecutive 10-year crediting periods; and pathways certified after December 31, 2029 are only eligible for avoided methane crediting through either 2040 or 2045, depending on which type of fuel is produced. OAL took issue with CARB's use of the word "may," stating it is "unclear when the Executive Officer will renew crediting periods for fuel pathways." OAL also explained that "it is unclear what factors, criteria, or other information will be evaluated by the Executive Officer" when making renewal decisions.

In response to OAL, CARB replaced the word "may" with "shall" and added language providing that the pathways which qualify for renewal are those that "continue to meet applicable eligibility requirements." CARB thus eliminated the Executive Officer's discretion to refuse to renew crediting periods for those pathways that "meet applicable eligibility requirements." As Commenters explained repeatedly in prior comments, by allowing more crediting periods for pathways certified before January 1, 2030, the LCFS Amendments provide a significant incentive for factory farms to expand their herds and install methane-producing infrastructure in the near-term. With this change, the LCFS amendments will now provide an even greater incentive for factory farms to act quickly and take advantage of the *guaranteed* renewal periods. Additionally, because "applicable eligibility requirements" provide no guardrails against factory farms deliberately increasing their methane pollution for capture and LCFS credit generation, these guaranteed renewal periods will significantly increase the motivation and certainty of multi-decade financial rewards for bad actor operations that pollute more to profiteer off the LCFS.

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The APA requires CARB to readopt the LCFS Amendments in a public hearing because CARB substantively changed the effect of this provision. Gov't Code § 11349.4(a). This change goes well beyond those at issue in *Californians for Safe Prescriptions v. California State Bd. of Pharmacy* (1993) 19 Cal.App.4th 1136, the only reported case to consider whether changes to a regulation made in response to an OAL

¹⁰ California Air Resources Board, Final Regulation Order: Proposed Amendments to the Low Carbon Fuel Standard, at 180-81 (January 3, 2025) ("Initial LCFS Amendments"), https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/fro atta-1.pdf.

¹¹ Disapproval Decision, at 9.

¹² *Id*.

¹³ California Air Resources Board, Proposed Regulation Order: Proposed Amendments to the Low Carbon Fuel Standard Regulation, at 170 (April 4, 2025) ("Proposed LCFS Amendments"),

 $[\]underline{https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/atta1.pdf}.$

disapproval required a public hearing. There, the petitioner unsuccessfully challenged numerous changes to a regulation governing the tasks that non-pharmacists can do in pharmacies. *Id.* at 1142. The originally adopted regulations provided, for example, that a non-licensed person may do certain pharmacy tasks "subject to prior review by a pharmacist." *Id.* at 1145. After OAL disapproval, the agency changed the regulation to provide that a non-licensed person may do certain tasks "at the direction of the pharmacist." *Id.* at 1145. The court held that this was not a significant change because it did not substantively affect the meaning of the regulatory provision. *Id.* at 1145-46. Unlike that change, CARB's change here alters the effect of Section 95488.9(f)(3)(A) by removing the discretion of the Executive Director to not renew crediting periods for factory farm gas pathways. CARB must hold a public hearing to consider this change.

This change will result in a "substantial increase in the severity of previously identified significant effects," (14 Cal. Code Regs. § 15162(a)(1)), thus also triggering a need for further environmental review. CARB itself acknowledged that the LCFS Amendments would have numerous significant air and water quality impacts, due in part to the LCFS Amendments causing an increase in the number of anaerobic digesters installed at factory farms. The reason CARB concluded that the LCFS Amendments would cause an increase in the installation of anaerobic digesters is that the amendments "incentivize the collection and use of biomethane gas from dairies." CARB's change would further incentivize the installation of anaerobic digesters on large dairies and other factory farms, thereby substantially increasing the severity of the significant impacts identified in the EIA.

Similarly, this change will increase the severity of the significant impacts associated with herd expansion, which CARB failed to acknowledge in the EIA. As Commenters have consistently explained, voluminous data demonstrates that expansion of herds is a reasonably foreseeable compliance response to the LCFS Amendments. The faulty nationwide and statewide data CARB relied on in its Recirculated DEIA did not come close to providing substantial evidence supporting its position that there is no link between the LCFS and herd expansion.

Indeed, since the November 2024 approval of the LCFS Amendments, more evidence showing the effect of the LCFS on herd expansion has surfaced, both in California and beyond the state's borders. On April 1, 2025, CARB approved a pathway application submitted by Five Points Pipeline LLC for a collection of five dairies in the San Joaquin Valley that confine a total of 32,200 cows, each of which previously

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¹⁴ Final EIA, at 59-74, 110-122.

¹⁵ Recirculated DEIA, at 30.

installed anaerobic digesters.¹⁶ Commenters submitted comments opposing the pathway application, noting that, according to CARB's own data, the largest of the five dairies grew by over 50% between 2013 and 2015, during the same time period that it applied for and received state funding to upgrade a decommissioned digester and initiate operations. Since 2022 and leading up to being approved to generate avoided methane credits, the dairy has grown an additional 15 percent – to 10,700 cows.¹⁷ Despite the clear fact that this operation has increased its methane emissions with no attempt to mitigate them in the leadup to applying for the LCFS, CARB will now reward those decisions by crediting Five Points Pipeline LLC for capturing a portion of that intentionally generated methane pollution.

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On March 28, 2025, CARB certified fuel pathway B0698 for a collection of factory farms in Arizona. Commenters submitted comments opposing this fuel pathway application, in part because of herd expansion. One factory farm included in the B0698 fuel pathway was previously included in the B0308 fuel pathway, which CARB certified in June 2022, allowing it to profit from avoided methane crediting. Under the B0308 fuel pathway, the factory farm reported a herd size of 10,700 cows. When CARB recently certified the B0698 fuel pathway, that same factory farm reported a herd size of 18,500 cows—7,800 more cows than it had in 2022. This represents a herd expansion of over 70% in the less than three years that this factory farm has participated in the LCFS and profited from avoided methane crediting. Another factory farm in the B0698 fuel pathway did not exist until 2016, five years after the inception of the LCFS. Yet the LCFS now rewards this factory farm for capturing the methane from nearly 6,000 cows. On the LCFS is a collection of the LCFS.

On March 26, 2025, CARB approved fuel pathway B0725 for a collection of factory farms in Iowa. Commenters also submitted comments opposing this fuel pathway application, in part due to herd expansion incentivized by the LCFS. Commenters noted

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¹⁶ California Air Resources Board, Staff Summary: Five Points Pipeline LLC Tier 2 Pathway Application B0688 (April 1, 2025) (**Exhibit B**).

¹⁷ Leadership Counsel for Justice & Accountability, Central Valley Defenders of Clean Water & Air, Food & Water Watch, and Animal Legal Defense Fund, Comments on Tier 2 Pathway Application B0688 (March 26, 2025) (Exhibit C).

¹⁸ California Air Resources Board, Staff Summary: WOF SW GGP 1 LLC Tier 2 Pathway Application B0308 (June 30, 2022) (**Exhibit D**).

¹⁹ California Air Resources Board, Staff Summary: WOF SW GGP 1 LLC Tier 2 Pathway Application B0698 (March 28, 2025) (**Exhibit E**); Leadership Counsel for Justice & Accountability, Central Valley Defenders of Clean Water & Air, Food & Water Watch, and Animal Legal Defense Fund, Comments on Tier 2 Pathway Application B0698 (March 24, 2025) (**Exhibit F**).

²⁰ *Id*.

that the number of cows on this collection of factory farms had nearly doubled since the beginning of the LCFS program.²¹ Notably, the largest factory farm in the application did not exist until 2016—five years after the LCFS began.²² That same factory farm expanded its herd by 66% from 2022 to 2024. Another one of these factory farms recently got a permit to expand its operations by another 45%.

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Taken together, these new fuel pathways demonstrate that the LCFS is perversely incentivizing rapid herd expansion both within and beyond California's borders and even encouraging the creation of new factory farms. And the timeline shows that avoided methane crediting in the LCFS has supercharged this perverse incentive. Now, CARB seeks to reward these massive, recent herd expansions with lucrative LCFS credits.

As with the installation of anaerobic digesters and foregoing manure management that does not produce large methane emissions, the change made by CARB will further incentivize factory farms to expand their herds to take advantage of *guaranteed* avoided methane crediting periods during which factory farms can increase their financial returns by generating more methane pollution. Environmental review is needed to analyze the impacts associated with increased herd expansion.

B. Section 95481: Expanding Eligibility for Excessive Factory Farm Avoided Methane Crediting.

Section 95481 consists of a list of the definitions governing the LCFS. In the initially approved LCFS Amendments, CARB added a definition for the term "Break ground," defining it as "earthmoving and site preparations necessary for construction of the digester system and supporting infrastructure that starts following approval of all necessary entitlements/permits for the project." In its Final Statement of Reasons, CARB stated that this "definition adequately suggests that construction activity should begin shortly after breaking ground." The OAL took issue with the definition because it did not capture CARB's stated intent to require construction activity to begin "shortly after" breaking ground. ²⁵

²¹ Leadership Counsel for Justice & Accountability, Central Valley Defenders of Clean Water & Air, Food & Water Watch, and Animal Legal Defense Fund, Comments on Tier 2 Pathway Application B0725 (March 18, 2025) (**Exhibit G**).

²² California Air Resources Board, Staff Summary: Gevo NW Iowa RNG, LLC Tier 2 Pathway Application B0725 (March 26, 2025) (**Exhibit H**).

²³ Initial LCFS Amendments, at 7.

²⁴ Disapproval Decision, at 20.

 $^{^{25}}$ *Id*.

In response to the OAL Disapproval, CARB added the following sentence to the end of the definition: "This has the same meaning as 'Beginning of Construction' as used for federal investment tax credits and clarified under IRS guidance Notice 2022-61 (November 30, 2022), incorporated herein by reference." According to Notice 22-61, an entity can establish "Beginning of Construction" in one of two ways: (1) by starting physical work of a significant nature ("Physical Work Test"); and (2) by paying or incurring five percent or more of the total cost of the facility ("Five Percent Safe Harbor"). 27

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CARB's response to OAL's Disapproval Decision suffers from several flaws. First, the change is not responsive to the OAL's Disapproval. OAL took issue with the definition's failure to adequately articulate whether construction activity is required following breaking ground; OAL did not take issue with the particular actions an entity must take to break ground. Additionally, CARB's change makes the definition internally inconsistent. As written, the definition requires "earthmoving and site preparations" to break ground, but would also allow an entity to "break ground" purely through financial commitments. OAL is likely to issue another disapproval decision on these grounds unless CARB rewrites the definition.

Expanding the definition of breaking ground to apply to simply incurring five percent of the cost of a facility will likely increase the availability of credit generation by factory farms. Numerous provisions governing crediting for fuel derived from livestock manure provide more credit opportunities for projects that "break ground" before a specified date. See, e.g., Section § 95488.8(i)(2)(B) (biomethane from projects breaking ground after December 31, 2029 must comply with pipeline delivery requirements); Section § 95488.9(f)(3)(A) (pathways for natural gas produced from livestock manure that break ground after December 31, 2029 only eligible for avoided methane crediting through December 31, 2040); Section § 95488.9(f)(3)(A) (pathways for hydrogen or electricity produced from livestock manure that break ground after December 31, 2029 only eligible for avoided methane crediting through December 31, 2045); Section § 95488.9(f)(3)(B) (rule restricting avoided methane crediting in the event of direct regulation requiring methane reductions from factory farms only applies to projects that break ground after December 31, 2029).

²⁶ Proposed LCFS Amendments, at 7.

²⁷ Internal Revenue Service, Prevailing Wage and Apprenticeship Initial Guidance Under Section 45(b)(6)(B)(ii) and Other Substantially Similar Provisions, 87 Fed. Reg. 73580 (November 30, 2022), https://www.federalregister.gov/documents/2022/11/30/2022-26108/prevailing-wage-and-apprenticeship-initial-guidance-under-section-45b6bii-and-other-substantially.

Making it easier for factory farm biomethane projects to "break ground" will 053.3 cont. inevitably increase the incentive to produce methane pollution for fuel production—and, in turn, LCFS credits. Unlike the non-substantive clarifications in Californians for Safe *Prescriptions*, 19 Cal.App.4th at 1146, expanding the definition to apply to purely financial commitments substantively changes the effect of the definition of "Break ground." CARB must hold a public hearing to consider this change. See Gov't Code § 11349.4(a). Similarly, making it easier for factory farms to qualify for longer crediting periods will substantially increase the severity of those significant environmental impacts identified in the EIA, as well as those CARB fails to acknowledge. 14 Cal. Code Regs. § 15162(a)(1). CARB must conduct supplemental environmental review to adequately analyze how expanding the definition of "Break ground" will impact air and water quality in the communities surrounding factory farms.

053.3a

Moreover, CARB's reliance on rules developed by the Department of Treasury ("Treasury") is particularly problematic given how Treasury treats avoided methane crediting for factory farms. On January 15, 2025, Treasury promulgated final regulations implementing the credit for production of clean hydrogen and certain provisions of the energy credit as enacted by the Inflation Reduction Act of 2022 ("Clean Hydrogen and Energy Credit Regulations"). 28 On January 15, 2025, Treasury also promulgated final regulations regarding the clean electricity production credit and the clean electricity investment credit established by the Inflation Reduction Act of 2022 ("Clean Electricity Production and Investment Credit Regulations"). 29 Under the same regulatory regime CARB cites favorably to and proposes to adopt text from, the Treasury has taken a very different approach with respect to the perverse incentives created by rewarding manure methane emissions.

Instead of ignoring the obvious problem of perversely incentivizing factory farms to produce more pollution to capture LCFS credits as CARB staff has done and continues to do, Treasury readily acknowledges the "risks of perverse incentives" and sought to establish guardrails against this problem.³⁰ In both rulemakings, Treasury states that "the magnitude of the incentive provided by the" credits create "a significant risk of additional waste production in response to the credit."³¹ Treasury warns that "crediting the additional waste with avoided emissions would result in inaccurate credit

²⁸ Department of the Treasury, Credit for Production of Clean Hydrogen and Energy Credit, 90 Fed. Reg. 2224-01 (January 15, 2025).

²⁹ Department of the Treasury, Section 45Y Clean Electricity Production Credit and Section 48E Clean Electricity Investment Credit, 90 Fed. Reg. 4006 (January 15, 2025). ³⁰ 90 Fed. Reg. at 2290; 90 Fed. Reg. at 4081.

³¹ 90 Fed. Reg. at 2290; 90 Fed. Reg. at 4080.

053.3a cont. determinations."³² Treasury provided examples of how factory farms could increase their methane pollution to take advantage of lucrative crediting, including by:

Shifting management practices for existing quantities of manure from land application to lagoon, thereby significantly increasing methane generation;

On the margin, making new or expanded concentrated animal feeding operations (CAFOs) more profitable (whether by increasing the overall numbers of animals raised, or by consolidating smaller existing operations) and thereby inducing additional manure and methane generation; and

Using management practices at biodigesters to produce more methane than would have been produced otherwise (for example, increasing the temperature at an anaerobic digester).³³

Treasury also recognizes the significant uncertainty around leakage, noting the "range of leakage rates from operations capturing and upgrading manure-derived methane," which could introduce a "risk of over crediting in estimating a GHG emissions rate."³⁴

In light of these realities and concerns, Treasury took a more careful approach and assigned a weighted average carbon intensity for all manure-derived fuels of -51 grams of CO2eq/MJ—not the free-for-all, race to the bottom engendered by CARB's approach under these LCFS amendments. Treasury's approach to avoided methane crediting demonstrates that Commenters' concerns with the LCFS are well-founded, and that there are alternative, more cautious approaches available to CARB. Additionally, Treasury's rulemakings directly undercut CARB's unsupported position that there is no link between avoided methane crediting and herd expansions.

II. CARB's Changes to the Proposed Amendments Unlawfully and Arbitrarily Use the LCFS to Achieve Post-2030 Policies to Develop Hydrogen Fuels.

053.2 cont.

CARB's proposed LCFS amendments exceed its statutory authority when it unilaterally decides to use the LCFS to build-out hydrogen fuels and infrastructure post-2030. As set forth in Commenters' prior comments, the Legislature has not authorized such rulemaking authority for post-2030 policy or otherwise directed CARB to use the LCFS as the mechanism for developing hydrogen infrastructure or stationary source fuels. Because CARB does not operate with unbound rulemaking authority, CARB may

³² 90 Fed. Reg. at 2290; 90 Fed. Reg. at 4080.

³³ 90 Fed. Reg. at 2290; 90 Fed. Reg. at 4080.

³⁴ 90 Fed. Reg. at 2289; 90 Fed. Reg. at 4080.

053.2 cont. not proceed as proposed to develop hydrogen fuels post-2030 or otherwise use the LCFS to build out hydrogen for use by stationary sources.

The Legislature has not authorized CARB to adopt rules or regulations to achieve reductions in greenhouse gas emissions to achieve post-2030 policy objectives, including building out hydrogen fuels and hydrogen infrastructure for stationary sources. Nor did the Legislature give CARB such authority in Senate Bill 596 or Senate Bill 1075.³⁵ Senate Bill 596 directs CARB to prepare a comprehensive strategy for the cement sector by July 1, 2023, one of the hard to decarbonize stationary source sectors which the 2022 Scoping Plan Update identifies. The Legislature authorizes CARB to implement that cement strategy only "upon appropriation by the Legislature" and to date CARB has only produced a draft strategy which identifies hydrogen as a potential fuel for the cement sector. In Senate Bill 1075, the Legislature directed CARB to prepare an evaluation of hydrogen, including green hydrogen, by June 1, 2024, that shall include policy recommendations, a description of potential strategies supporting hydrogen infrastructure, and an analysis of hydrogen use as a climate strategy. Senate Bill 1075 did not authorize CARB to adopt rules or regulations to implement the hydrogen strategy.

CARB proposes changes to section 95482(h) to authorize, after January 1, 2030, hydrogen fuels produced using CCS or using CCS in combination with avoided methane credits through book-and-claim accounting. To date, CARB has not produced the Senate Bill 1075 report and the Legislature has not given CARB rulemaking authority. CARB lacks the statutory authority to adopt this amendment, and the proposed changes are thus *ultra vires*.

III. Conclusion

For the foregoing reasons, CARB must readopt the LCFS Amendments after conducting adequate environmental review of the changes proposed in response to OAL's Disapproval.

https://ww2.arb.ca.gov/sites/default/files/2025-03/Draft%20Net-Zero%20GHG%20Emissions%20Strategy%20for%20the%20Cement%20Sector.pdf.

Zero%20GHG%20Emissions%20Strategy%20for%20the%20Cement%20Sector.pdf ³⁸ Health & Safety Code § 38561.8(b).

³⁵ See SB 596, 2021 Cal. Legis. Serv. Ch. 246; SB 1075, 2022 Cal. Legis. Serv. Ch. 250.

³⁶ Health & Safety Code § 38561.2(c). The Legislature has not appropriated funds for this purpose.

³⁷ CARB, Draft Net-Zero Greenhouse Gas Emissions Strategy for the California Cement Sector 47-49 (released March 19, 2025), available at

Respectfully submitted April 21, 2025

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Exhibits

Exhibit A: California Air Resources Board, Draft Net-Zero Greenhouse Gas Emissions Strategy for the California Cement Sector (March 14, 2025), https://ww2.arb.ca.gov/sites/default/files/2025-03/Draft%20Net-Zero%20GHG%20Emissions%20Strategy%20for%20the%20Cement%20Sector.pdf.

Exhibit B: California Air Resources Board, Staff Summary: Five Points Pipeline LLC Tier 2 Pathway Application B0688 (April 1, 2025).

Exhibit C: Leadership Counsel for Justice & Accountability, Central Valley Defenders of Clean Water & Air, Food & Water Watch, and Animal Legal Defense Fund, Comments on Tier 2 Pathway Application B0688 (March 26, 2025).

Exhibit D: California Air Resources Board, Staff Summary: WOF SW GGP 1 LLC Tier 2 Pathway Application B0308 (June 30, 2022).

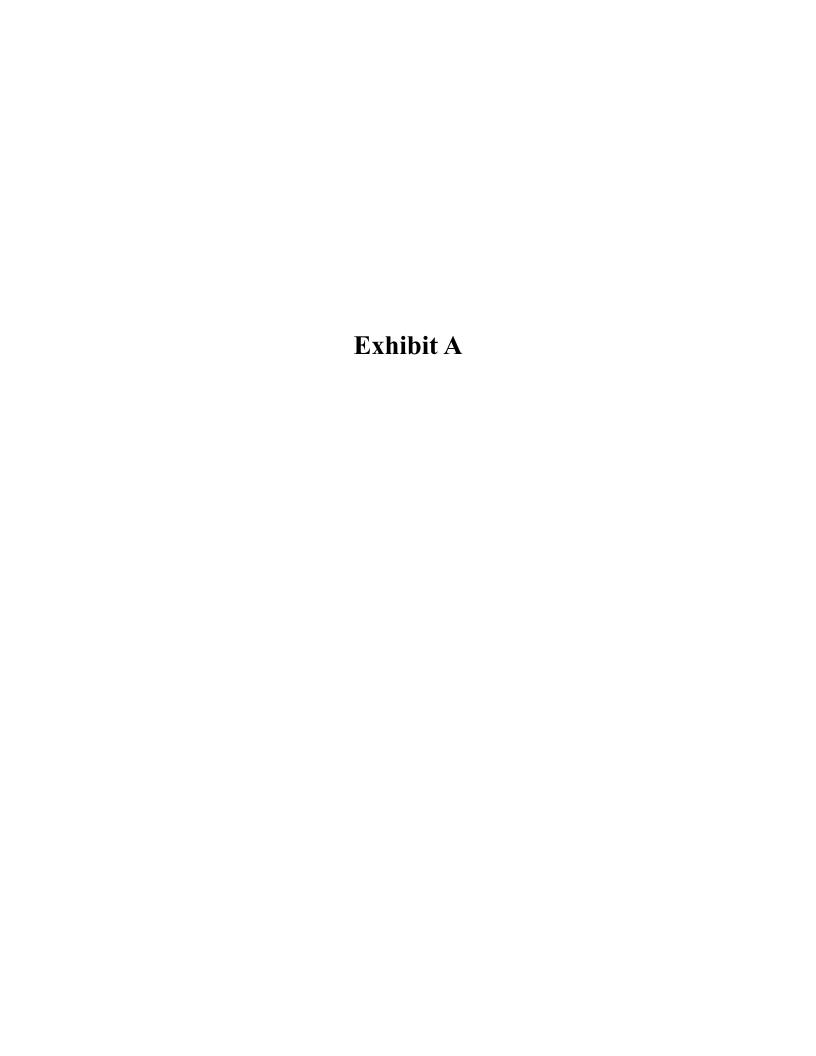
Exhibit E: California Air Resources Board, Staff Summary: WOF SW GGP 1 LLC Tier 2 Pathway Application B0698 (March 28, 2025).

Exhibit F: Leadership Counsel for Justice & Accountability, Central Valley Defenders of Clean Water & Air, Food & Water Watch, and Animal Legal Defense Fund, Comments on Tier 2 Pathway Application B0698 (March 24, 2025).

Exhibit G: Leadership Counsel for Justice & Accountability, Central Valley Defenders of Clean Water & Air, Food & Water Watch, and Animal Legal Defense Fund, Comments on Tier 2 Pathway Application B0725 (March 18, 2025).

Exhibit H: California Air Resources Board, Staff Summary: Gevo NW Iowa RNG, LLC Tier 2 Pathway Application B0725 (March 26, 2025)

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Draft Net-Zero Greenhouse Gas Emissions Strategy for the California Cement Sector

Draft Net-Zero GHG Emissions Strategy for the California Cement Sector

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Abbreviations

°C	Degrees Celsius
AASHTO	American Association of State Highway and Transportation Officials
AB	Assembly Bill
ACI	American Concrete Institute
ACM	alternative cementitious material
AMC	advanced market commitment
AQMD	Air Quality Management District
ARL	Adoption Readiness Level
ASTM	American Society for Testing and Materials
ВСА	Border Carbon Adjustment
Btu	British Thermal Unit
CalEPA	California Environmental Protection Agency
CalTrans	California Department of Transportation
CARB	California Air Resources Board
СВАМ	Carbon Border Adjustment Mechanism
CCR	California Code of Regulations
CCS	carbon capture and sequestration
CCUS	carbon capture, utilization, and storage
CDR	carbon dioxide removal
CEQA	California Environmental Quality Act
CH ₄	methane
CN	Combined Nomenclature
CNRA	California Natural Resources Agency
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalent
CPUC	California Public Utilities Commission
CWDB	California Workforce Development Board
DAC	direct air capture
EMSW	engineered municipal solid waste
EPD	environmental product declaration
GCCA	Global Cement and Concrete Association
GGBFS	ground granulated blast furnace slag
GHG	greenhouse gas
GWP	global warming potential
HTS	Harmonized Tariff Schedule
IBC	International Building Code
ICC	International Code Council
IIJA	Infrastructure Investment and Jobs Act
IRA	Inflation Reduction Act
MMBtu	one million British thermal units
MT	metric tons

MMT	million metric tons
MMTCO ₂ e	million metric tons of carbon dioxide equivalent
MRR	The Regulation for the Mandatory Reporting of GHG Emissions
MSW	municipal solid waste
MTCO ₂ e	metric tons of carbon dioxide equivalent
MW	megawatt
MWh	megawatt-hour
N ₂ O	nitrous oxide
NAICS	North American Industry Classification System
NGO	non-governmental organization
NOx	nitrogen oxides
ОЕННА	Office of Environmental Health Hazard Assessment
PCA	Portland Cement Association
PHMSA	Pipeline and Hazardous Materials Safety Administration
PLC	Portland limestone cement
PM ₁₀	Fine particulate matter ≤ 10 micrometers in diameter
PM _{2.5}	Fine particulate matter ≤ 2.5 micrometers in diameter
SB	Senate Bill
SCM	supplementary cementitious material
TRL	Technology Readiness Level
U.S. DOE	U.S. Department of Energy
U.S. EPA	U.S. Environmental Protection Agency
UIC	Underground Injection Control
USGS	U.S. Geological Survey
WHR	waste heat recovery

Overview and the Role of the SB 596 Cement Strategy

Cement is a crucial ingredient to make concrete, which is one of the most widely used construction materials. California, with seven active manufacturing plants, is one of the largest cement producing states in the United States. California's seven plants collectively produce roughly 10 million metric tons (MMT) of cement and emit about 7.5 MMT of greenhouse gas (GHG) emissions each year, which is about two percent of statewide GHG emissions. Senate Bill (SB) 596 (Becker, Chapter 240, Statutes of 2021) was signed by Governor Newsom in September 2021 and requires the California Air Resources Board (CARB or Board) to develop a comprehensive strategy (SB 596 Cement Strategy) for cement used in California to achieve two GHG intensity targets: 40% below 2019 levels by 2035 and net-zero emissions by 2045. In developing the Strategy, SB 596 requires that CARB:

- Define a metric for GHG intensity and evaluate relevant 2019 data to establish a baseline from which to measure GHG intensity reductions.
- Assess existing measures, identify modifications to existing measures, and evaluate new measures to overcome market, statutory, and regulatory barriers that currently inhibit achieving net-zero emissions;
- Evaluate measures to support market demand and financial incentives to encourage the production and use of cement with low GHG intensity, including:
 - o Measures to expedite the adoption of Portland limestone cement and other blended cements in projects undertaken by State agencies;
 - o Measures to provide financial support and incentives for research, development, and demonstration of technologies to mitigate GHG emissions from cement production to accelerate deployment;
 - o Measures to facilitate fuel switching; and
 - o Measures to create incentives and remove obstacles for energy efficiency improvements and waste heat recovery;
- Prioritize actions that leverage state and federal incentives;
- Identify actions that reduce adverse air quality impacts; and
- Support economic and workforce development in communities neighboring cement plants.

SB 596 also requires consideration of provisions to minimize emissions leakage and account for GHG emissions embedded in imported cement in a similar manner as GHG emissions from cement produced in the state, such as a border carbon adjustment. Finally, SB 596 requires CARB to coordinate and consult with other state agencies, districts, and experts in academia, industry, and public health, and with local communities.

Overview of California's Climate Policies

SB 596 is one of California's suite of climate policies that started in 2006 with the passage of the Assembly Bill (AB) 32 (Nu?ez and Pavley, Chapter 488, Statutes of 2006), the California Global Warming Solutions Act of 2006, which established statewide greenhouse gas reductions goals for anthropogenic sources of emissions such as energy production, manufacturing sectors, and transportation fuels. The AB 32 goal to return to 1990 levels of greenhouse gas emissions by 2020 was achieved years ahead of schedule in 2014. As Figure 1 shows, California is now implementing policies to achieve a target of 40 percent below 1990 levels by 2030 set by SB 32 (Pavley, Chapter 249, Statutes of 2016), and to achieve carbon neutrality as soon as possible, but no later than 2045 (AB 1279 (Muratsuchi, Chapter 337, Statutes of 2022)). AB 1279 also requires ensuring that statewide anthropogenic GHG emissions are reduced by at least 85 percent below 1990 levels to meet the carbon neutrality goals by 2045. The cement sector is included in the state's overall climate goals and is specifically covered by the Cap-and-Trade Program. The emissions reductions achieved through implementation of SB 596 will contribute to California's state-wide goals, and SB 596 and AB 1279 share a common goal to achieve carbon neutrality by 2045. There are some differences in the mid-term targets -- the SB 596 2035 interim target is 40% below the average 2019 levels (measured as GHG emissions intensity per ton of cement used in California). The SB 32 statewide GHG reduction goal is 40% below the 1990 level by 2030.





The 2022 Scoping Plan for Achieving Carbon Neutrality (2022 Scoping Plan Update), approved by the CARB Board in December 2022, reviewed the suite of California's climate policies to lay out the sector-by-sector actionable plan to achieve the two targets in AB 1279. The 2022 Scoping Plan Update recognizes the cement sector as a hard-to-decarbonize sector, as its manufacturing is associated with high heat to process feedstock, which releases additional inherent carbon dioxide when heated. The 2022 Scoping Plan Update emphasized the need for these sectors to act now, as long-term, strategic planning is required to implement technologically feasible, cost-effective, and equity-focused projects to achieve the state's science-based climate targets.

Development of SB 596 Cement Strategy

SB 596 presents a unique opportunity to develop a framework that helps a hard-to-decarbonize industry reduce emissions at a pace that contributes to the state-wide climate policies while minimizing emissions leakage. To quickly and effectively implement such a framework, it is critical to focus on programs that leverage existing regulations and/or that are simple to administer such that they could also be easily incorporated in other like-minded jurisdictions. Considering the unique nature of industrial decarbonization, it is also conceivable that new programs may be needed. This draft strategy considers three types of program categories that need to be leveraged to support cement decarbonization. For details, see "Tools, Rules, and Potential Measures to Help Achieve Net-zero Emissions Goals" section.

- 1. Overarching programs that support economy- and industry-wide decarbonization: industrial manufacturing consumes substantial amounts of fuels, which need to be decarbonized. Multiple existing statutory directives including Senate Bill 100 (SB 100) (De León, Chapter 312, Statutes of 2018), the California Renewables Portfolio Standard Program, and Senate Bill 1075 (SB 1075) (Skinner, Chapter 363, Statutes of 2022) on hydrogen development, deployment, and use all provide overall guidelines on state-wide transition to cleaner energy. Also, if carbon emissions emitted at industrial plants are captured, they need to be transported and stored safely and permanently. Senate Bill 905 (SB 905) (Caballero, Chapter 359, Statutes of 2022), Carbon Capture, Removal, Utilization, and Storage requires CARB to evaluate, demonstrate, and regulate CCUS projects and technology.
- 2. Programs that support GHG emissions reductions at cement plants (supply-side management): existing programs include Mandatory Reporting Requirements (MRR) and the Cap-and-Trade Program, both of which were established under AB 32 and cover all seven cement plants currently operating in California. Administered by CARB, MRR collects rigorous GHG emissions and production data associated with cement manufacturing, and the Cap-and-Trade Program provides a market-based emission trading system to price GHG emissions for the covered sectors, including cement manufacturers, and collectively achieve cost-effective emissions reductions while minimizing emissions leakage. In addition, multiple funding programs are administered by federal agencies pursuant to the Inflation Reduction Act of 2022 and the Infrastructure Investment and Jobs Act of 2021, providing financial support for cement decarbonization projects in California as well as other states. The California Energy Commission (CEC) administers the Industrial Decarbonization and Improvement of Grid Operations to provide incentives for industrial projects.

3. Programs to increase demand of low-carbon cement (demand-side management): cement is primarily used as an ingredient to make concrete, which is one of the key building materials essential for infrastructure. It is important to help create a robust market for low-carbon cement/concrete while ensuring product affordability/accessibility. California Department of Transportation (Caltrans) writes specifications and evaluates and approves new materials for use in Caltrans projects. State/local agencies including Department of General Services (DGS) have authority over concrete used in eligible construction projects. Some newer statutes require quantification of embodied carbon used in buildings. Assembly Bill 43 (AB 43) (Holden, Chapter 316, Statutes of 2023), Greenhouse Gas Emissions: Building Materials Embodied Carbon Trading System, which amended and added to Assembly Bill 2446 (AB 2446) (Holden, Chapter 352, Statutes of 2022), Embodied Carbon of Building Construction Materials, requires CARB to develop a framework for measuring and then reducing the average carbon intensity of the materials used in the construction of new buildings. SB 253 (Wiener, Chapter 385, Statute of 2023), starting in 2027, will require companies doing business in California to publicly disclose annual GHG emissions for scope 1, 2, and 3, to inform investors, empower consumers, and activate companies' action on emissions reductions.

There are existing local, state, and federal environmental policies to protect local air quality, environmental health, and safety. When implementing SB 596 projects, such as fuel-switching, it is always preferrable that they contribute to reducing local and regional cumulative exposure to air pollutants, mitigate environmental/health risks, and are in compliance with all local, state, and federal regulations. This is particularly important if cement plants are located adjacent to frontline communities or in non-attainment air quality regions.

Public Engagement Process for the SB 596 Cement Strategy

To initiate the development of the SB 596 Cement Strategy, staff has been working closely with a wide variety of interested parties. To date, CARB hosted two public workshops (October 20, 2022, and May 31, 2023) and one community meeting (October 18, 2023) and received a total of 28 written public comments in response to those meetings. Staff also met individually with more than 50 organizations and individuals and attended and participated in a variety of conferences and workshops.

As technologies and markets for industrial decarbonization are developing rapidly, this Draft SB 596 Cement Strategy is intended to identify as many potential GHG emissions reductions levers as possible and to seek feedback. Throughout the document, key questions are highlighted for public input, which include:

- 1. Definitions of key concepts including GHG emission reductions, removals, cement and cementitious products;
- 2. Potential approaches to calculate the baseline GHG intensity using 2019 data and an interim target for 2035;
- 3. Potential GHG reduction levers and technology options;
- 4. Potential measures or programs to address regulatory, statutory, and marker barriers that CARB should consider, both near-term and long-term; and
- 5. Potential approaches to reduce adverse air quality impacts and support economic and workforce development in communities neighboring cement plants.

Background Information on Cement and California's Cement Industry

This section discusses the basics of cement, cement manufacturing, GHG emissions associated with cement used in California, and California's concrete industry. Unless terms require specific definitions for SB 596, the SB 596 Cement Strategy references the U.S. Geological Survey (USGS) definitions for cement and concrete-related terms. (Appendix A)

What is cement?

Cement is a finely ground powder that is typically used as an ingredient to make concrete, one of the most widely used building materials throughout the world. The most common type of cement is gray Portland cement, which is a hydraulic cement that reacts with water to form gluey minerals that set and harden to hold together concrete. To produce Portland cement, limestone and other minerals are reacted at high temperatures to make clinker, which is then blended with mineral additives such as gypsum, limestone, and a small amount of supplementary cementitious materials (SCM). As shown in Figure 2, cement is then shipped to ready-mixed concrete producers, precast or prestressed concrete producers, masonry producers, and other customers, where it is blended with SCMs, aggregates, admixtures, and water to become ready-mixed concrete or precast/prestressed concrete. Cement is also used to make other products, such as mortar or grout. Ready-mixed concrete is typically shipped to construction sites and placed to become part of buildings and other infrastructure. Cement typically makes up 7-15% of concrete products, but cement manufacturing is the largest source of GHG emissions associated with concrete.

Ready-mixed **Concrete Producers** Precast/prestressed Manufacturers **Concrete Producers Masonry Concrete Producers** Cement Concrete **Final Products** Cement Ready-mixed concrete Concrete Clinker Precast/prestressed Aggregates
 Admixtures • Gypsum concrete products Cement Water • Limestone Mortar • SCMs • SCMs Grout

Figure 2: Schematic Drawing of the Cement-Concrete Supply Chain

Cement Manufacturing Process

The central role of hydraulic cement is to provide cementitious (sticky) properties to bind together aggregates when mixed with water. Clinker provides that functionality, and cement manufacturing is focused on clinker production. Cement plants are typically located adjacent to quarries of limestone and clay, the main materials used to make clinker.

First, quarried rocks including limestone are conveyed to cement plants and crushed to desired sizes. Crushed rocks are then combined with other minerals, such as iron ore, and ground, mixed, and fed to a preheater/precalciner tower to increase the efficiency of the subsequent clinker manufacturing process.

After precalcination, the feedstock is exposed to increasingly higher temperatures as it passes through a long kiln to achieve four major mineral phases: alite, belite, tricalcium aluminate, and ferrite (see Table 1 for chemical formulas for these phases). Today, cement production is optimized to maximize the amount of alite, because it sets quickly once concrete is placed.

At the beginning of the process, calcination occurs at about 800-900 °C. During calcination, limestone (calcium carbonate) becomes calcium oxide by releasing CO₂. After calcination, clinkerization occurs as the temperature continues to rise further into the kiln. During clinkerization, calcium oxide reacts with calcined clay to form di-calcium silicate, which is also called belite, as well as amorphous calcium aluminates. As the materials move through the kiln, the aluminates start forming a liquid phase to become a flux to keep the temperatures high. At about 1250 °C, belite starts reacting with remaining calcium oxide to form tri-calcium silicate, or alite. At the end of the kiln, the temperature reaches 1,450 °C for maximum production efficiency.

After it is discharged from the kiln, the clinker goes through coolers and is ground and blended with gypsum, limestone, and SCMs to become cement. The process of clinker production in cement kilns is the most GHG emissions-intensive process in the entire cement and concrete manufacturing process, and alite production is the most energy-intensive phase of clinker production because a temperature near 1,450 °C is needed to form alite. As Table 1 shows, alite is the most prevalent mineral phase in clinker/cement.

Table 1: Clinker Mineral Phases and Mineral Additives

Mineral Phase	CCN ¹	% By Weight	Characteristics
Alite (tricalcium silicate, or 3 CaO · SiO2)	C₃S	50% - 70%	Readily reacts with water during hydration; contributes to the early age strength of 1~ 3 days
Belite (dicalcium silicate, or 2 CaO · SiO2)	C ₂ S	15% - 30%	Develops strength more slowly than alite during hydration and contributes to strength after four weeks
Tricalcium aluminate, or 3 CaO · Al2O3	C ₃ A	5% - 10%	Starts the hydration process quickly and generates a large amount of heat. Contributes to the early age strength of 1~3 days
Ferrite (Tetracalcium aluminoferrite 4 CaO · Al2O3 · Fe2O3)	C ₄ AF	5% - 15%	Used as a flux to control temperatures during limestone calcination process
Mineral Additives		% By Weight	Characteristics
Gypsum		About 5%	Slows down the hydration process to allow time to place concrete
Limestone		5% - 15%	Contributes to a better particle size distribution

Even though cement takes up less than 15% of concrete by volume, clinker production is responsible for up to 90% of GHG emissions associated with concrete: no other material used in concrete is a significant source of GHG emissions.

McKinsey and Company estimated general energy requirements and associated GHG emissions for each cement production stage as shown in Table 2.²

-

¹ Cement Chemist Notation (CCN) was developed to simplify chemical formulas commonly used for cement manufacturing.

² McKinsey and Company. 2020. Laying the foundation for zero-carbon cement.

Table 2: Estimated Energy Requirements and Associated GHG Emissions from Cement Production

	Total	Quarry	Crusher	Trans- port ¹	Raw mill	Klin and preheater/ precalciner ²		Cooler	Cement mill	Logis- tics ⁴
Energy*	3,895	40	5	40	100	3,150		160	285	115
						Process				
Emissions	0.925	0.003	0.001	0.007	0.017	emissions	0.479	0.028	0.049	0.022
						Fuel	0.319			

¹ Assumed with 1kWh/t/100m

Clinker production is associated with two different types of GHG emissions:

1. Process emissions, which are generated when limestone is treated with high heat and releases CO₂(limestone calcination). The chemical transformation of limestone calcination is:

Calcium carbonate ($CaCO_3$) + energy = Calcium oxide (CaO) + CO_2

In California, process emissions are responsible for about 60% of total GHG emissions associated with cement production.

2. Emissions from fuel combustion needed to generate heat (at about 1,450 °C for clinkerization) in kilns. In California, fuel combustion is responsible for about ~35% of total GHG emissions associated with cement production.

Cement production today is optimized to maximize the amount of alite, which sets early but requires clinkerization at about 1,450 °C. As alite is the most emissions intensive mineral phase, cement and concrete can potentially be less GHG-intensive if it includes less alite.

Electricity is also used throughout the cement manufacturing process, including for cooling clinker and grinding materials. Indirect GHG emissions associated with electricity use are less than 5% of total GHG emissions associated with cement manufacturing.

The process described above is for traditional cement manufacturing at incumbent cement plants, but it is possible to produce cement using alternative processes that are associated with lower GHG emissions. For example, there are demonstration projects to produce cement using non-limestone minerals. In addition, cement manufacturing can be altered to yield a clinker with belite, rather than alite, as the prevalent mineral phase to reduce required the temperature to make clinker. It is also possible to produce cement by leveraging chemical reactions without relying on thermal processes. Some of the alternative processes are already commercial on a small scale, whereas others are still in a precommercial stage of development. More discussion is in the "Alternative Materials to Reduce Clinker Intensity of Cement and Concrete" section.

² Assumed global average, data from the Global Cement and Concrete Association, Getting the Numbers Right 2017

³ Assumed reciprocating grate cooler with 5kWh/t clinker

⁴ Assumed lorry transportation for average 200km

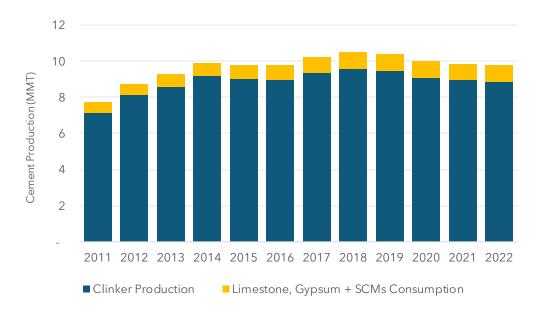
^{*}MJ per ton cement

^{*}Ton CO2 per ton cement

Cement Industry in California

Cement plants are typically built adjacent to limestone quarries and continue operating until the reserve in the quarry is depleted. In 2006, 11 cement plants operated in California. In 2019, the baseline year for SB 596, eight cement plants operated in California. As of March 2024, there are seven active cement plants, as one plant ceased operation in 2020. All cement plants operating in California are covered by the Regulation for the Mandatory Reporting of GHG Emissions (MRR) and report annual GHG emissions, electricity consumption, and cement production to CARB. Production data are reported in short tons of material, but in this document, short tons are converted to metric tons in most cases. As Figure 3 indicates, these active cement plants have produced about 10 million metric tons of cement (clinker, gypsum, limestone and SCMs combined) annually over the last decade.

Figure 3: Cement Production in California³



The GHG emissions from California's cement sector are part of the state's GHG emissions inventory, which provides an estimate of state-wide emissions associated with fuel combustion, electricity generation, and process emissions.⁴ For the cement value chain, the GHG inventory covers emissions associated with cement manufacturing, emissions associated with upstream/downstream activities, such as limestone quarrying and concrete production, and transportation. In 2019, state-wide GHG emissions were 403.7 MMT CO₂e, 1.9% of which came from the cement manufacturers. Table 3 shows GHG emissions from

³ California Air Resources Board. *Mandatory Greenhouse Gas Emissions Reporting*.

⁴ California Air Resources Board. California Greenhouse Gas Emission Inventory Program.

California cement plants in 2019. The eight cement plants collectively emitted 7,767,670 metric tons of carbon dioxide equivalent (MTCO₂e) of non-biogenic GHGs.

Table 3: GHG Emissions from Cement Manufacturing in California in metric tons of CO₂e in 2019⁵

Facility Name	Air District	GHG Emissions (MTCO₂e)
Cemex Construction Materials Pacific LLC, Victorville	Mojave Desert AQMD	1,910,079
CalPortland Company, Oro Grande	Mojave Desert AQMD	1,250,996
CalPortland Company, Mojave	Eastern Kern APCD	1,124,475
Mitsubishi Cement 2000, Lucerne Valley	Mojave Desert AQMD	1,068,736
National Cement Company, Lebec	Eastern Kern APCD	795,651
Lehigh Southwest, Cupertino (ceased operation in 2020)	Bay Area AQMD	768,381
Tehachapi Cement Plant	Eastern Kern APCD	556,466
CalPortland Company, Redding	Shasta County AQMD	292,886
Total		7,767,670

They are in Mojave Desert Air Quality Management District (AQMD), Eastern Kern Air Pollution Control District (APCD) and Shasta County AQMD. Figure 4 shows the location of the cement plants.

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⁵ California Air Resources Board. *Mandatory Greenhouse Gas Emissions Reporting*.

Figure 4: Cement Plant Locations and Air District Boundaries



As shown in Table 4, direct emissions in 2019 can be divided into process emissions from limestone calcination (4,917,548 MTCO₂e) and combustion emissions (2,850,122 MTCO₂e). Cement plants also purchase electricity, and indirect GHG emissions associated with purchased electricity are estimated to be 290,627 MTCO₂e when applying the statewide 2019 average grid GHG emissions factor (0.207 MTCO₂e/MWh).⁶

Almanac, California Electrical Energy Generation, last updated September 2024 for data year 2019.

Available at: https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/california-electrical-energy-generation

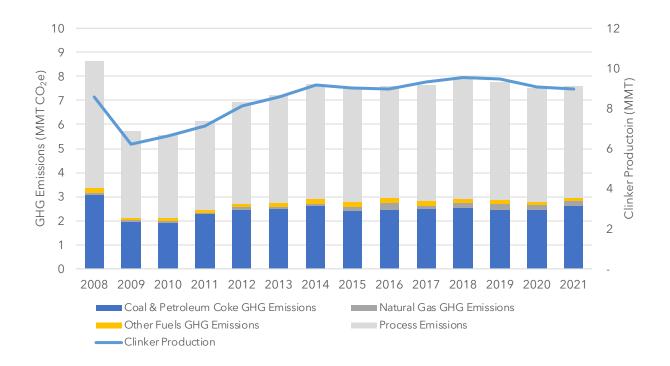
⁶ Emissions data were obtained from the CARB GHG Inventory, last updated September 2024 for data year 2019. Available at: https://ww2.arb.ca.gov/sites/default/files/2024-09/nc-ghg_inventory_scopingplan_all_00-22.xlsx and generation data were obtained from the CEC Energy

Table 4: Breakdown of California Cement Sector GHG Emissions in 20197

Process Emissions (MTCO₂e)	Combustion Emissions (MTCO ₂ e)	Indirect Emissions from Electricity (MTCO ₂ e)	Total GHG Emissions (MTCO₂e)
4,917,548	2,850,122	290,627	8,058,297

Figure 5 shows GHG emissions from California cement plants by fuel type since 2008.8 There was a large production decrease in 2009, which was caused by the Great Recession.9

Figure 5: Direct GHG Emissions from California Cement Plants by Fuel Type¹⁰



⁷ California Air Resources Board. *Mandatory Greenhouse Gas Emissions Reporting*.

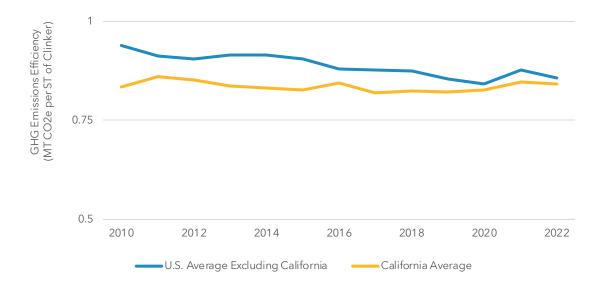
⁸ California Air Resources Board. Mandatory Greenhouse Gas Emissions Reporting.

⁹ The Great Recession began in December 2007 and ended in June 2009. Real gross domestic product (GDP) fell 4.3 percent from its peak in 2007 Q4 to 2009 Q2, the largest decline in the postwar era. Federal Reserve History. 2013. *The Great Recession*.

¹⁰ GHG emissions per fuel type: California Air Resources Board. *Greenhouse Gas Emission Inventory*. Clinker production: California Air Resources Board. *Mandatory Greenhouse Gas Emissions Reporting*.

Figure 6 shows the GHG emissions efficiency trend for California cement plants during 2010-2022. The California cements plants are consistently more efficient compared to the national average, and the efficiency of California's cement plants has generally been improving over the last decade. There are uncertainties related to how the COVID-19 pandemic affected industrial production efficiency during 2020-2021.





Cement Industry in California

SB 596 sets a target to achieve net-zero emissions for "cement used within the state," which is interpreted as cement produced in California plus cement imported into California for consumption, minus cement exported to other regions. However, data on the amount of cement moved across California's borders is limited to international transfers. No public data are available for transfers to or from other U.S. states.

Cement consumed in California has also historically included cement imported from other countries, including from China, Mexico, Vietnam, Egypt, Turkey and Thailand, to balance supply and demand. (See Table 7 for the primary countries of origin for cement imported

¹¹ As different data sources can define "cement" differently, Figure 4 compares the emissions efficiency of clinker production for consistency. Also, GHG emissions data used to generate Figure 4 include direct emissions only, excluding indirect emissions associated with electricity consumption.

¹² California average GHG intensity: California Air Resources Board. *Mandatory Greenhouse Gas Emissions Reporting*. GHG emissions used to calculate US average intensity: U.S. Environmental Protection Agency: *Facility Level Information on Greenhouse Gases Tool (FIGHT)*. Production data used to calculate US average intensity: U.S. Geological Survey. *Minerals Yearbook for cement*.

into California in 2019.) Figure 7 shows cement imported into and exported from California districts of entry¹³ (San Francisco, Los Angeles, and San Diego) relative to cement production in California from 2012 through 2021.

Figure 7: Cement Imports and Exports Relative to Domestic Production¹⁴

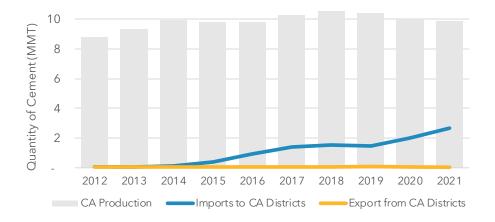
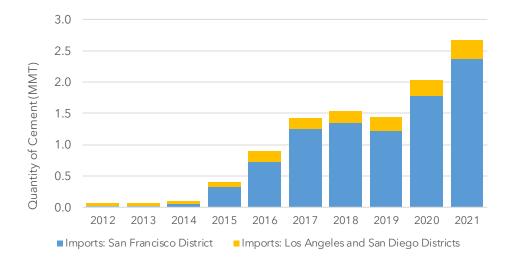


Figure 8 shows the quantity of cement imports at the San Francisco district relative to the total amount of imports to California. Imports increased noticeably at the San Francisco district during and after 2020, in part due to the Leigh Southwest plant in Cupertino, which was the only cement producer in San Francisco Bay Area, ceasing operation in 2020.

Figure 8: Cement Imports into California by District¹⁵



¹³ According to the International Trade Commission, "district" refers to the district of entry (i.e., where the merchandise clears U.S. Customs) for import flows.

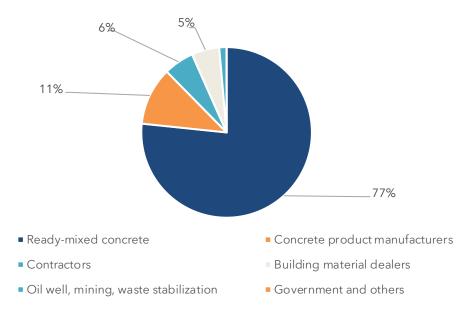
¹⁴ U.S. International Trade Commission. *UTC Dataweb*.

¹⁵ U.S. International Trade Commission. *UTC Dataweb*.

Concrete Industry in California

Cement is a crucial ingredient of concrete. As shown in Figure 9, in 2019, 77% of Portland cement in California was shipped to ready-mixed concrete producers, and 11% was shipped to precast/prestressed concrete producers.¹⁶

Figure 9: Cement Users in California in 2019¹⁷



In most cases, cement becomes a final product when concrete is mixed, placed, and hardened. As cement and concrete are interdependent, the concrete industry has an important role in achieving net-zero emissions goals for cement used in California. As 77% of cement is used as ready-mixed concrete, the Draft SB 596 Cement Strategy prioritizes the use case of ready-mixed concrete. Other types of products, such as precast/prestressed concrete and masonry cement, have some different opportunities and barriers for decarbonization.

There are about three hundred ready-mixed concrete producers throughout California.¹⁷ Figure 10 shows the number of ready-mixed producers by Caltrans District.¹⁸ District 7 (Los Angeles) and District 8 (Riverside) have the largest number of ready-mixed concrete producers to serve local markets, including populous areas such as the greater Los Angeles and San Diego areas. District 4 (Alameda), serving the San Francisco Bay Area, has the

¹⁶ U.S. Geological Survey. *Minerals Yearbook Cement Statistics and Information*.

¹⁷ The number of ready-mixed concrete producers was estimated using the *Number Quarterly Census of Employment and Wages* published by the California Employment Development Department. It is an estimate as the data are withheld in some cases.

¹⁸ California Department of Transportation. *District Map and County Chart*.

largest number of ready-mixed concrete producers in Northern California. However, large construction projects, such as high-speed rail construction or dam repair, can also occur in rural areas.

Figure 10: Number of Ready-mixed Concrete Producers and Population Density by Caltrans District19



District #	District Name	Number of Ready-Mix Plants
1	Del Norte	0
2	Lassen	0
3	Butte	19
4	Alameda	42
5	Monterey	0
6	Fresno	24
7	Los Angeles	74
8	Riverside	62
9	Inyo	0
10	Alpine	7
_ 11	Imperial	23
12	Orange	21

Ready-mixed concrete producers are diverse in terms of size, ownership type, and degree of vertical integration. There are some ready-mixed concrete producers that are owned by large vertically integrated companies, while others are independently owned. Some of them are small, family-run businesses serving rural areas. Over the last decade, ready-mixed concrete producers in California have been collectively producing about 40 million cubic yards of concrete annually, 19 which is shipped to construction sites using mixer trucks. Ready-mixed concrete is unique in that it is not a final product until it's placed. On the other hand, precast and prestressed concrete producers blend ingredients and place concrete at their facilities to manufacture beams, girders, walls, pipes, and other products.

In terms of production process, concrete producers mix additional materials with cement to make concrete that meets the requirements of contractors and/or construction project owners. As described in the "Alternative Materials to Reduce Clinker Intensity of Cement and Concrete" section, these requirements can be specific and/or prescriptive regarding which materials can be added and how much of a material can be added. The activities of ready-mixed concrete facilities, such as batching, mixing, and material-handling, is

¹⁹ The California Construction & Industrial Materials Association. 2023. *Achieving Net Zero Concrete in California*.

estimated to use energy that corresponds to about 4% of total GHG emissions associated with concrete.²⁰ No ready-mixed concrete producers in California report their GHG emissions to CARB, as they do not exceed the 10,000 MTCO₂e per year threshold²¹ to be subject to the MRR.

Potential Approaches to Establishing SB 596 Targets

This section discusses a potential framework to define net-zero emissions for cement used in California.

Key questions for feedback

- What types of GHG emissions and emissions reductions projects should be included to determine net-zero emissions associated with cement used in California?
- What types of carbon capture, use, sequestration or removal projects should be included in the accounting under SB 596? Should there be different considerations for projects that meet the requirements of SB 905?
- How should CARB define cement and supplementary cementitious materials (SCMs)?
- How should CARB calculate the baseline GHG emissions intensity and interim intensity target in 2035?

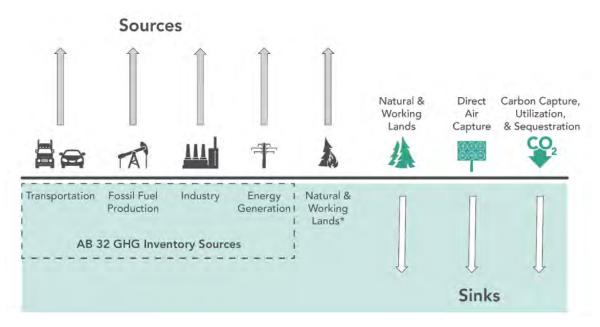
SB 596 requires the state's cement sector to achieve net-zero emissions of GHG associated with cement used within the state "as soon as possible, but no later than December 31, 2045." To determine how the sector can achieve net-zero emissions, it is first necessary to define "net-zero GHG emissions." AB 1279 defines it as "emissions of GHGs to the atmosphere that are balanced by removals of GHG emissions over a period of time, as determined by CARB." The 2022 Scoping Plan Update identified GHG emissions and sinks that need to be considered to quantify net-zero emissions as shown in Figure 11.

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²⁰ Ibid.

²¹ A facility that emits 10,000 MTCO₂e per year or greater is subject to GHG reporting requirements under the Mandatory GHG Reporting Regulation.

Figure 11: State-wide Concept of GHG Emission Sources and Sinks²²



On the sources side, California's cement sector has potential to reduce direct emissions from cement plants. In doing so, CARB is evaluating accounting for direct on-site emissions associated with manufacturing materials used to make cement. Upstream or transportationrelated emissions are not under consideration to limit the burden and complexity for quantification and because the vast majority of emissions are associated with cement plant process emissions. On the sinks side, it's possible for cement plants to capture the emissions that couldn't be reduced, which can be either mineralized and used as part of cement or concrete or sequestered. It is also possible for carbon removal projects to fix ambient carbon in concrete or cement production-related minerals. However, per SB 596, every cement GHG reduction project must be related to the cement production/use, as the bill specifies that "CARB shall not include GHG emissions reductions attributable to activities or offsets that are unrelated to the raw materials, fuels or other energy sources, processes, or transportation involved in making or using cement or its inputs." CARB has programs to quantify direct GHG emissions and incentivize emissions reductions at cement plants but does not yet have accounting frameworks for potential carbon sink projects related to the cement sector. Such protocols for CCUS are expected to be developed through the SB 905 implementation process. An overview of potential quantification methodologies for CCUS projects is discussed in the "Carbon Capture, Use, and Sequestration" section.

Potential Approach to Establishing Interim GHG Intensity Targets

SB 596 requires CARB to "establish interim targets for reductions in the GHG intensity of cement used within the state relative to the average GHG intensity of cement used within

²² California Air Resources Board. 2022. 2022 Scoping Plan for Achieving Carbon Neutrality.

the state during the 2019 calendar year, with the goal of reducing the GHG intensity of cement used within the state to 40 percent below the 2019 average levels by December 31, 2035." This section discusses initial concepts on the approach, methodology, and data sources that could be used to calculate the baseline and interim targets.

GHG intensity is typically expressed as the total amount of GHG emissions associated with the production process per unit of production (MTCO₂e per MT of product). To establish an interim target:

- 1) product definitions related to cement that reflect the SB 596 requirements are needed;
- 2) GHG emissions associated with the use of each relevant material need to be identified and quantified; and
- 3) a baseline GHG emissions intensity for 2019 needs to be established.

Defining cement and cement-related products

As the majority of GHG emissions associated with cement used within the state are due to clinker production, displacement of conventional limestone-based clinker by alternative low-carbon materials can reduce GHG emissions associated with cement use. There are two types of materials that can potentially displace clinker to make cement: supplementary cementitious materials (SCMs) and alternative cementitious materials (ACMs). An SCM does not have cementitious properties but can react with some mineral constituents in cement to enhance cementitious properties. An ACM is cementitious and can therefore completely replace clinker. Different materials can be mixed at different ratios, but each cement type needs to satisfy material standards to ensure quality and strength. In the U.S., cement typically must conform to American Society for Testing and Materials (ASTM) standards, which specify technical standards and testing procedures for materials.²³ The American Association of State Highway and Transportation Officials (AASHTO), which represents highway and transportation departments in all 50 states, the District of Columbia, and Puerto Rico, also sets standards for cement that are widely referenced. For the purposes of this Draft SB 596 Cement Strategy, ASTM standards were used, each of which has corresponding AASHTO standards.

There are three major ASTM standards related to cement:²⁴

 ASTM C150 for Portland cement: Cement that conforms to C150 is the most widely used cement in the U.S. It prescribes how much non-clinker material can be added to

²³ Another major standard for cement and concrete is set by the American Association of State Highway and Transportation Officials (AASHTO).

²⁴ For more details about material standards, see Alternative Materials to Reduce Clinker Intensity of Cement and Concrete section.

make Portland cement. Typical C150 cement contains about 90% clinker, 5% gypsum, and 5% limestone.

- ASTM C595 for blended hydraulic cements: Relative to C150, C595 allows increased use of limestone and certain SCMs, such as fly ash, slag, and natural pozzolans. For example, cement that meets the C595 IL standard (Portland limestone cement or PLC) can include up to 15% limestone.
- ASTM C1157 standard performance specification for hydraulic cement: C1157 has no material requirements, only a requirement to perform and provide function equivalent to Portland or blended cement. Cement that does not meet C150 or C595 because of a higher amount of non-clinker materials may still meet C1157.

It is possible that emerging cement types may not meet any of the current ASTM standards, in which case they will need to undergo appropriate testing and demonstration to meet the requisite strength and performance requirements.

Many definitions of cement, including those used in CARB's MRR and Cap-and-Trade Regulation,²⁵ assume that cement is made using limestone-based clinker and are not specific about alternative materials added to clinker to make cement. For SB 596, CARB is considering broadening the definition of cement to support use of alternative low-carbon materials provided the resulting product satisfies performance requirements and provides comparable functionality to Portland cement. A similar initial concept for the Cap-and-Trade and Mandatory Reporting Regulations was shared in a workshop in Spring 2024.²⁶

"Cement" means a manufactured material that meets the specification standards for Portland cement (such as ASTM C150) or hydraulic blended cements (such as ASTM C595), or that meets performance-based standards for functional equivalents of Portland or hydraulic blended cements (such as ASTM C1157). Cement is used to make concrete, masonry cement, plastic (stucco) cement, and mortar cement.

This definition allows ACMs that were produced using non-limestone minerals or alternate processes to be considered as part of "cement," if they demonstrate functional equivalence to conventional cement. CARB is also considering defining supplementary cementitious materials to provide clarity and certainty for this key term.

"Supplementary Cementitious Materials" or "SCMs" are materials that are added to and contribute to the properties of a cementitious mixture through hydraulic or

²⁶ CARB. Cap-and-Trade Workshop, May 31, 2024. *See Slide 25-30 for overall industrial allocation approach and cement-specific approach.*

²⁵ The definition used by CARB's MRR and Cap-and-Trade Program is: "Cement means a building material that is produced by heating mixtures of limestone and other minerals or additives at high temperatures in a rotary kiln to form clinker, followed by cooling and grinding with blended additives. Finished cement is a powder used with water, sand, and gravel to make concrete and mortar."

pozzolanic activity, or both, such as fly ash, ground granulated blast furnace slag, silica fume, natural pozzolan, calcined clay, and glass pozzolan.

Further, SCMs can be divided into two categories to distinguish the types of GHG emissions associated with their production.

- "Primary supplementary cementitious materials" are supplementary cementitious materials that are produced as a primary product. The production of primary supplementary cementitious materials is associated with some direct GHG emissions. Primary SCMs include natural pozzolan and calcined clay.
- "Byproduct supplementary cementitious materials" are SCMs generated as a byproduct by an industrial process that is designed to produce a product other than the SCM. The generation of byproduct supplementary cementitious materials is not associated with direct GHG emissions, as the emissions are attributable to the primary products. Byproduct supplementary cementitious materials include fly ash, ground granulated blast-furnace slag (GGBF), and materials generated from alternative cement manufacturing processes.

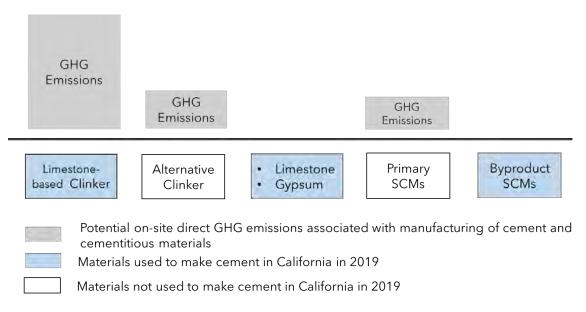
For accounting under SB 596, CARB recommends that GHG emissions associated with instate production of primary SCMs be included and that GHG emissions associated with the production of out-of-state primary SCMs and all byproduct SCMs be excluded. This is because the out-of-state and byproduct SCMs are associated with processes upstream cement emissions. However, it is important to recognize that common byproduct SCMs, such as fly ash and GGBF, may be created through emissions-intensive industrial processes, such as coal-fired power generation or primary steel production.

Identifying GHG emissions associated with cement

After clarifying the definition of "cement," the next step to establishing a GHG emissions intensity for cement used in California is to identify GHG emissions associated with each material that is mixed to make cement. As shown in Figure 12, clinker and primary SCMs are associated with on-site manufacturing emissions (direct emissions), which are Scope 1 emissions. Limestone, gypsum, and byproduct SCMs are not associated with Scope 1 emissions since they are processed elsewhere and brought into cement plants. However, fly ash and GGBFS, the byproduct SCMs that are most used today, are associated with high levels of upstream GHG emissions: fly ash is a byproduct of coal-fired industrial processes, and GGBFS is a byproduct of primary steel production. The availability of fly ash and GGBFS is also limited worldwide and decreasing.

²⁷ Scope 1 emissions are direct GHG emissions that occur from sources that are controlled or owned by an entity.

Figure 12: Conceptual Diagram of Direct GHG emissions of Materials Used to Make Cement



In 2019, only clinker, limestone, gypsum, baghouse dust, and ground aids were used to make cement at California cement plants. Of those materials, only limestone-based clinker was associated with on-site direct GHG emissions.

Determining baseline GHG emissions intensity

SB 596 defines the baseline GHG emissions intensity (expressed as the total amount of GHG emissions associated with production of all cement used divided by the amount of cement used) as the average GHG emissions intensity for cement used within the state during the 2019 calendar year. It is understood that GHG intensity for "cement used within the state" includes the GHG emissions associated with domestic production and imports. CARB currently has different levels of data for each.

- Domestic production: CARB maintains high-quality verified data on GHG emissions and production reported by cement plants in California pursuant to MRR.
- Imports: Currently there is no mandatory reporting system to track the amount and GHG emissions intensity for cement imported through California ports. However, the Global Cement and Concrete Association (GCCA) operates a voluntary GHG emissions reporting program for cement plants across the globe. Public GCCA data can be used to estimate the GHG emissions intensity associated with cement imported into California ports in 2019. CARB is not aware of any data available to track cement brought into California from other U.S. states.
- Exports: There are small amounts of cement exported from California ports. It is also understood that some amount of cement is shipped from California plants to other U.S. states, but there are no publicly available data sources that track intra-state goods movement.

To establish the 2019 baseline GHG emissions intensity, CARB recommends including imports from other countries and accounting for the associated emissions but excluding both imports from other U.S. states and exports from California to other U.S. states and countries for following reasons:

- It is unlikely that the GHG intensity associated with cement produced and consumed in-state differed significantly from the GHG intensity associated with cement produced in-state and exported.
- There is no public data source that tracks the amount of cement imported from or exported to other U.S. states.
- The amount of cement exported from California to other countries is insignificant.

The initial recommendation is to calculate the 2019 GHG intensity baseline as follows:

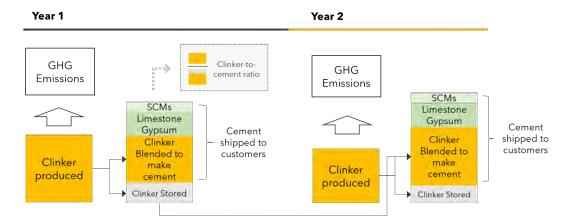
(2019 emissions from California cement plants + 2019 emissions associated with imported cement) / (amount of cement produced by California cement plants in 2019 + amount of cement imported in 2019)

The following data sources are available for each quantity.

1. Cement production in California:

Annual facility-specific cement production information has been collected by CARB each year since 2008 under MRR. MRR requires the reporting and verification of the amount of clinker produced, and the amounts of clinker, gypsum, and limestone blended to make cement for shipment. MRR requires reporting of the amount of SCMs blended to make cement, but that information is not currently verified. As Figure 13 shows, produced clinker can be stored to be blended for shipping later. Thus, GHG emissions associated with cement production occur at a different time from when the cement is used, and potentially over different years.

Figure 13: Hypothetical Timing of Clinker Production and Blending of Cement



To address potential timing discrepancies, the amount of cement produced in 2019 can be based on the amount of "clinker produced" in 2019. First, the 2019 clinker-to-cement ratio is calculated as the ratio of "clinker blended to make cement" to all clinker and mineral additives blended to make cement for shipment. As shown in Table 5, the amount of cement produced in 2019 can then be calculated as the clinker produced in 2019 adjusted by the clinker-to-cement ratio. When calculated in this manner, the cement produced in California in 2019 was 10,417,622 metric tons.

Table 5: Total Cement Production by California Cement Plants in 2019²⁸

Clinker	Clinker	Limestone	Gypsum	SCMs	Cement
Produced	Blended	Blended	Blended	Blended	Production
(MT)	(MT)	(MT)	(MT)	(MT)	(MT)
9,453,091	9,451,877	333,001	609,853	21,556	10,417,622

2. GHG emissions associated with cement production in California:

As shown in Table 6, annual GHG emissions and purchased electricity information is also reported to CARB by each California cement plant pursuant to MRR.

Table 6: Total GHG Emissions Associated with Cement Production in California in 2019

GHG Emissions (MTCO₂e)	Purchased Electricity (MWh)	Average Statewide Electricity Emission Factor (MTCO ₂ e/MWh)	Purchased Electricity GHG Emissions (MTCO2e)	Total GHG Emissions (MTCO₂e)
7,767,670	1,399,400	0.207	290,153	8,057,824

3. The amount of imported cement:

The U.S. International Trade Commission (ITC) tracks the annual quantity of imported commodities by North American Industry Classification System (NAICS) code or Harmonized Tariff Schedule (HTS). The ITC data includes annual import data for NAICS code 327310 (Cement Manufacturing), and data for 2019 is presented in Table 7. The data in Table 7 were used as an estimate of the amount of cement

²⁸ California Air Resources Board. *Mandatory Greenhouse Gas Emissions Reporting*.

²⁹ Emissions data were obtained from the CARB GHG Inventory, last updated September 2024 for data year 2022. Available at: https://ww2.arb.ca.gov/sites/default/files/2024-09/nc-ghg_inventory_scopingplan_all_00-22.xlsx and generation data were obtained from the CEC Energy Almanac, California Electrical Energy Generation, last updated September 2024 for data year 2023. Available at: https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/california-electrical-energy-generation

imported into California ports in 2019. The blending ratio of clinker, gypsum, limestone, and SCMs in the imported cement is not known for this data.

Table 7: Cement Imported to California in 2019 by Country-of-Origin³⁰

Country of Origin	Quantity (MT)
China	849,772
Mexico	349,145
Vietnam	122,343
Egypt	49,903
Turkey	45,300
Thailand	17,243
Other regions	595
Total	1,434,301

4. GHG Emissions associated with imported cement:

GCCA's "Getting the Numbers Right" project³¹ collects voluntary data from cement plants across the globe using a GHG quantification methodology that is reasonably comparable to MRR for Scope 1 direct emissions and Scope 2 indirect emissions (associated with electricity consumption). GCCA aggregates and publishes GHG emissions-intensity at a regional level. However, the GCCA emissions-intensity metric does not match CARB's recommended approach to determining cement production described above and provided in Table 5 and Table 6.³² In order to determine a GHG emissions intensity that is comparable to CARB's approach, a region-specific clinker-to-cement ratio was applied to convert the GCCA region-specific GHG emissions-intensity data for clinker to GHG emissions-intensity for cement.³³ That emissions-intensity of cement value can be multiplied by the quantity of imports in Table 7 to estimate the GHG emissions associated with imports. Results of that calculation for 2019 are provided in Table 8.

³¹ Global Cement and Concrete Association. GNR 2.0 - GCCA in Numbers.

³⁰ U.S. International Trade Commission. *UTC Dataweb*.

³² GCCA uses either clinker, cement (equivalent), or cementitious products as a denominator depending on the specific circumstance. Clinker is gray and white clinker used for the production of gray and white cement. Cement (equivalent) is a cement production value, which is determined from clinker produced onsite applying the plant-specific clinker-to-cement ratio. Cementitious products consist of all clinker produced by the reporting company for cement-making or direct clinker sale, plus gypsum, limestone, clinker kiln dust, all clinker substitutes consumed for blending, and all cement substitutes. The Global Cement and Concrete Association. "CO₂ and Energy Accounting and Reporting Standard for the Cement Industry, May 2011."

³³ In "Getting the Numbers Right," the products include gray and white cement except for clinker. California manufacturers only produce gray cement. CARB recommends using the data for gray cement.

Table 8: Estimated Direct GHG Emissions Associated with Cement Imported to California in 2019³⁴

Country of origin	GCCA Region	Cement Quantity (MT)	Clinker Emissions Intensity (MTCO ₂ /MT clinker)	Clinker-to- Cement ratio	Cement Emissions Intensity (MTCO ₂ /MT cement)	GHG Emissions (MTCO ₂ e)
China	Asia	849,772	0.849	78%	0.697	592,329
Mexico	Central America	349,145	0.876	72%	0.682	238,103
Vietnam	Asia	122,343	0.849	78%	0.697	85,278
Egypt	Egypt	49,903	0.879	84%	0.758	37,815
Turkey	Middle East	45,300	0.843	85%	0.731	33,135
Thailand	Thailand	17,243	0.843	83%	0.722	12,450
Other		595	Not included	Not included	Not included	
Total						999,110

To calculate GHG emissions associated with electricity used to make imported cement, it is possible to: (1) estimate region-specific electricity GHG emissions-intensity in MTCO₂e per MT of cement, and (2) multiply the appropriate region-specific electricity GHG emissions-intensity value by the amount of imported cement originating from each region. To estimate region-specific GHG emissions intensity, GCCA's region-specific electricity intensity (weighted average in MWh per MT of cement produced)³⁵ can be converted to MTCO₂e of GHG emission per MT of cement by multiplying by the country-specific electricity emissions-intensity factors (MTCO₂/MWh) compiled by Ember.³⁶ Estimated GHG emissions associated with electricity use for cement imported to California in 2019 are provided in Table 9.

³⁴ Global Cement and Concrete Association. GNR 2.0 - GCCA in Numbers.

³⁵ Unlike direct GHG emissions, gray clinker-specific data aren't available for electricity purchases.

 $^{^{36}}$ Ember is a European think thank that publishes datasets related to global electricity generation. Embar. *Electricity Data Explorer*. Ember data only account for CO₂ whereas CARB's data includes CH₄ and N₂O in addition to CO₂. However, in 2019 the GHG emissions from CH₄ and N₂O in California was 0.3%.

Table 9: Estimated Indirect Electricity GHG Emissions Associated with Imported Cement in 2019³⁷

Country of origin	GCCA Region	Cement Quantity (MT)	Electricity consumption (MWh / MT cement)	Country- specific Grid GHG Intensity (MTCO ₂ e/MWh)	Electricity GHG Intensity (MTCO ₂ e/ MT cement)	GHG Emissions (MTCO ₂)
China	Asia	849,772	0.094	0.560	0.052	44,499
Mexico	Central America	349,145	0.108	0.442	0.048	16,639
Vietnam	Asia	122,343	0.094	0.504	0.047	5,771
Egypt	Egypt	49,903	0.115	0.467	0.054	2,675
Turkey	Middle East	45,300	0.110	0.412	0.045	2,052
Thailand	Thailand	17,243	0.104	0.501	0.052	894
Other		595	Not included	Not included		Not included
Total						72,530

By adding direct GHG emissions from Table 8 and indirect electricity GHG emissions from Table 9, total GHG emissions associated with imported cement in 2019 is estimated to be 1,071,640 MTCO₂e.

5. Potential GHG intensity 2019 baseline and 2035 interim target

SB 596 established the 2035 GHG intensity target to be 40 percent below the 2019 baseline GHG intensity. Using the data above, Table 10 shows the 2019 baseline GHG intensity for cement used in California to be 0.770 MTCO₂e/MT cement used, and the potential 2035 interim GHG intensity target to be 0.462 MTCO₂e/MT of cement used.

Table 10: Potential Baseline GHG Intensity and 2035 Interim GHG Intensity Target for Cement Used in California

Type of Cement	GHG Emissions (MTCO₂e)	Quantity of cement (MT)	2019 Baseline (MTCO ₂ e / MT cement used)	2035 Interim Target (MTCO ₂ e / MT cement used)
Cement produced in CA	8,057,824	10,417,622		
Cement imported into CA	1,071,640	1,434,301		
Total	9,129,464	11,851,923	0.770	0.462

³⁷ Global Cement and Concrete Association. *GNR 2.0 - GCCA in Numbers*. Country-specific Grid GHG Intensity Values are by Ember. *Electricity Data Explorer*.

Overview of Decarbonization Levers and Technology Options

This section provides an overview of cement decarbonization levers and technology options, as well as the approach to identify market, statutory, and regulatory concerns and barriers associated with them.

Key questions for feedback

- Are there additional decarbonization levers that should be considered beyond the three following levers that are discussed in this section?
 - o Energy-related GHG reduction options at cement plants, including fuel-switching, increased use of low- or zero-carbon electricity, and electrification
 - o Carbon capture, use, and sequestration
 - o Increased use of low-carbon cement and concrete
- For each lever, CARB is assessing feasibility by considering demand-side, supply-side, and non-economic factors, including permitting issues and whether robust GHG accounting methods exist. Should CARB consider additional factors for evaluation?

To help identify potential cement decarbonization levers and associated technology options, a variety of technical reports by industry, academia, public agencies, non-government organizations (NGOs), and other organizations were reviewed, including the 15 decarbonization roadmaps identified in Table 11.

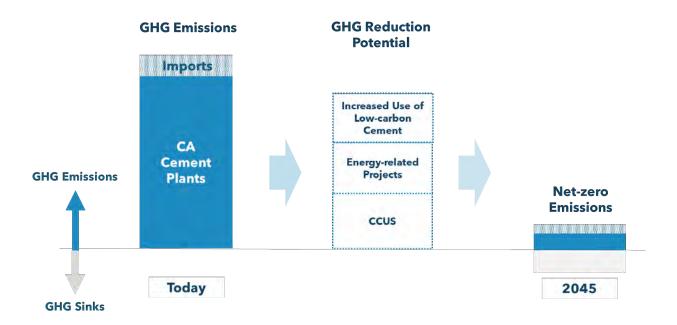
Table 11: List of Cement Decarbonization Roadmaps

Roadmap Title	Author	Year Released
Cement Industry		
Achieving Carbon Neutrality in the California Cement Industry Key Barriers & Policy Solutions, Second Edition	California Nevada Cement Association	2023
Concrete Future: The GCCA 2050 Cement and Concrete Industry Roadmap for Net Zero Concrete	Global Cement and Concrete Association	2021
Roadmap to Carbon Neutrality: A More Sustainable World is Shaped by Concrete	Portland Cement Association	2021
Cementing the European Green Deal: Reaching Climate Neutrality Along the Cement and Concrete Value Chain By 2050	The European Cement Association	2020
Concrete Industry		
Achieving Net Zero Concrete in California: Pathways, Opportunities, & Barriers	California Construction and Industrial Materials Association	2023
UK Concrete and Cement Industry Roadmap to Beyond Net Zero	Mineral Products Association / The Concrete Centre (U.K.)	2020
Public Agencies		
Pathways to Commercial Liftoff: Low-Carbon Cement	U.S. DOE	2023
Roadmap to Net-Zero Carbon Concrete by 2050	Government of Canada	2022
Technology Roadmap for "Transition Finance" in Cement Sector	Government of Japan	2022
Enabling Industrial Decarbonization: A Policy Guidebook for U.S. States	United States Climate Alliance	2022
Industrial Decarbonization Roadmap	U.S. DOE	2022
Deep Decarbonisation of Industry: The Cement Sector	European Commission	2020
Technology Roadmap: Low-Carbon Transition in the Cement Industry	International Energy Agency	2018
Non-Government Organizations		
Making Net-Zero Concrete and Cement Possible: An industry-backed, 1.5 °C-aligned transition Strategy	Mission Possible Partnership	2023
Decarbonizing Concrete: Deep Decarbonization pathways for the Cement and Concrete Cycle in the United States, India, and China	Global Efficiency Intelligence/ Climate Works	2021

In general, roadmaps and other literature identify a suite of options as decarbonization levers, including carbon capture, use and sequestration, fuel-switching, and the increased use of alternative materials to displace limestone-based clinker. These reports project that 30%~50% of GHG emissions reductions could come from CCUS, as the high level of process emissions associated with cement production increases the carbon dioxide

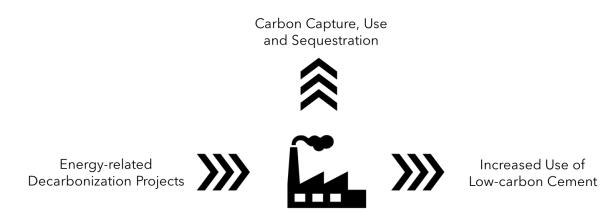
concentration in the flue gas compared to sectors where such process emissions are not present. The reports suggest that another 20%~30% of GHG emissions reductions can be achieved by energy-related projects, which are a combination of fuel-switching, increased use of renewable or zero-carbon electricity, and energy efficiency, such as on-site waste heat recovery. The reports also suggest that about 20%~30% of GHG emissions reductions could be achieved by the use of alternative materials and that if the technology matures fast enough, then the reductions could be much higher because these materials can eliminate the reliance on carbon-intensive limestone. Figure 14 illustrates potential GHG emissions reduction levers toward net-zero emissions based on the projections in existing roadmaps.

Figure 14: Potential GHG Emissions Reductions Levers to Achieve Cement Net-zero Emissions



Based on the literature review and input from interested parties, three general levers for decarbonizing the cement sector were identified. A variety of technological options exist for each lever, some of which are new or emerging technologies. Many of these technologies, including carbon capture, energy-related options, and increased use of low carbon cement, can be implemented at existing cement and concrete plants, but there are economic, practical, permit and other constraints that may limit how extensively an existing facility could be retrofitted to implement them. Some options may be more feasible to implement at new facilities.

Figure 15: Cement Decarbonization Levers



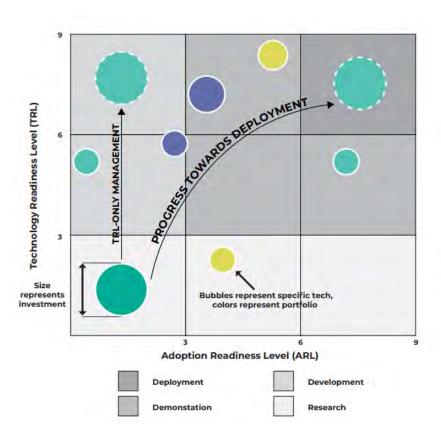
Cement Decarbonization Levers

The following sections discuss: (1) potential technologies or project types available for California cement sector for each lever, and (2) market, statutory, and regulatory concerns and barriers for each technology options. In identifying potential cement decarbonization technologies and barriers associated with them, it is important to recognize that currently cement manufacturing is GHG emission intensive. This means that to achieve net-zero the manufacturing process will need innovative and transformational changes, which can require substantial time and financial investment. Multiple cement decarbonization technologies are emerging around the world today, but they are still largely in research, development, and demonstration phase. For these technologies to realize commercialization, they need to overcome multiple technical, financial, market, regulatory and social barriers.

Historically, the U.S. Department of Energy (U.S. DOE) has been using the technology readiness level (TRL) framework to assess the maturity of a technology across lab, pilot, demonstration, and commercial phases. To gauge challenges beyond the technical readiness captured by the TRL, the U.S. DOE recently developed the Adoption Readiness Level (ARL) framework. The ARL assesses factors associated with value proposition, market acceptance, resource maturity, and license to operate. As Figure 16 indicates, both TRL and ARL need to be at high degrees of readiness for an innovation to reach full commercialization. CARB adopted the ARL framework to support the evaluation of barriers for the Draft SB 596 Cement Strategy.³⁸

³⁸ U.S. Department of Energy. 2023. Commercial Adoption Readiness Assessment Tool (CARAT).

Figure 16: Assessing Innovation Progress Toward Commercialization Using TRL and ARL Developed by U.S. DOE³⁹



The ARL provides a framework to assess the progress of an innovation to achieve commercialization. CARB adapted the ARL to help identify "market, statutory, and regulatory barriers" for each technology lever as required by SB 596. This framework can help identify areas where focused support and actions may be needed to achieve commercial-scale deployment of cement decarbonization technologies and is described in Table 12.40

³⁹ U.S. Department of Energy. 2023. Commercial Adoption Readiness Assessment Tool (CARAT).

⁴⁰ Notably the "value proposition" category was excluded when adapting this information, as CARB is not positioned to assess value proposition of each technology option. "GHG emissions reduction quantification," was added as some existing/potential emission reductions or CCUS projects do not yet have robust quantification methodologies.

Table 12: Adaptation of the U.S. DOE's Adoption Readiness Level Framework⁴¹

Factors	Description		
Demand-side factors Based on DOE's Market Acceptance risks, refers to the challenges in capturing the target market(s) demand characteristics	 Technology faces demand uncertainty and market barriers to entry Technology is limited to small markets or relies on a market that does not exist yet The path to deliver product from a producer to a customer along the value chain is not established 		
Supply-side factors Based on DOE's Resource Maturity risks, refers to the challenges in producing/providing the product and services at a commercial scale	 Significant capital investment is needed to achieve production on a commercial scale Deployment of technology requires additional development, integration, and management Additional infrastructure is needed to enable the technology. Limited availability of workforce to commercialize the technology 		
Permitting and other non-economic factors Based on DOE's License to Operate risks, refers to the national, state, and local non-economic risks that can affect the deployment of a technology	 Local, state, and federal regulations or other requirements/ standards must be met to deploy the technology The process to secure approvals to site and build equipment and infrastructure associated with the technology deployment is complex Concerns for hazardous side effects or adverse events inherent to production, transport, or use of the technology or product in the absence of sufficient controls Negative perception by local communities of the technology and its risks or impact, whether founded or unfounded 		
Quantification of GHG reductions and removals	Overarching framework to quantify, report, and verify GHG emissions reductions and removal projects in a consistent manner throughout the cement-concrete-construction value chain		

Overview of Energy-related GHG Reduction Lever

This section provides an overview of the current energy consumption by incumbent cement plants in California, potential alternative fuels, potential to increase the use of low- or zero-

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⁴¹ U.S. DOE. 2023. Commercial Adoption Readiness Assessment Tool (CARAT)

carbon electricity, and potential concerns and barriers associated with these options, including air quality concerns.

Key questions for feedback

- CARB identified increased use of fuels with biogenic content, introduction of clean hydrogen, increased use of electricity, and electrification as potential options to reduce GHG emissions related to energy use. Are there other energy-related GHG reduction options that should be considered?
- CARB developed an initial list of factors to help achieve wide deployment for each technology category (see "Feasibility Assessment" sections). Each category is associated with different focus areas, which are visually summarized in the figure below.
- Is the overall evaluation appropriate for each option? Should CARB consider additional factors?

Factors for Wide Deployment		Fuels with Biogenic Content	Hydrogen	Increased Use of Electricity/ Electrification		
Technology Readiness						
Adoption Readiness	Demand-side Factors					
	Supply-side Factors					
	Permitting and Other Factors					
	GHG Quantification					
	•	Strategic focus	may be required to	encourage deployment		
		Targeted action	Targeted action could achieve wide deployment			

Overview of energy consumption by California cement plants

Fuel combustion to produce clinker through limestone calcination accounts for about 3 MMT (about 35%) of GHG emissions associated with cement manufacturing. Clinker production is one of the most energy-intensive of all industrial processes, as cement kilns (long dry kilns), which are at least 14 feet in diameter and can be over 400 feet in length, need to be constantly heated to 1,450 °C. Cement plants in California have historically used coal and petroleum coke as primary fuels for heating kilns because these fuels cost-effectively provide high heat. Table 13 shows the U.S. EPA default CO₂ emission factors and high heat values for fuels used by California cement plants to calculate cement plant GHG emissions pursuant to MRR. Coal and coke have high heat value but are associated with high levels of GHG emissions.

Table 13: U.S. EPA Default Emission Factors and High Heat Values for Fuels Used by California Cement Plants⁴²

Fuel Group	Fuel Name	Default High Heat Value	Default CO ₂ Emission Factor
Coal and Coke		MMBtu/short ton	kg CO₂/MMBtu
	Bituminous Coal	24.93	93.40
	Coke	24.80	102.04
Natural Gas		MMBtu/scf	kg CO ₂ /MMBtu
	Natural Gas (Weighted U.S. Average)	1.028 x 10 ⁻³	53.02
Other fuels (solid)		MMBtu/short ton	kg CO ₂ /MMBtu
	Municipal Solid Waste	9.951	90.7
	Tires	26.87	85.97
	Petroleum Coke	30.00	102.41
Solid Biomass		MMBtu/short ton	kg CO ₂ /MMBtu
	Wood and Wood Residuals	15.38	93.80
	Agricultural Byproducts	8.25	118.17
Gaseous Biomass		MMBtu/scf	kg CO ₂ /MMBtu
	Biogas (Captured Methane)	0.841 x 10 ⁻³	52.07

In 2019, California cement plants consumed about 34 million MMBtu of energy and 1.4 terawatt hours of electricity to produce about 9.5 MMT of clinker. As shown in Figure 17, about 58% of the total thermal energy demand was met by coal. Natural gas and petroleum coke each provided about 16% of total thermal energy, followed by waste tires (6%) and biomass-derived waste (4%).

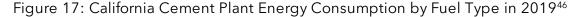
Combustion of coal and petroleum coke has negative air quality and human health impacts. Beyond GHGs, the major pollutants of concern from coal combustion are particulate matter, sulfur oxides, and nitrogen oxides. Some undesirable combustion products, including carbon monoxide (CO) and numerous organic compounds, are generally emitted even under proper boiler operating conditions.⁴³ Petroleum coke has a similar, but not identical, emissions profile as coal. Due to the refining process, there is often vanadium and nickel present in the PM emissions from combusting petroleum coke. Additionally, though sulfur oxide emissions are low, they are not absent.⁴⁴ Existing federal, state, and local air permit requirements govern the criteria air pollutant emissions from the use of these fuels. When

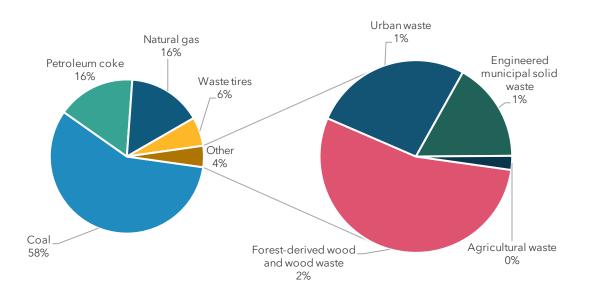
⁴² Final Rule on Mandatory Reporting of Greenhouse Gases promulgated by the United States Environmental Protection Agency (U.S. EPA) in its Final Rule on Mandatory Reporting of Greenhouse Gases. (40 C.F.R. § 98)

⁴³ U.S. EPA. AP-42: Compilation of Air Emissions Factors from Stationary Sources. *Bituminous and Subbituminous Coal Combustion*.

⁴⁴ Congressional Research Service. Petroleum Coke: Industry and Environmental Issues. October 29, 2013.

replacing fossil fuels with alternatives to reduce GHG emissions, SB 596 requires CARB to identify actions that both reduce GHG emissions and reduce adverse air quality impacts. In order to do so, it is necessary to understand the potential air quality impacts of various alternative fuels. The primary authority to regulate toxic air contaminants and criteria air pollutants at stationary source emissions lies with the local air districts and U.S. EPA.⁴⁵ These requirements are discussed in greater detail in the Air Quality Impacts section.





Alternative fuels can be used to displace fossil fuels to reduce GHG emissions associated with cement energy use. As potential availability of feedstock to produce low- or zero-carbon fuels can be different from region to region, the 2022 Scoping Plan Update was relied on to identify alternative fuels potentially available to California cement plants, including fuels with biogenic content, low- or zero-carbon hydrogen, low- or zero-carbon electricity, and waste heat recovery.

There is also the potential that decarbonization projects increase thermal energy demand. For example, the European Cement Research Academy estimated that monoethanolamine (MEA)-based carbon capture, the most mature technology for capture carbon, could require about 3,500 mega joules (3.3 MMBtu) of thermal energy and about 80 to 129 kWh of electricity to capture the CO₂ associated with producing one metric ton of clinker.⁴⁷ It will be

⁴⁵ California Air Resources Board. *Response to Comments on the Draft Environmental Analysis on Proposed Amendments to Cap-and-Trade Regulation*. Page 2-15. 2017.

⁴⁶ California Air Resources Board. *Mandatory Greenhouse Gas Emissions Reporting*.

⁴⁷ The European Cement Research Academy. 2022. The ECRA Technology Papers 2022.

critical to monitor the availability of low- and zero-carbon energy and to take steps to increase supply of these energy sources to power potential decarbonization projects.

Fuels with Biogenic Content

Fuel-switching to fuels with biogenic content presents a near-term option for cement plants to achieve GHG emissions reductions, as the carbon in biogenic CO₂ combustion emissions is part of the existing natural atmospheric carbon cycle and not newly present in the atmosphere as is the case for fossil fuel-derived carbon. Tires and waste-derived fuels are partially biogenic, and in fact over 50% of the GHG emissions associated with burning these fuels can be anthropogenic.⁴⁸ As shown in Figure 17 above, about 4% of the thermal demand of California's cement kilns in 2019 was met by the combustion of low-moisture biomass.⁴⁹

Fuels with biogenic content have multiple potential benefits. For example, SB 1383 (Lara, Chapter 395, Statutes of 2016) establishes the State's intent to phase out disposal of organic waste and requires a 40% reduction in statewide methane emissions by 2030. If cement plants use biomethane, it can help support the demand and infrastructure needed to advance the goals of SB 1383 and support methane reduction goals. In addition, combustion of low-moisture biogenic fuels that meet SB 1383 requirements could potentially contribute to diverting organic waste from being landfilled. However, combustion of municipal solid waste is considered solid waste disposal and is outside the scope of landfill diversion.

Woody biomass, including forest-derived wood or wood waste, urban waste, and agricultural waste provided about 3% of the total thermal energy used by cement plants in 2019. These waste-derived fuels are 100% biogenic and therefore can contribute to reductions in anthropogenic GHG emissions when displacing fossil fuel use. However, combustion of any solid fuel, including both fossil fuels and biogenic fuels, can result in local air pollutant emissions, such as particulate matter emissions, and it's important that any cement plant relying on fuel combustion remain in compliance with their air permits, regardless of solid fuel source.

⁴⁸ California Air Resources Board. 2016. *California's 2000-2014 Greenhouse Gas Emission Inventory Technical Support Document.* Under the GHG Inventory methane and N₂O emissions resulting from biomass combustion are counted for California's GHG inventory total.

⁴⁹ The California Cap-and-Trade Regulation defines biomass as "non-fossilized and biodegradable organic material originating from plants, animals, and microorganisms, including products, by-products, residues, and waste from agriculture, forestry, and related industries as well as the non-fossilized and biodegradable organic fractions of industrial and municipal wastes, including gases and liquids recovered from the decomposition of non-fossilized and biodegradable organic material."

Some California cement plants use engineered municipal solid waste (EMSW) and/or waste tires as fuels, which are associated with partial biogenic content. About 1% of the thermal energy needs for California cement plants were met using EMSW in 2019. EMSW is municipal solid waste (MSW⁵⁰) that has been mechanically processed to remove some of the chlorinated plastic and non-combustible materials. EMSW must contain less than 25% moisture and less than 25% non-combustible materials, and it must maximize the calorific value and burn rate of the waste.⁵¹ EMSW does not have a nationwide estimated biogenic content percentage, but U.S. EPA estimates the average biogenic portion of MSW to be 60%.

In 2019, about 6% of thermal demand by California cement plants was met by waste tires,⁵² for which U.S. EPA determined the default biogenic fraction to be 20%. Waste tires are subject to the California Tire Recycling Act,⁵³ and facilities that combust them must get relevant permits from local, state, and federal agencies under the Clean Air Act.⁵⁴ Although waste tires have a relatively large high heat value (26.87 MMBtu/short ton compared to 24.93 MMBtu/short ton for bituminous coke), the majority of GHG emissions associated with tires (~80%) are non-biogenic. The use of alternate fuels with high levels of anthropogenic GHG emissions provide limited value to achieving the aggressive goals of SB 596 in decarbonization the cement sector.

EMSW

There is currently a lack of data on criteria and air toxic pollutant emissions associated with combustion of EMSW because facilities in the state use EMSW as only a small fraction of their total fuel. To complete analysis of the potential air quality impacts of each alternative fuel type, more information is needed about the criteria and toxic air pollutants that can be attributed to burning specific fuel types. For example, with EMSW, some, but not all, chlorinated plastics are required to be removed, and combustion of the remaining plastic could produce volatile organic compounds and hazardous air pollutants, such as dioxins. There is ongoing analysis of the potential GHG emissions reductions and air pollutant

⁵⁰ CARB's Mandatory GHG Reporting Regulation defines MSW as: "solid phase household, commercial/retail, and/or institutional waste." For a more detailed description, see *Regulation for the Mandatory Reporting of Greenhouse Gas Emission.*

⁵¹ The process and requirements to convert municipal solid waste into engineered municipal solid waste is specified in Ca. Pub. Res. Code § 40131.2" Cal. Pub. Resources Code § 40131.2.

⁵² The California Tire Recycling Act defines waste tire as "tire that is no longer mounted on a vehicle and is no longer suitable for use as a vehicle tire due to wear, damage, or deviation from the manufacturer's original specifications. A waste tire includes a repairable tire, scrap tire, altered waste tire, and a used tire that is not organized for inspection and resale by size in a rack or a stack, but does not include a tire derived product or crumb rubber. Ca. Pub. Res. Code § 42860

⁵³ Ibid.

⁵⁴ Clean Air Act Title 42 U.S.C. 7401.

impacts of switching to a range of biomass-derived fuels. See the Air Quality Impacts section below for more information.

There is also a lack of clarity over when EMSW can and cannot be used as a fuel. The relevant agencies include local air districts, local municipal waste management agencies, and CalRecycle. One open question is what amounts of chlorinated plastics need to be removed to effectively protect human health.

Tires

Pursuant to section 42889.4 of the California Public Resources Code, CARB is required to publish criteria and toxic air pollutant emissions information from facilities that burn tires as supplemental fuel.⁵⁵ The published information does not specify what emissions are directly attributable to combustion of tires; it provides the total quantity of tires combusted at each facility and the total quantity and type of emissions from each facility. This makes it challenging to evaluate the air pollutant emissions directly associated with the combustion of tires. Aligned with the requirements of the Tire Recycling Act (PRC 42873(b)), California Department of Resources Recycling and Recovery (CalRecycle, the state agency responsible for recycling and waste management within the state) does not support incineration of tires. Given the lack of support from CalRecycle, the air quality concerns, and the limited GHG benefits, the use of tire-derived fuels is not a priority for the Draft SB 596 Cement Strategy.

Alternative Pathways to Use Biomass

Currently, solid fuels are directly combusted in cement kilns. However, the 2022 Scoping Plan Update puts forward a long-term statewide plan that will result in a transition away from solid fuel combustion. The move away from combustion will reduce both GHG emissions and local air pollutant emissions to improve air quality and public health for all Californians, especially in priority communities. There is potential to convert solid biomass to energy through either gasification or pyrolysis. Gasification refers to conversion of biomass feedstock in an oxygen- or air-deficient environment to produce fuel gases (e.g., synthesis gas, producer gas), which can then be converted to biomethane via a methanation process. ^{56,57} Pyrolysis is similar to gasification but is generally optimized to produce liquid fuels or bio-oils. Slow pyrolysis, which has a processing time of several minutes to a few hours, maximizes the production of biochar, which is a fuel with high heat value that is potentially suitable for use in cement kilns. As non-combustion thermal conversion technologies are not widely used to produce alternative fuels today, more information is needed to understand the potential impact on air pollution emissions. Regardless of what any new

⁵⁵ California Air Resources Board. 2021. Report on Air Emissions from Waste Tire Burning in California.

⁵⁶ Methanation is the conversion of CO_x to methane (CH₄) via hydrogenation.

⁵⁷ IEA Bioenergy. *Emerging Gasification Technologies for Waste & Biomass.* 2020.

information may indicate, all emissions are subject to the relevant local, state, and federal permits and emission limits.

Biomethane

Biomethane, sometimes called "renewable natural gas," is a near-pure source of methane.⁵⁸ Anaerobic digestion is commonly used to convert biomass with high moisture content to biogas. Solid waste landfills also generate biogas. The resulting biogas can be upgraded to biomethane and injected into common carrier natural gas pipelines as a substitute for natural gas. Biomethane is already commonly injected into common carrier natural gas pipelines for use in commercial applications.

Under the current California policies, most available biomethane is being used in the transportation sector under the Low Carbon Fuel Standard, and some is in the process of being procured to serve residential use under SB 1440.⁵⁹ A shift in policies may be needed to support industrial use of biomethane. As indicated above, the use of biomethane by cement plants can also help advance the goals of SB 1383.

Feasibility Assessment of Fuels with Biogenic Content

Technology readiness

Various types of biomass are currently combusted by California cement plants. In addition to direct biomass combustion, biomass can also be converted to biomethane via anaerobic digestion. Biomethane can also be produced from biogas collected from landfills. Biomethane production is already commercialized, but biomethane is not currently used in cement production. Use of biomethane or biomass could increase if the issues discussed below are addressed.

Adoption readiness

Biomass-derived fuels have several focus areas for wide deployment depending on the feedstock/fuel type.

- Demand-side factors
 - o Biomethane is already commercially available for the transportation sector, but incentive mechanisms may be needed to grow the market for industrial use.
- Supply-side factors

⁵⁸ IEA. 2020. Outlook for biogas and biomethane: Prospects for organic growth.

⁵⁹ In 2022, the California Public Utilities Commission (CPUC) issued a decision (D.22-02-025) under the Renewable Gas proceeding that adopted biomethane procurement targets for natural gas investor-owned utilities (IOUs) under SB 1440. The short-term procurement target for 2025 is 17.6 billion cubic feet per year and the medium term 2030 target is 72.8 billion cubic feet of biomethane per year.

- o Small amounts of biomass are already combusted by cement plants. However, a robust waste biomass supply market may be necessary to ensure stable supply as overall demand for low-carbon energy sources is projected to increase rapidly.
- o Efficient supply chains need to be developed to collect, transport, and process the different types of waste biomass generated in different regions.
 - The supply of biomass differs regionally in California. Southern California has limited waste woody biomass but has large amounts of MSW, manure, and wastewater. The Central Valley is one of California's major agricultural areas where substantial agricultural waste is generated.⁶⁰ Parts of the Central Valley are reasonably close to the area in Southern California where six of the cement plants are located. The cement plant in the northern part of the state (in Redding, CA) has better access to forest and agricultural waste than the cement plants in Southern California.
- Permitting and other non-economic factors
 - o Biomass combustion and conversion can be associated with air pollutant emissions and odors.
- Quantification of GHG emissions
 - o For fuels with biogenic fractions, more accessible methodologies may be needed to quantify the biogenic portion of GHG emissions.

Potential next steps

To compare the potential local air pollution levels of biomass-derived fuels relative to existing fossil fuel use, small-scale alternative fuels evaluations with detailed emissions monitoring could be undertaken prior to more full-scale biomass use at cement plants. This would allow cement plants to test different fuel mixtures to maximize fuel efficiency, minimize emissions, and gain valuable data on to the chemical composition of their exhaust and potential air quality impacts. This information could then be used by CARB, CalRecycle, and local Air Districts to develop joint agency recommendations on the types of biomass-derived fuels that the cement sector should prioritize. Potential actions could also include cross-sectoral coordination on waste biomass supply and optimal uses of biomethane.

Hydrogen

Low-carbon hydrogen is an important fuel to achieve California's state-wide goal of carbon neutrality by 2045. The 2022 Scoping Plan Update calls for accelerating the transition away

⁶⁰ According to the estimation by Breunig et al, major agricultural wastes in California with relatively low moisture content include almond hulls/shells and orchard/vineyard residue (about 5,000 tons biomass solid per year respectively, excluding moisture) and biosolids in dairy manure are estimated to be about 7,000 tons and manure solids are about 3,000-4,000 tons.

from combustion of fossil fuels, in part through low-carbon hydrogen production, including via electrolysis powered by zero-carbon electricity, steam methane reformation (SMR) of biomethane, and biomass gasification with CCS (bioenergy with CCS, or BECCS). As hydrogen provides very high flame temperatures, at over 2000 °C in air, it may be suitable for cement kilns. Hydrogen combustion leads to negligible GHG emissions, and a marked decline in PM emissions. Compared to natural gas, hydrogen combustion might have an increase in NO_x emissions, but California cement plants have emissions control equipment for NO_x and SO_x. Several feasibility studies are underway in different parts of the world to understand how hydrogen can be used as a fuel for cement kilns.⁶¹

There have been multiple efforts at federal, state, and local levels to support the development of low-carbon hydrogen production and infrastructure. At the federal level, U.S. DOE initiatives and the Inflation Reduction Act 45V Hydrogen Production Tax Credit⁶² are major drivers for increased production of hydrogen. At the state level, California's Hydrogen Market Development Strategy⁶³ is building up California's renewable hydrogen market. ARCHES, California's public-private partnership to establish a hydrogen ecosystem to drive down the cost of renewable hydrogen, received up to 1.2 billion dollars as part of the Infrastructure Investment and Jobs Act of 2021 (IIJA) funding.⁶⁴ At the local level, initiatives such as the Angeles Link⁶⁵ and Lancaster Hydrogen City⁶⁶ are starting to develop local/regional hydrogen infrastructure.

Feasibility Assessment of Hydrogen Fuel

<u>Technology readiness</u>

Industrial hydrogen has been produced widely, but low- or zero-carbon hydrogen production based on electrolysis powered from zero-carbon electricity, SMR of biomethane, BECCS, or other low carbon feedstocks are still in the process of achieving cost-effective production or being scaled.

Adoption readiness

- Demand-side factors
 - Some purchase cost reduction programs are likely needed to create a market for industrial use, such as incentivizes or easier access to low-carbon hydrogen.

⁶¹ See, for example, Global Cement. "Update on hydrogen injection in cement plants."

⁶² The Clean Hydrogen Production Tax Credit creates a new 10-year incentive for clean hydrogen production tax credit with up to \$3.00/kilogram.

⁶³ The Governor's Office of Business and Economic Development. *California's Hydrogen Market Development Strategy.*

⁶⁴ "California wins up to \$1.2 billion from feds for hydrogen." ARCHES.

⁶⁵ SoCalGas. Angeles Link.

⁶⁶ The City of Lancaster. *The First Hydrogen City.*

- Supply-side factors
 - o Low- and zero-carbon hydrogen production costs are currently high.
 - o Additional generation capacity for renewable electricity and/or biomass conversion will be needed to support low-carbon hydrogen production.
 - o New/additional pipelines may be needed to transport hydrogen, unless it is produced onsite.
- Permitting and other non-economic factors
 - o There are concerns about potentially increased NOx emissions resulting from combustion of hydrogen.⁶⁷
 - o There are operational and safety concerns related to injecting hydrogen into existing natural gas pipelines.

<u>Current status and potential next steps</u>

In 2022, the Legislature passed Senate Bill (SB) 1075, which calls for CARB, in collaboration with the California Energy Commission and California Public Utilities Commission, to produce a comprehensive report on hydrogen. This report will cover the development, deployment, and use of hydrogen across all sectors as a key part of achieving the State's climate, air quality, and energy goals. The SB 1075 implementation process will help inform the availability of hydrogen for cement plants.

Electrification and Increased Use of Low- or Zero-carbon Electricity

In 2019, California cement plants collectively purchased 1,399,400 MWh of electricity, which was about five percent of the total cement plant energy use. There are two California cement plants with on-site wind generation capacity that totals about 30 MW. While current cement plant electricity consumption is a small portion of overall energy use, electricity has potential to support decarbonization of the cement sector, as (1) electricity is a non-combustion method that can significantly reduce local air pollutant emissions at cement plants, and (2) state policies, including the Cap-and-Trade Program and California Renewables Portfolio Standard Program, 68 continue to drive down electricity sector GHG emissions intensity. There are multiple ways cement plants can leverage low- or zero-carbon electricity.

• Kiln/precalciner electrification: As cement kilns require substantial energy, kiln electrification was not historically considered feasible. However, in recent years there

⁶⁷ U.S. DOE's Hydrogen and Fuel Cell Technologies Office has been evaluating how to address potential NOx emissions from gas turbines fueled with hydrogen. U.S. DOE. 2022. *Low NOx Targets and State-of-the-Art Technology for Hydrogen Fueled Gas Turbines.*

⁶⁸ SB 100, which was amended by SB 1020 (Laird, Chapter 361, Statues of 2022) in 2022, sets a state-wide goal of 100% of all retail sales from eligible renewable energy resources and zero-carbon resources by December 31, 2045.

- have been demonstration projects aimed at achieving needed temperatures by electric heating combined with the convective transfer of heat by process gases.⁶⁹
- Concentrated solar heat: Concentrated solar heat uses arrays of mirrors to direct solar radiation to a receiver, which then transfers heat to needed process. A pilot of this technology has been demonstrated to achieve temperatures needed for clinkering reactions (in excess of 1,500 °C) at the IMDEA solar tower in Spain.⁷⁰
- Conversion of electricity to thermal energy: There are efforts to turn resistive heat generated by electricity into thermal energy exceeding 1,000 °C using mediums such as refractory brick. If these technologies can continuously provide temperatures at about 1,500 °C, they can potentially be used for cement kilns.⁷¹
- Energy efficiency (waste heat recovery): As cement kilns operate up to 1,450 °C, relatively high temperature waste heat from the kiln can potentially be recovered and used to generate electricity to meet on-site electricity demand. Many industrial facilities, including cement plants, internationally and nationally already employ this technology. The cement industry in California has been exploring waste heat recovery (WHR),⁷² as current electricity prices and new federal incentives for onsite electricity generation have created incentives for these investments.

Feasibility Assessment of Electrification and Increased Use of Low- or Zerocarbon Electricity

<u>Technology readiness</u>

Kiln electrification is still in the early stage of demonstration, but precalciner electrification is considered less technically challenging because it requires lower temperatures.⁷³ There are multiple demonstration projects for concentrated solar heat, but this technology may take longer than five years to reach commercialization. Thermal energy using electricity is in the early stage of commercialization, especially for the high temperatures needed in cement manufacturing. Use of recovered waste heat for electricity generation can be deployed if adoption readiness issues are addressed.

Adoption readiness

Electricity is an established energy source with minimal adoption readiness issues, but the cement industry has raised concerns about high electricity prices and barriers to electrification stemming from electricity rates structures.

⁶⁹ See, for example, European Cement Research Academy. 2022. *The ECRA Technology Papers 2022*.

⁷⁰ Global Cement and Concrete Association. *CEMEX - Solar Clinker*.

⁷¹ RONDO. *The Rondo Heat Battery*.

⁷² California Nevada Cement Association. 2023. *Achieving Carbon Neutrality in the California Cement Industry Second Edition*.

⁷³ U.S. DOE. 2023. Pathways to Commercial Liftoff: Low-Carbon Cement.

Current status and potential next steps

AB 2109 (Carrillo), Electricity surcharge exemption, was passed and enacted in September 2024 to exempt large industrial customers from paying certain surcharges on their reductions in electricity if that reduction is achieved through an industrial process heat recovery technology with specified requirement. Depending on the implementation of AB 2109, additional support may be needed to increase the use of zero and low carbon electricity at cement plants.

Overview of Carbon Capture, Use, and Sequestration Lever

This section provides: 1) an overview of SB 905, 2) an overview of carbon capture technologies, 3) an overview of carbon use and sequestration technologies, 3) an overview

Key questions for feedback

- For carbon capture, there are diverse technology options of differing readiness and maturity for application in the cement sector. What technology options are viewed as most promising for application in the cement sector? Are there additional technologies that should be considered?
- Are there additional CO₂ use or sequestration methods that should be considered?
- What quantification and verification methodologies are available for CO₂ capture and use in the cement sector that could be incorporated into a SB 905 program?
- Should CO₂ use and removal technologies, like recarbonation be included? If so, under what circumstances and what kinds of quantification, verification and permanence methods should be required? CARB developed an initial list of factors for wide deployment. A discussion section for each technology category is provided, which is found in the following "Feasibility Assessment" sections. What if any additional factors should be considered?

Factors for Wide Deployment		ccs	сси
Technology Readiness			
Adoption Readiness	Demand-side Factors		
	Supply-side Factors		
	Permitting and Other Factors		
	GHG Quantification		

Strategic focus may be required to encourage deployment

Targeted action could achieve wide deployment

of carbon removal technologies, and 4) feasibility assessment of carbon capture, use, sequestration and removals.

In 2019, California cement plants collectively emitted about 4.9 MMT of process emissions (about 63% of total GHG emissions from cement plants) as a result of the limestone calcination process (calcium carbonate (CaCO₃) + heat energy = Calcium oxide (CaO) + CO₂). Because of the high level of hard-to-abate inherent process emissions, CCUS is considered an important potential decarbonization option for the cement industry. Carbon Capture, Use, and Sequestration is a three-pronged approach to CO₂ emissions reduction; 'capturing' is the essential first step for 'use' or 'utilization' of captured CO₂, or 'sequestration' which is the removal and storage of carbon from the atmosphere in GHG sinks or GHG reservoirs through physical or biological processes. The use of captured CO₂ for different applications both within and outside the cement and concrete industry are rapidly developing. Overall, CCUS technologies have evolved significantly over the last several years. More recently, the Inflation Reduction Act of 2022 (IRA) and the Infrastructure Investment and Jobs Act of 2021 (IIJA) are providing a significant amount of funding to CCUS projects across several sectors, which will further advance the technology. See "Tools, Rules and Potential Measures to Help Achieve Net-zero Emissions Goals" for current federal/state funding opportunities for CCUS.

SB 905: Carbon Capture, Removal, Utilization, and Storage Program

All carbon capture, use, and removal projects must be quantifiable, verifiable, permanent, and consistent with the requirements of SB 905. Protocols for CCUS and CDR project-types will need to be developed to support broader adoption of CCUS and CDR and the cement sector.

SB 905 was signed into law in 2022 and requires CARB to establish a Carbon Capture, Removal, Utilization, and Storage Program to evaluate the efficacy, safety, and viability of CCUS and CDR technologies, to develop protocols for CCUS and CDR technologies, and to develop monitoring and reporting schedules to state regulatory agencies.

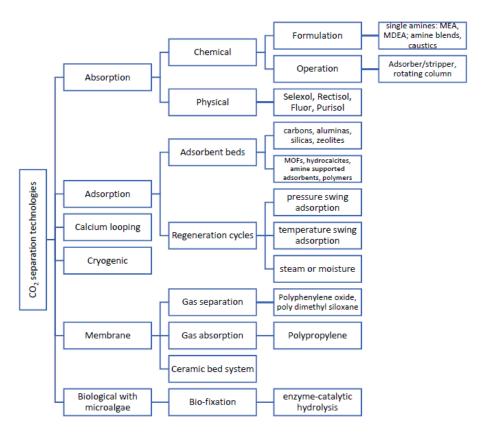
Prior to the passage of SB 905, CARB adopted a CCS protocol in 2018 as part of amendments to the Low Carbon Fuel Standard. This initial CCS protocol is focused on the quantification, monitoring, and reporting of CO2 captured from industrial sources and stored underground in a geologic formation. This initial protocol does not cover the diversity of capture, utilization, sequestration, or removal approaches that could be implemented by the cement sector. As part of implementing SB 905, CARB expects to update and develop new protocols for additional CCUS and CDR approaches, including those that are discussed in this report and that could be utilized by the cement sector to reduce their emissions pursuant to SB 596.

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Carbon Capture Technologies

There has been extensive research and development into different methods of capturing CO₂ in recent years. Monoethanolamine (MEA)-based chemical absorption, sorbent-based capture, cryogenic, oxy-fuel combustion capture, indirect calcination, and calcium looping, among other technologies, have been deployed or tested related to cement manufacturing. Ultimately, any CCUS will have to be evaluated and included in the SB 905 Carbon sequestration: Carbon Capture, Removal, Utilization, and Storage Program.

Figure 18: Examples of CO₂ Separation Technologies⁷⁴



- MEA-based chemical absorption, which captures carbon contained in post-combustion flue gas using liquid amine scrubber. It has been used in other sectors, such as petroleum refining and coal-fired electricity generation, over the last couple of decades. However, MEA-based capture requires substantial amounts of energy, water, and space to operate.
- A variety of solid sorbents have been evaluated for carbon capture applications. Relative to liquid solvents like MEA, solid sorbents can potentially have lower

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⁷⁴ Font-Palma et al. 2021. Department of Engineering, University of Hull. *Review of Cryogenic Carbon Capture Innovations and Their Potential Applications.*

⁷⁵ See, for example, Global Cement and Concrete Association. *Amine-based post-combustion capture*.

regeneration energy, lower corrosion concerns, and lower associated emissions (from both manufacturing and required energy for use). Calcium looping uses calcium oxide as a CO_2 sorbent, and alternates calcination and reabsorption processes (CaO \rightleftharpoons CaCO₃) to first absorb CO_2 from the exhaust stream using CaO, and then to heat the CaCO₃ to release concentrated CO_2 for capture and repeat the cycle. Captured CO_2 is then compressed, transported, and sequestered.

- Cryogenic carbon capture could capture carbon with fewer chemical requirements than sorbents. It separates CO_2 from the exhaust gases by cooling to initiate a phase change from gas to liquid or solid.⁷⁶
- In-oxy-fuel combustion with carbon capture, the fuel combustion happens in pure oxygen or oxygen-enriched air, instead of ambient air, so that the CO₂ concentration of the exhaust gas is higher (because there is less nitrogen present) and the CO₂ capture process is more efficient. However, additional energy is needed to reduce the amount of nitrogen in the combustion environment that produces oxygen.

In addition, there are emerging technologies that isolate the process CO₂ emissions that result from limestone calcination.

• Indirect calcination yields an exhaust gas with a high CO₂ concentration because calcination of limestone occurs before the materials are mixed with combustion flue gas. Capturing the process CO₂ emissions from the high concentration exhaust gas enables more efficient and cost-effective CO₂ capture.

Use and Sequestration of Captured Carbon

In addition to geologically sequestering captured CO_2 , it can be used for productive purposes. Broadly, captured CO_2 can have many different uses both within the cement and concrete industries and outside of it. Per the goals of this SB 596 Cement Strategy, the following use and sequestration techniques are focused on applications in the cement sector, but it is recognized that this is not an exhaustive list.

Fuel Production

Captured CO_2 can be used to produce methanol by hydrogenation. Methanol has many uses, but when combined hydrogen it can be used as a liquid fuel for the transportation and shipping industries. The CO_2 is usually captured via direct air capture, or MEA- based chemical absorption from an industrial process, such as cement manufacturing.⁷⁷

⁷⁶ Font-Palma et al. 2021. Department of Engineering, University of Hull. *Review of Cryogenic Carbon Capture Innovations and Their Potential Applications*.

⁷⁷ Energy Conversion and Management. 2023. Yang et al. A strategy for CO₂ capture and utilization towards methanol production at industrial scale: An integrated highly efficient process based on multi-criteria assessment.

Carbon Mineralization

Carbon mineralization is the process by which carbon dioxide becomes a solid mineral, such as a carbonate. There are several mineralization technologies that fix CO_2 into minerals, such as calcium carbonate ($CaCO_3$) and magnesium carbonate ($MgCO_3$). These minerals can be used as commercial products within the cement and concrete supply chain, such as in aggregates or supplementary cementitious materials. Additionally, calcium-rich minerals in concrete can absorb CO_2 , which means that CO_2 can be sequestered into concrete during its blending and production stage. There are companies that are commercializing the process of injecting CO_2 during the concrete production process.

Both calcium carbonate and magnesium carbonate are stable and can be considered as potentially permanent carbon sinks. Unlike a CCS framework, mineralized CO₂ may be difficult to monitor, due to the challenge of tracking its distribution to buyers and location of ultimate use. Once the product is incorporated into its end products, like concrete, periodic measurement could damage the structure it was used in, or it could be inaccessible. Provided robust quantification, reporting, and verification methods can be developed, CCU could play a role in cement decarbonization, particularly if geological sequestration projects require longer time for implementation.

Geologic Sequestration

Geologic sequestration is the process of injecting CO2 captured from an emissions source into deep subsurface rock formations for permanent storage. Geologic sequestration of CO_2 is an established and well-understood method for long-term storage of CO_2 and presents an opportunity for cement decarbonization in addition to utilization approaches. CO_2 transport, from the cement production site to the injection site, is one of the challenges that the cement sector may experience in implementing carbon capture with geologic sequestration to reduce emissions.

Carbon Removal Technologies

There are also new and emerging technologies that can be used to absorb carbon dioxide from the atmosphere that do not neatly fit into the 'use' or 'sequestration' categories. These technologies are listed below to solicit input on whether and under what circumstances they could be considered for SB 596 and if included how carbon removal technologies would be quantified to the same standards as any other sequestration or use method.

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⁷⁸ USGS. 2019. Making Rocks- How Growing Rocks Can Help Reduce Carbon Emissions.

⁷⁹ See, for example, *Carboncure*.

Direct Air Capture (DAC)

Direct Air Capture is the broad term for a suite of technologies that remove CO_2 directly from ambient air. Currently there is at least one direct air capture (DAC) process that could align with the cement-concrete supply chain. It uses calcium oxide as a sorbent to mineralize ambient CO_2 into calcium carbonate. The calcium carbonate with captured CO_2 , or any mineral generated by incorporating CO_2 through a DAC process, could potentially be used as concrete aggregate.

Recarbonation

At final use, cement is mixed with aggregate, admixtures, and water to create concrete. Concrete is the most common building material in the world and theoretically can be a carbon sink and a source of permanent sequestration. As hydrated compounds in cement are exposed to atmospheric CO₂, the calcium hydroxide (Ca(OH)₂) bonds with CO₂ to return to calcium carbonate (CaCO₃), yielding H₂O as a biproduct.⁸⁰ This process of concrete absorbing CO₂ from ambient air to create calcium carbonate is known as recarbonation. This is notably different from the previously discussed methods of use and sequestration, because it does not absorb a pure CO₂ stream generated from either process or energy emissions. Theoretically, the calcium hydroxide present in cement can reabsorb 100% of the CO₂ that was emitted during the original calcination process.⁸¹ However, the actual amount of CO₂ that gets recarbonated is limited and may vary widely, depending on factors like the surface area of the concrete, concrete porosity, exposure time, and/or presence of other substances that can react with CO₂. Recarbonation occurs over the lifetime of the concrete, which can be centuries.82 Overall, quantification of the amount of CO₂ captured would need be held to the same standards as any other sequestration technique: it would need to be measurable, quantifiable, verifiable, and permanent, and meeting these standards may be challenging for recarbonation given its variability.

Feasibility Assessment of CCUS projects

CCUS is a rapidly evolving suite of technologies. As of February 2025, there are not yet any commercial-scale applications of CCUS in operation at a cement plant in California. There are, however, several pilot CCUS projects active in California.⁸³ There are some uncertainties associated with implementation, which are somewhat differ between CCS and CCU.

Technology readiness

⁸⁰ CO₂ Uptake Potential due to Concrete Carbonation: A Case Study. Possan et. al. 2017.

⁸¹Global Cement and Concrete Association. 2024. Carbon Uptake.

⁸² Cembureau. 2019. Cement Recarbonation.

⁸³ See for example, Fortera, and Calpine.

o Estimates of the technology readiness for CO₂ capture technologies vary, but amine-based chemical absorption is a relatively mature technology. The first commercial MEA-based capture facility at a cement plant is completing construction in Norway, and Heidelberg in Edmonton, Canada is also developing amine-based carbon capture units. Other CO₂ capture technologies are at different levels of the development stage. For example, there are demonstration projects for indirect calcination and solid sorbent absorption, which are slightly more advanced than cryogenic capture and membrane absorption, which are still in research and development phase. Most CO₂ utilization technologies are in the development stage, but there are demonstration projects in California where CO₂ captured from the flue gas of an industrial facility (a power plant and a cement plant) is mineralized to produce aggregates or SCMs.

Adoption readiness

- o Demand-side factors
 - o CCU: Cement and/or concrete products produced using captured CO₂ need to conform to standards, codes, and specifications for cement, concrete, and/or aggregate and be accepted by the concrete-construction industry.
- o Supply-side factors
 - o CCUS technology is capital intensive.
 - o Infrastructure, including carbon storage facilities, transportation pipelines, and geologic sequestration wells, need to be developed.
 - Standardized frameworks and/or agreements may be needed among stakeholders on the value chain (cement plants, transportation providers, storage, and sequestration project operators) to implement effective and efficient CCUS projects.
- o Permitting and other non-economic factors
 - o SB 905 Carbon Capture, Removal, Utilization, and Storage Program is under development.
 - o The permitting requirements for transporting and sequestering captured CO₂ are under development by the federal Pipeline and Hazardous Materials Safety Administration.⁸⁴
- o Quantification of GHG emissions
 - CCUS will need GHG quantification protocols to contribute to the goals of SB 596.

⁸⁴ US Department of Transportation. *USDOT Proposed New Rule to Strengthen Safety Requirements for Carbon Dioxide Pipelines*. January 15, 2025.

CCUS technologies are not at scale. It will take coordination to simultaneously develop carbon capture and the needed infrastructure for use or sequestration.



CASE STUDY: Norway Development of the CCS Value Chain

CCS requires infrastructure to safely and sustainably capture, transport and sequester carbon. When a cement plant installs a carbon capture unit, captured carbon needs to be safely transported and permanently stored at a sequestration site. However, it is most likely that each stage is owned, developed and operated by different business entities and will require different levels of investments, planning, permitting and construction. In Norway, the state played a pivotal role to make sure that all three phases become operational at the same time. Acting as the "project integrator," Norway is helping develop an industrial CCS value chain (Longship Project) by providing both financial and technical support to stakeholders carrying out carbon capture, transportation and offshore sequestration.

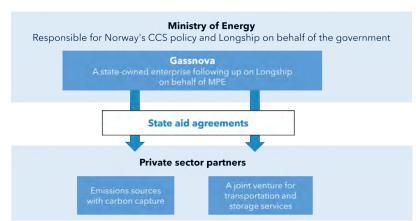


Figure: The Framework of Longship Project

Under the Longship Project, Heidelberg Materials' cement plant is installing amine-based carbon capture units with plans to capture around 400,000 tons of CO₂ annually. Northern Lights, a joint venture, is responsible for the operation of onshore/offshore facilities to receive CO₂ from the Heidelberg Materials plant, ship it to a receiving terminal, and transporting it via pipeline to a storage site 2,600 meters below the seabed. According to *Gassnova*, as of Fall 2024, Heidelberg CCS project is 76% complete and Northern Lights project is 94% complete.

Because CCS is an emerging technology, this project addressed the lack of commercial incentives for the industrial partners and risks to adopt emerging technologies. To do so, the Norwegian government offered a tailor-made state aid agreements for companies willing to capture carbon and transport/sequester that carbon. These financial aids cover approximately two-thirds of the total costs according to the initial cost estimates. The state-owned enterprise, Gassnova also coordinated on issues that required harmonization such as CO₂ specification, export rates from the capture plants, and use of loading arms between capture export terminal and ship. A committee was also established to address cross-sectoral operation issues including transport schedule. Gassnova is also responsible for project evaluation and tracking the progress of the entire project. The state aid agreements, technical studies, reports on lessons learned among other materials are publicly available as resources for other projects and similar efforts. For more information on Longship Project, visit https://ccsnorway.com/the-project/

In California, SB 905 is projected to facilitate the implementation of CCUS projects on multiple fronts. CARB is coordinating efforts to ensure that CCUS issues related to the cement sector will be addressed through both processes. In addition, the potential for installation of on-site CO₂ capture units to reduce local air pollutant emissions depending on the technology deployed is being evaluated.⁸⁵

Overview of Increased Use of Low-carbon Cement and Concrete Lever

This section provides: 1) an overview of standards, codes and specifications that govern the use of cement, 2) technical descriptions of material to make low-carbon cement (fillers, CMs, and ACMs), and 3) concerns and barriers to promote the use of low-carbon cement and concrete. Alternative raw materials with lower GHG emissions can be added to reduce the amount of clinker in cement. In the U.S., most alternative materials are typically added to cement when making concrete at concrete plants, while some are blended with clinker at cement plants. There are three major categories of low-carbon alternative materials that can be added cement: fillers, supplementary cementitious materials (SCMs), and alternative cementitious materials (ACMs). Some materials are already used by industry, and others may be made available by new manufacturers or suppliers that are not currently part of the cement-concrete-construction value chain. These materials are discussed in the following sections.

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⁸⁵ Clean Air Task Force. 2023. Air Pollutant Reductions from Carbon Capture.

Key questions for stakeholder feedback

Alternative low-carbon materials can be added by cement or concrete producers to displace limestone-based clinker to lower GHG emissions associated with cement.

- CARB staff identified fillers, SCMs and ACMs as potential materials to displace limestone-based clinker. Should other product categories be included?
- An initial list of focus areas for wide deployment for each technology category is found in the "Feasibility Assessment" sections. Each category is associated with different levels of challenges, and potential areas for priority is visually summarized in the figure below. Is the overall evaluation of each material appropriate? Should CARB consider additional barrier factors?

Factors for Wide Deployment		Fillers	SCMs	ACMs
Technology Readiness				
Adoption Readiness	Demand-side Factors			
	Supply-side Factors			
	Permitting and Other Factors			
	GHG Quantification			

Strategic focus may be required to encourage deployment

Targeted action could achieve wide deployment

To facilitate stakeholders feedback on this subject, the appendices of the Draft SB 596 Cement Strategy include (1) the status of a new material approval process by California Department of Transportation (Caltrans) (Appendix B), and (2) the results of the California concrete producer survey (Appendix C).

Standards, Codes, and Specifications of Cement and Concrete

Before discussing low-carbon materials, it's important to understand the standards, codes, and specifications that apply to cement and concrete, which are subject to rigorous rules to ensure the final products' strength and safety. Every alternative material used to replace clinker in cement needs to conform to relevant requirements.

Material standards

Material standards provide material specifications and testing methods to help industries supply products with standardized, uniform quality. The ASTM and American Association of State Highway and Transportation Officials (AASHTO) are the major standard setting bodies for cement and concrete in the U.S. and in California. As discussed in "Potential Approaches

to Establishing SB 596 Targets" section, ASTM C150 (AASHTO M 85) for Portland cement, ASTM C595 (AASHTO M 240) for hydraulic blended cements, and ASTM C1157 for the standard performance specification are the three primary standards used for cement in the United States.

Once cement is shipped to concrete producers, it's mixed with aggregates, chemical admixtures, and water to become concrete products. The standard specification for readymixed concrete is ASTM C94 (AASHTO M 157), which governs the mixing and testing of concrete.

Building codes

Depending on the type of construction, concrete is also subject to building codes and specifications that set minimum requirements for how structural systems, plumbing, heating, and other aspects of residential and commercial buildings should be designed and constructed. In the U.S., the American Concrete Institute (ACI) develops reference specifications. After development, an ACI specification is then considered for inclusion in the International Building Code (IBC), which is a model building code developed by the International Code Council (ICC). The California Building Standards Code (Cal. Code Regs., Title 24) adopts the IBC. However, local governments have authorities to adopt, via ordinance, amended building standards with more stringent requirements to accommodate environmental standards or other considerations.

Standard specifications

Based on material standards and building codes, project owners, both public and private, write specifications to ensure that their projects realize their plan while satisfying code requirements. They may either use standard specifications written by organizations such as the ACI or ASTM or write their own. For public infrastructure projects, such as road and bridge construction, state departments of transportation (DOT) write their own specifications. These specifications often incorporate unique requirements for both testing and construction methods based on regional conditions. Because of that, the DOT specifications are typically more restrictive than standard material specifications and are often used as the default minimum requirements in construction market in respective states. In California, California Department of Transportation (Caltrans) specifications have significant influence on specifications used throughout the state. Private project owners may leverage standard or pre-packaged specifications, as it can be time-consuming and resource-intensive to examine a wide range of requirements, including requirements for cement or concrete, to support writing their own specifications.

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⁸⁶ The ACI 301-20 reference specification governs concrete, and the ACI 318-19 reference specification specifically lists building code requirements for structural concrete, covering placement, consolidation, and curing, among other aspects.

Fillers

Fillers are relatively inert, finely ground particles that can fill voids in cement to improve binding efficiency. Limestone powder is the most used type of filler, which is typically interground with clinker and gypsum at cement plants to ensure that they are evenly mixed. ASTM C150 allows a maximum 5% limestone filler, but the ASTM C595 Type IL standard for Portland limestone cement (PLC), allows up to 15% limestone. By switching cement from ASTM C150 to C595 Type IL, the amount of clinker can be reduced by about 10%. GHG emissions associated with limestone filler are minimal because it is made by finely grinding limestone without a thermal process. Depending on the application, PLC could improve the hydration reaction as it provides nucleation sites, which could also increase concrete strength.

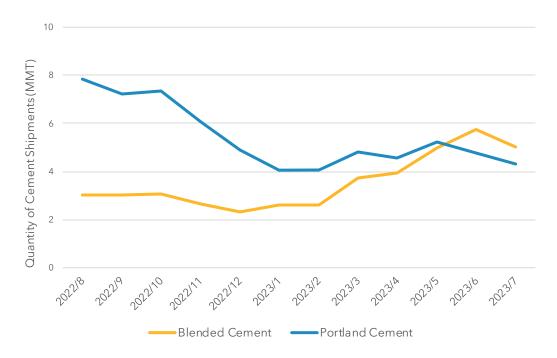
Historically, PLC has been commonly used around the world but has not been widely used in California or in the U.S. However, PLC use in the U.S. is rapidly increasing. The USGS Mineral Commodity Summaries for cement issued in January 2023 observed that: "Following widespread acceptance of Portland-limestone cement (PLC) blended cement by various authorities, several cement plants announced their transition to PLC (Type IL)."⁸⁷ Figure 19 shows that shipment of blended cement (of which the majority is PLC)⁸⁸ in the U.S. exceeded the shipment of Portland cement in 2023.⁸⁹

⁸⁷ U.S. Geological Survey. 2023. *Mineral Commodity Summaries for cement, January, 2023*.

⁸⁸ Starting with the January 2023 Minerals Industry Survey, USGS asks the amount of PLC as part of blended cement. July 2023 report estimated that 4.9 Mt (98%) of blended cement shipment in July 2023 was PLC.

⁸⁹ U.S. Geological Survey. 2023. *Cement Mineral Industry Surveys*

Figure 19: Cement Shipments in the U.S. by Type⁹⁰



In 2022, CalTrans approved the use of PLC for its projects, which is expected to help increase the use of PLC in California. However, the transition to PLC in California has been relatively slow, as shown in Figure 20. In 2023, CARB conducted a survey with concrete producers in California to understand the barriers to increased use of PLC. Details of the survey are in Appendix D.

⁹⁰ U.S. Geological Survey. 2023. *Mineral Commodity Summaries for cement, January, 2023*.

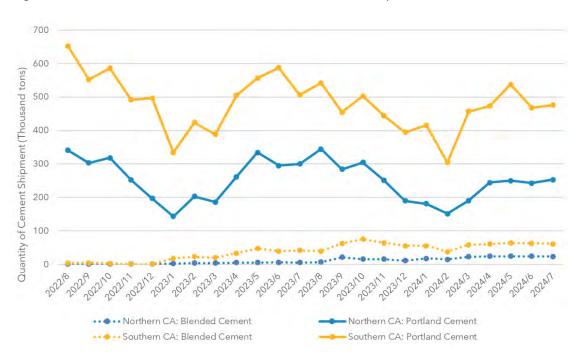


Figure 20: Portland Cement and Blended Cement Shipments in California⁹¹

There are construction project owners that have been prioritizing PLC for multiple reasons. University of California, San Diego has been using PLC for aesthetic benefits in addition to GHG emission reduction benefits.

Beyond PLC, there are emerging technology options to increase the amount of limestone filler above 15%. For example, high-filler, low-water cement can potentially include 50% limestone filler and may still conform to ASTM C1157, even when its limestone content is greater than 15%.⁹²

⁹¹ U.S. Geological Survey. 2023. *Mineral Commodity Summaries for cement, January, 2023*.

⁹² See, for example, UN Environment Program, *Eco-efficient Cements: Potential Economically Viable Solutions* for a Low-CO2 Cement-based Materials Industry.



CASE STUDY: Leveraging Benefits of Portland Limestone Cement

As part of its commitment to responsible stewardship of resources and to demonstrating leadership in sustainable business practices, The University of California has a Policy on Sustainable Practices. One of the policy goals is green building design. One example of green building design is at UC San Diego where there are currently 63 LEED certified projects on campus for a total of 7,380,300 square feet of green building. UC San Deigo has been using Portland limestone cement (PLC) in its buildings for more than a decade for both aesthetic and sustainability reasons.

Because of the higher amount of limestone, PLC exhibits lighter and brighter colors compared to conventional Portland cement. UC San Diego first introduced PLC for aesthetic benefits. Exposed concrete made of PLC is one of the key design features of some major on-campus buildings.



(Source: UC San Diego Franklin Antonio Hall https://fah.ucsd.edu/about)

PLC can reduce cement's embodied carbon by about 10% compared to conventional Portland cement by replacing clinker, the most emissions intensive component of cement. However, as a new material with limited historical data, there were uncertainties in how PLC would perform. To address the concerns, a UC San Diego contractor used mockups to test the performances of different types of concrete mix using PLC such as consistency, workability, set times, and temperatures. This allowed the project owner to approve deviations from the original specifications when they arose. Mock-ups also helped the design and cost optimization because it dictated which design details or finishing methods would result in additional costs. For example, sharp edges or certain seam finishes, which are critical details for exposed concrete design in some cases, added additional work and costs. UC San Diego projects demonstrate how PLC's unique characteristics can be addressed while leveraging its benefits.

Supplementary Cementitious Materials

Cement (calcium silicates) sets and hardens when it reacts with water to form calcium silicate hydrate paste. But some portions of cement forms calcium hydroxide, which does not contribute to hydration. Supplementary cementitious materials can be added to turn calcium hydroxide into calcium silicate hydrate paste to provide additional cementitious properties. 93 SCMs can also control alkali-silica reaction (ASR), 94 sulfate attack, 95 or other reactions that distress concrete. Fly ash (byproduct of coal combustion) has been widely used as an SCM because it can control ASR and sulfate attack cost-effectively, in addition to providing other benefits such as increasing concrete workability. GGBFS (byproduct of primary steel production) is also widely used as an SCM because it increases the strength and durability of concrete. However, supply of fly ash and GGBFS has been steadily decreasing as we transition away from emissions-intensive production methods for electricity and primary steel. Negligible amounts of fly ash and GGBFS are generated in California. There are ongoing projects to recover ash from landfills or to use bottom ash as an SCM. Silica fume is a highly pozzolanic SCM that can enhance the strength and durability of concrete. Silica fume is mostly used as a component in special types of concrete with a need for greater resistance to chloride penetration, such as parking structures, bridges, and bridge decks.

While fly ash, GGBFS, and silica fume are byproducts of other industrial processes, SCMs are also produced from naturally occurring clay, which is not associated with upstream industrial activities. Silica contained in natural pozzolan, when finely ground, can react with calcium hydroxide in cement% to form calcium silicate hydroxide and perform similarly to fly ash. Also, natural pozzolans are often treated at a temperature in the range 700-850 °C and used as calcined clay. The reactivity of natural pozzolans or calcined clay is influenced by particle size, material composition and temperature. Different types of natural pozzolans and calcined clay have been tested, and metakaolin, which is made by calcining kaolinite, is considered to exhibit high reactivities. The can be blended at a higher ratio than other SCMs to make limestone calcined clay cement (LC3), which contains about 30% metakaolin, 15% limestone filler, 50% clinker, and 5% gypsum.

⁹³ U.S. Department of Transportation Federal Highway Administration. *Use of Supplementary Cementitious Materials (SCMs) in Concrete Mixtures.*

⁹⁴ ASR is caused when a chemical reaction between the alkalis in Portland cement and certain types of silica minerals present in some aggregates occurs. The reaction product, which is a hygroscopic gel, can absorb moisture, swell, cause expansion and cracking of the concrete.

⁹⁵ Sulfate attack occurs when the sulphates present in saline soils, ground waters or seawater react with calcium hydroxide in concrete. Sulfate ion can ingress and cause deterioration of the concrete cement paste, which results in the concrete losing physical integrity.

⁹⁶ National Precast Concrete Association. 2017. SCMs in Concrete: Natural Pozzolans.

⁹⁷ RMI. 2023. Scaling Limestone Calcined Clay Cement (LC3): Learnings from the First Movers

SCMs can also be generated using recycled materials. It is environmentally beneficial to use them if environmental impacts to recycle them are lower than those of producing other SCMs. Glass pozzolan, which is made from recycled glass, is one of such products with potential environmental benefits. ASTM recently developed ASTM C1866 to provide specifications for glass pozzolan used as an SCM.

Caltrans is currently evaluating new types of SCMs to reduce GHG emissions associated with cement and concrete by focusing on locally or regionally available materials. See Appendix B for details about the Caltrans process to approve new alternative materials for use in concrete.

Alternative Cementitious Materials (ACMs)

There are emerging cementitious binding materials that are functionally equivalent to limestone-based clinker that can be produced using lower carbon alternative minerals or processes. Whereas SCMs and fillers can only partially replace limestone-based clinker, alternative materials with cementitious properties can completely replace it. They may be referred to as alternative cement, novel cement, or alternative binding materials, but this report refers to them as alternative cementitious materials (ACMs). There has been a variety of emerging ACMs that are in research, development and deployment phase, and it is more likely that new companies will start producing ACMs rather than incumbent cement manufacturers. If an ACM meets performance requirements equivalent to Portland cement (including ASTM C15), hydraulic blended cements (including ASTM C595), or performance-based standards such as ASTM C1157, it can be considered as cement.

The ACI's definition for alternative cement divides it into three categories: clinkered alternative cements, 98 calcined alternative cements, 99 and nonclinkered alternative cements. 100 Clinkered alternative cements are made by processing non-limestone minerals which can contain no carbon. However, it still requires high temperature clinkerization processes similar to Portland cement. Belite-based cements are less energy intensive than conventional alite-based cement, as it's produced at temperatures lower than 1,300 °C, compared to conventional alite-based cements that are produced at 1,300 °C to 1,450 °C. Belite-cement can be produced from the existing cement manufacturing process. There is

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⁹⁸ The ACI defines clinkered alternative cements as "produced using technologies similar to Portland cement production, with process changes that preclude production of Portland cement but positively affect the environmental impact of production."

⁹⁹ The ACI defines calcined alternative cements as "an alternative cement produced by calcining a raw material only, without further pyroprocessing, to produce additional mineral phases within the material."

¹⁰⁰ The ACI defined nonclinkered alternative cement as "an alternative cement produced using precursors that require no pyroprocessing and set after addition of an activating solution to cause reactions that are not hydration or acid-base."

calcium silicate-based cement production that is in research, development and demonstration stage.¹⁰¹

Whereas clinkered alternative cements still require significant amounts of thermal energy, calcined alternative cements are a combination of calcined magnesite and other minerals that are produced at calcining temperatures in the range 700 to 1,000 °C, a lower temperature than needed to for clinkered alternative cements. Magnesium-based cements have been known and produced for decades, however the supply of magnesium oxide suitable for cement production is limited compared to limestone.

The third category, non-clinkered alternative cements, is produced via chemical reactions with no thermal process thereby avoiding both process and combustion emissions. Major non-clinkered alternative cements are alkali-activated materials (AAM), which is based on materials called precursor that include some combination of silica (SiO_2), alumina (Al_2O_3), and calcium oxide (CaO). Most major SCMs, including GGBS, fly ash, or metakaolin, fall under this category. When precursor materials react with an alkali activator, chemical compounds in precursor materials break, reform, and then polymerize to become a binder. Calcium oxide-rich precursors react like hydraulic cement, while precursors rich in silica and alumina go through non-hydraulic geopolymerization reactions (the resulting binder is known as a geopolymer). Non-clinkered alternative cements have potential to drastically reduce GHG emissions associated with cement production. However, as major precursors are also used as SCMs, the supply of these materials may have to be increased significantly to respond to growing demand for SCMs and AAMs.

There is also a pilot project to use an electrochemical reactor to process limestone to produce calcium hydroxide without relying on thermal processes. Carbon contained in limestone is released as pure CO₂ stream at room temperature for easy capture. The resulting calcium hydroxide can be used as cement with the addition of SCMs.¹⁰²

Feasibility Assessment of Increasing the Use of Low-carbon Cement

Technology Readiness

Alternative cementitious materials are at varying stages of commercialization, but in general SCMs are closer to mass production compared to ACMs. Conventional SCMs, such as fly ash and GGBFS, are already commercial throughout the world but the supply has been steadily decreasing. SCMs such as natural pozzolans and calcined clay are also already produced in different parts of the world, and California has known natural pozzolan deposits. On the other hand, most ACMs are still in the early stages of research, development,

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¹⁰¹ CARB. 2022. Kick-off Workshop for Net-Zero Emissions Strategy for the Cement Sector.

¹⁰² U.S.DOE. 2024. Industrial Demonstrations Program Selections for Award Negotiations: Cement and Concrete. First Commercial Electrochemical Cement Manufacturing.

demonstration, and deployment. In 2024, Industrial Demonstrations Program, funded by the Bipartisan Infrastructure Law and Inflation Reduction Act and administered by the U.S. DOE, selected three SCM/ACM projects for funding. One project aims to achieve wide commercialization of limestone calcined clay cement. A California-based company is targeting to start production of cement that uses calcium silicate rocks and alternative production methods. Another project plans to build a production facility that produces cement using non-thermal electrochemical process to treat calcium silicate-based feedstock. Additionally, some types of ACMs, such as belite-based clinker and alkaliactivated clinker, are already produced at a small scale.

In July 2024, the U.S. DOE Industrial Efficiency and Decarbonization Office (IEDO) announced its plan to create a Cement and Concrete Center of Excellence to accelerate the development and adoption of novel low-carbon cement and concrete technologies. The center will support collaboration among various interested parties to develop and validate low-carbon cement and concrete technologies.¹⁰⁵

Adoption Readiness

Low-carbon alternative materials will need to be produced at a commercial scale, then accepted by the construction industry to achieve wide commercialization. Market acceptance and resource maturity are the major barriers.

• Demand-side factors

- o As construction material used for structures, cement is required to satisfy relevant material standards, building codes and specifications. Because of that, professionals on the concrete-construction value chain tend to rely on conventional cement types with proven track records and avoid low-carbon cement types even if they meet the same performance requirements.
 - As mentioned above, CARB conducted an online survey with California concrete producers to understand the barriers to using PLC. The results demonstrated that there is a group of concrete producers that still see issues accepting PLC, such as the lack of track record, storage space and demand. See Appendix C for the results of the survey. Most of the barriers applicable to PLC also apply to other SCMs and ACMs, as any new materials must conform to applicable standards/codes and then accepted by concrete users.

¹⁰³ U.S.DOE. 2024. Industrial Demonstrations Program Selections for Award Negotiations: Cement and Concrete. Deeply Decarbonized Cement.

¹⁰⁴ U.S.DOE. 2024. Industrial Demonstrations Program Selections for Award Negotiations: Cement and Concrete. Deeply Decarbonized Cement.

¹⁰⁵ U.S. DOE. 2024. U.S. Department of Energy Announces Plans To Create Low-Carbon Cement and Concrete Center of Excellence To Reduce Industrial Emissions

- o Recent developments to address demand-side challenges:
 - Standardization bodies including ASTM are reviewing existing requirements for materials used to make cement. In 2024, the American Concrete Institute published ACI Code 323-24 to provide provisions for low-carbon concrete where reduced global warming potential is required in a construction project.¹⁰⁶
 - In November 2019, Marin County became the first local jurisdiction in California to adopt a low-carbon concrete building code that requires concrete used to construct buildings in the county to meet the GHG intensity thresholds per unit of concrete.¹⁰⁷ In 2024, City of Santa Monica adopted a new ordinance to reduces emissions from concrete poured in new buildings, spas, and swimming pools.¹⁰⁸ In the same year, City of Dublin adopted a low-carbon concrete building code intended to reduce the embodied carbon associated with concrete.¹⁰⁹
 - At the State level, effective July 1, 2024, the 2022 California Green Building Standards Code (CALGreen) requires large-scale nonresidential and school construction projects to lower embodied carbon in concrete and other construction materials.¹¹⁰
 - In 2024, the Federal Highway Administration (FHWA) awarded funding for 39 State Departments of Transportation, including Caltrans, under the Low Carbon Transportation Materials Discretionary Grant Program. Funds may be used for work that may be necessary to determine low-carbon cement/concrete eligibility, availability, and appropriateness for use on public projects.¹¹¹
- Supply-side factors
 - o Production of ACMs requires new manufacturing facilities which can be capital intensive.
 - o As major SCMs are also AAM precursors, supply may have to be increased to address potential demand for low-carbon cement.
 - o Concrete producers may need to install additional silos to store additional materials.
 - o Workforce training may be needed to test/handle new materials.

¹⁰⁶ American Concrete Institute. 2024. *ACI CODE-323-24: Low-Carbon Concrete - Code Requirements and Commentary*

¹⁰⁷ County of Marin. Low-Carbon Concrete Requirements.

¹⁰⁸ City of Santa Monica. Low-Carbon Concrete Requirements.

¹⁰⁹ City of Dublin. Low-Carbon Concrete Building Code.

¹¹⁰ Supplement Update to the Guide to the 2022 California Green Building Standards Code (CALGreen)-Nonresidential.

¹¹¹ Federal Highway Administration. Low-Carbon Transportation Materials Grants Program

- Permitting and other non-economic factors
 - o Any new facilities that start producing SCMs or ACMs must go through appropriate permitting process to protect public health, safety and environment.
- GHG emission quantification
 - o Barrier description: as cement is an ingredient of concrete, a consistent accounting framework may be needed throughout the cement-concrete-construction value chain.
 - o Recent developments to address barriers:

In 2024, U.S. EPA U.S. awarded funding to help develop robust, high-quality environmental product declarations (EPDs) for construction materials including cement and concrete.

Awardees included national industry organizations and cement manufacturers.¹¹²

Potential next steps

Potential next steps can include coordination and collaboration among interested parties to accelerate adoption of new materials including other agencies that have jurisdiction over cement and concrete use, cement producers, alternative material producers, concrete producers, contractors, engineers, architects, public/private project owners, standard/code setting bodies, industry experts, and NGOs.

¹¹² U.S. Environmental Protection Agency. 2024. *Biden-Harris Administration Announces Nearly \$160 Million in Grants to Support Clean U.S. Manufacturing of Steel and Other Construction Materials*

Potential Community Benefits and Opportunities

This section covers SB 596 requirements to identify actions that (1) reduce adverse air quality impacts, and (2) support economic and workforce development in communities neighboring cement plants.

Key questions for feedback

Local air quality is managed by multiple regulations at the local, state and federal level for different types of pollutants and toxics.

• What actions at the local, state, or federal level should be considered to reduce potential adverse air quality or toxics impacts to communities neighboring cement plants?

Two areas for potential job creation related to cement decarbonization have been identified: 1) installation of new carbon capture or power generating units at cement plants, and 2) handling of low-carbon cement in the concrete-construction value chain.

• Are there other job creation opportunities CARB should consider? What kind of frameworks/approaches should CARB consider to promote high quality jobs associated with cement decarbonization?

Air Quality Impacts

SB 596 requires CARB to "identify actions that reduce adverse air quality impacts...in communities neighboring cement plants." Non-GHG emissions, such as criteria pollutants and toxic air contaminants, are governed by multiple regulations implemented by local, state, and federal agencies.

As Table 14 indicates, California's cement plants are in three air districts: Mojave Desert AQMD, Eastern Kern APCD, and Shasta County AQMD.

Table 14: California Cement Plant Locations, Air District and Population

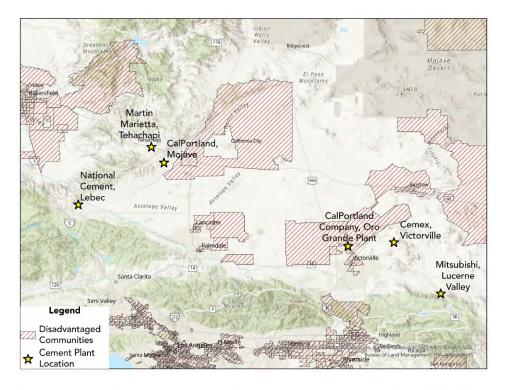
Air District	Cement plant	City	Population
Mojave Desert AQMD	Cemex, Victorville	Apple Valley (unincorporated)	75,791
Mojave Desert AQMD	CalPortland, Oro Grande	Oro Grande (unincorporated)	10,357
Mojave Desert AQMD	Mitsubishi Cement, Lucerne Valley	Lucerne Valley	3,562
Eastern Kern APCD	Tehachapi Cement Plant	Tehachapi	8,240
Eastern Kern APCD	CalPortland, Mojave	Mojave	3,394
Eastern Kern APCD	National Cement, Lebec	Lebec (unincorporated)	1,634
Shasta County AQMD	CalPortland, Redding	Redding	85,699

As seen in Table 14 most cities near where cement plants in California are located have small populations (see Figure 10 for population density by county). Some cement plants do not have communities within a five-mile radius. Figure 21 shows the distance of cement plants to disadvantaged communities (represented with crosshatching on the map). Under SB 535, census data and CalEnviroScreen 4.0 scores are combined to determine which communities are designated as disadvantaged in the practical definition of 'Disadvantaged Communities'. 113 One of the seven cement plants is located within a disadvantaged community. CalPortland, Oro Grande is in a subdivision of the unincorporated area of Oro Grande with a population of 1,660, which is a disadvantaged community just outside of the City of Victorville. There are several schools within a mile of the Oro Grande cement plant. There are other large facilities located within a 10-mile radius of this disadvantaged community, including George Air Force Base, High Desert Power plant, and American Organics, a large composting facility. There is also high-density truck traffic associated with a nearby Amazon distribution center and Snapple bottling plant that can impact local air quality. It's also notable that the seven cement plants are in various types of topography, and the terrain can affect how emissions from individual sources contribute to the regional and local air quality.

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¹¹³ Senate Bill 535 (De Leon, Statutes of 2012). *Practical Definition* of 'Disadvantaged Communities' Under SB 535.

Figure 21: Locations of Cement Plants in Southern California and Redding Relative to Disadvantaged Communities





As described earlier, California cement plants combust coal, petroleum coke, natural gas, waste tires, biomass, and other types of fuels to process a feedstock that includes minerals and small amounts of metals, and the plants are required to comply with relevant local, state, and federal air quality permitting and environmental rules.

District-wide air quality rules

Criteria pollutants (carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO $_2$), ozone (O $_3$), particle pollution (PM $_2$ 5 and PM $_1$ 0), and sulfur dioxide (SO $_2$) are the six principal pollutants that can be harmful to public health and the environment. The federal Clean Air Act requires U.S. EPA to set the National Ambient Air Quality Standards for criteria pollutants. CARB is responsible for establishing the State strategy for meeting all its local air quality standards and for adopting regulations and control measures for state-wide sources of pollution. Local air districts are responsible for adopting rules and regulations to attain those standards in their respective districts. Such regulations include control measures on equipment at stationary sources, including cement plants, that emit criteria air pollutants and other pollutants that contribute to the atmospheric formation of criteria pollutants. Generally, regulatory authority over air pollution from specific sectors and sources is split among CARB and the local air districts. Local air districts oversee local air pollutant regulations and permits for stationary facilities, such as cement plants, that are within their jurisdiction. CARB regulates local air pollution from mobile sources in the State, such as cars and trucks.

Areas that do not meet an ambient air quality standard are classified as nonattainment area for the pollutant that does not meet the standard. Mojave Desert AQMD and Eastern Kern APCD are currently nonattainment areas for both ozone and PM₁₀, and Shasta County AQMD is a nonattainment area for ozone. Per Assembly Bill 617 (AB 617, Garcia, Chapter 136, Statute of 2017), air districts with nonattainment status are required to adopt an expedited schedule to implement Best Available Retrofit Technology (BARCT).¹¹⁴ These requirements apply to all stationary sources within all air districts with nonattainment status. The Expedited BARCT implementation schedules for Mojave Desert AQMD, Eastern Kern APCD, and Shasta County AQMD include control options for the cement plants in their respective districts.¹¹⁵ However, no district has updated their BARCT requirements for cement because of Expedited BARCT.

AB 617 also established the Community Air Protection Program (CAPP). CAPP's primary focus is to reduce exposure in communities most impacted by air pollution, with a specific focus on local pollutants such as PM and toxics.¹¹⁶ To date, CARB has selected 19

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¹¹⁴ CARB. Expedited BARCT.

¹¹⁵ The BARCT Implementation Schedule for each air district is available from the following links: Mojave Desert AQMD. *AB 617 BARCT Implementation Schedule*. Eastern Kern APCD. *AB 617 BARCT Implementation Schedule*. Shasta County AQMD. *AB 617 BARCT Implementation Schedule*.

¹¹⁶ CARB. 2017. Community Air Protection Program.

communities to participate in the CAPP. The intent is to use the lessons learned and pollution reductions strategies in these communities to improve health in burdened communities across the state. There are no cement plants within the communities in the CAPP.

Cement decarbonization projects implemented in California can potentially reduce air pollutant emissions. For example, when high-carbon fuels are replaced by low-carbon fuels, emissions such as NOx and SOx can be reduced, depending on the fuel and process changes. As described in the energy-related GHG reduction section above, there are opportunities for adoption of zero emission technologies, including electrification at cement plants. Where feasible, a transition from on-site fuel combustion to zero emission technologies can reduce or eliminate local emissions associated with combustion. Furthermore, the installation of carbon capture units at cement plants combined with the appropriate control equipment can potentially reduce NOx and SOx concentrations in flue gas, which is the mixture of combustion and process emissions.¹¹⁷

Air Toxic Rules

Substances found in fuels or feedstock used by the cement plants, or formed as a result of the manufacturing process, can be released into the air during manufacturing processes and pose health risks. Reducing the impurities in the fuels could limit the amount of air pollutants produced in the flue gas. AB 2588 (Connelly, 1987), the Air Toxics "Hot Spots" Information and Assessment Act, requires local air districts to develop methods to prioritize facilities that release air toxics by considering the potency, toxicity, quantity, and volume of hazardous materials released from the facility, the proximity of the facility to potential receptors, and any other factors that the district determines may indicate that the facility may pose a significant risk. A facility that is ranked as a high priority is required to submit a health risk assessment (HRA) to its local air district. The information related to California cement plants can be accessed using CARB's AB 2588 Air Toxics "Hot Spots" Facility Search Tool.¹¹⁸ The CalPortland Cement Plant in Shasta County AQMD is classified as 'High Priority' under the 2023 Shasta County AB 2588 Annual Report.¹¹⁹ The three cement plants located in Eastern Kern APCD are all classified as 'intermediate risk' per the 2022 AB 2588 Report, 120 and two cement plants in the Mojave Desert AQMD are all required to conduct quadrennial public notification to households and businesses that there is the potential of exposure to health risks exceeding the District's public notification level. 121

¹¹⁹ Shasta County Air Quality Management District. 2023 AB 2588 "Hot Spots" Report.

¹¹⁷ Clean Air Task Force. 2023. Air Pollutant Reductions from Carbon Capture.

¹¹⁸ CARB. AB 2588 "Hot Spot" Facility Tool.

¹²⁰ Eastern Kern Air Pollution Control District. 2022 Annual AB 2588 Air Toxics Report.

¹²¹ Mojave Desert Air Quality Management District. 2022 Air Toxics "Hot Spots" Program Annual Report.

Potential next steps

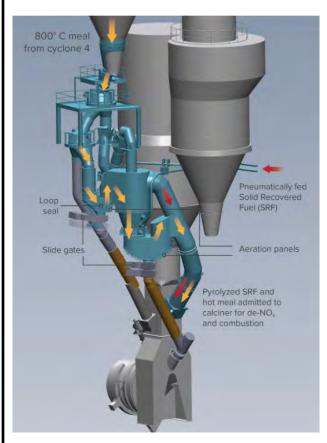
As detailed above and in the Decarbonization Levers section of the SB 596 Cement Strategy, potential GHG reduction projects can use different types of fuels and substances associated with different potential emission impacts. Stakeholders have expressed concerns over potential increases in local air pollutant emissions or air toxics due to the combustion of waste or fuels with biogenic content, potential increases in VOC emissions from aminebased capture absorbers, and potential increases in NOx emissions due to hydrogen combustion. Potential next steps include CARB's continued coordination with local air districts and as described above in the Feasibility Assessment for Fuels with Biogenic Content there is the potential to use small-scale alternative fuels evaluations with detailed emissions monitoring to better understand test different fuel mixtures gain valuable data on any changes to the chemical composition of their exhaust and potential air quality impacts. It may also be possible to leverage existing regulatory frameworks to ensure pollutant control mechanisms support the improvement of local air quality for a range of potential fuels. Data on potential fuels alone cannot speak to the harmful air pollutant exposure any individual may face. Therefore, understanding the other sources of air pollution that impact a community, or individuals must also be considered when assessing health impacts.

A cement plant in lowa is switching to primarily alternative fuels and tackling the associated increase in NOx emissions. The case study below is a model for decarbonization via the fuel switching lever while simultaneously reducing adverse air emissions.



CASE STUDY: Alternative Fuel Use and Emissions Reduction Pilot Project

In September 2024, Summit Materials and Green America Recycling's, Davenport, Iowa Cement Plant completed the first pre-commercial installation of the FuelFlex Pyrolyzer system. This 38-million-dollar investment eliminates the need for a complete upgrade of the calciner to handle the switch from fossil fuels to refuse derived fuels and biomass, which have more variability and higher volatility than fossil fuels. High volatile solids include MSW and EMSW, as well as some biomass-based waste streams. The installation also reduces the need for ammonia injection to reach NOx emission compliance. If successful, the pilot project will enable the plant to replace approximately 55% of its fossil fuel use with non-hazardous waste, thereby cutting coal and petcoke consumption by over 50,000 tons annually. The fuel switching is expected to reduce the plant's ghg emissions. This change in fuel and the installation of the pyrolyzer will also reduce NOx emissions and production of waste ammonia water.



FLSmith FuelFlex Pyrolyzer

How it works:

- 1. 800 °C meal from the lowest preheater cyclones is used as a gasification medium to pyrolyze alternative fuels.
- 2. Air pulsation fluidizes the hot meal, forming a U-shaped gas lock that prevents pyrolysis gases from flowing backwards.
- 3. The hot meal stream flows into the pyrolyzer vessel. Refuse derived fuel (RDF) is added and through contact with the hot meal, it is pyrolyzed to form reactive gases and char.
- 4. The volatile gases and char are separated before being reunited and fed as a very reactive stream into the calciner.
- 5. The stream of pyrolysis products reacts with rotary kiln NO by so-called "re-burning" reactions, utilizing pyrolysis gases to convert NO into free N2. This project is the first of its kind and in its early stages, more information is expected after its first year in operation.

Workforce Development

SB 596 also requires CARB to identify actions that support economic and workforce development in communities neighboring cement plants. Consistent with the 2022 Scoping Plan Update, such actions could focus on investments and high road job opportunities in communities near cement plants, and especially in low-income communities and communities of color.¹²²

At least two areas where SB 596 implementation could support new job opportunities are:

- Installation of carbon capture or power generating units at cement plants, which can result in new construction jobs and new long-term employment opportunities for operation and maintenance.
- Concrete producers, engineers, architects, and construction workers potentially need
 to acquire new skills to test, specify, and handle low carbon materials blended in
 cement and concrete. Because cement is consumed throughout the state, new job
 skills and training opportunities are needed throughout the State for
 concrete/construction-related workers using lower carbon cement and concrete
 mixes.

There are already some local initiatives that link workforce development and decarbonization projects. For example, Bakersfield College of the Kern Community College District has a public-private partnership, the Valley Strong Energy Institute, 123 which supports workforce development and growth of regional renewable energy industry. Such platforms/frameworks could potentially be extended or used for workforce development projects related to the cement and concrete industry.

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¹²² According to the *California Labor and Workforce Development Agency's High Road Training Partnership program*, high road jobs are considered "Quality jobs [that] provide family-sustaining wages, health benefits, a pension, worker advancement opportunities, and collective worker input and are stable, predictable, safe and free of discrimination."

¹²³ Bakersfield College. Bakersfield College Valley Strong Energy Institute.



Action Items to Address Workforce Barriers Identified by the Industry

Workforce education and training has an important role to play in removing barriers for low-carbon cement and concrete acceptance by the construction sector. Below is the list of key action items identified by industry:

- Communicate why low-carbon cement/concrete is needed and provide specific technical training to professionals such as engineers, designers, and tradespeople to equip them with needed skills and knowledge;
- Focus on training tradespeople on concrete mixture optimization techniques, specialized placement procedures for low-carbon construction materials, systems, and other relevant skills required for implementing these new technologies;
- Collaborate with state DOTs, federal agencies, engineering and design firms, trade organizations, industry associations, union halls, and trade schools to ensure the dissemination of technology transfer and skill training resources; and

For the existing workforce:

- Collaborate with organizations and associations serving tradespeople and professionals in the cement and concrete industries to provide training for individuals relevant professionals on cement/concrete decarbonization;
- Train the trainer to deliver continuing education curriculum;
- Focus on training designers, engineers, architects, contractors, and tradespeople initially and offer parallel training directed to owners; collaborate with public/private organizations with technical expertise to deliver training and presentations.

For college-level education:

- Provide applicable reference material and model curricula for faculty to integrate into their courses;
- Develop a cadre of guest lecturers who can visit universities and jump-start programs on cement decarbonization;
- Establish minors or certificate programs and offer scholarships focused on cement decarbonization in construction materials to encourage students to study and specialize in this area; and
- Support summer programs providing intensive study.

Source: Sutter et al. *Overcoming Barriers to Adopting Carbon Reduction in Concrete*. American Concrete Institute.

Potential next steps

Potential next steps can include seeking input from labor unions and experts on workforce development and fostering collaboration among relevant local, state agencies, academic institutions, and other interested parties to identify job opportunities.

Tools, Rules, and Potential Measures to Help Achieve Net-zero Emissions Goals

This section discusses: (1) GHG accounting frameworks to quantify different types of GHG emissions reductions projects, (2) rules that govern cement decarbonization projects and associated permitting requirements, and (3) potential additional measures that can help achieve the goals of SB 596.

Key questions for feedback

- Additional methodologies may be needed to quantify GHG emissions reductions associated with CCUS and as well as the increased use of low-carbon materials to make cement. Should CARB consider specific quantification methodologies or protocols?
- Should EPDs or elements of EPDs have a role in tracking the use of low-carbon cement in concrete?
- The SB 596 Cement Strategy includes an initial list of existing or new programs that can be leveraged to achieve the goals of SB 596. Which programs are simple to administer and/or leverage existing frameworks and programs to facilitate quick implementation in California and elsewhere? Are there additional programs CARB should consider especially at the onset of the implementation?

GHG Accounting Frameworks

To achieve net-zero emissions in the cement sector, a suite of GHG emissions reduction efforts will need to be implemented by incumbent cement manufacturing plants, alternative material manufacturing plants, facilities or sites that use or sequester carbon captured at cement plants, and by cement users throughout the concrete-construction value chain. Because different project types may require different accounting frameworks, it is critical to develop an overarching framework that can appropriately account for GHG emissions throughout the cement-concrete value chain.

On-site GHG emissions reduction projects

As production of conventional limestone-based cement requires substantial amounts of energy and is also associated with process emissions, the goal of SB 596 is to achieve net-zero emissions associated with manufacturing of cement consumed in California. To achieve this goal, incumbent cement manufacturers may implement projects such as fuel-switching or energy efficiency. Seven incumbent cement plants in California are already covered by the Mandatory Reporting Regulation (MRR) and report GHG emissions (both energy-related and process emissions) and production data using rigorous methodologies harmonized with U.S. EPA's GHG emissions reporting program. Reported data are verified by CARB-accredited third-party verifiers. On-site GHG emissions can also be reduced by decreasing

the production of limestone-based clinker by replacing ACMs or SCMs with lower GHG emissions intensity. If an ACM and/or SCM were produced in California, the producer will be covered by the MRR if their annual emissions exceed 10,000 MTCO₂e.¹²⁴ In addition, an initial concept to include cement importers in the MRR and require them to report GHG emissions associated with imported cement was introduced at a workshop in Spring 2024. Such a provision would enable CARB to quantify GHG emissions associated with imported cement used in California.¹²⁵

Carbon capture, use and sequestration (CCUS)

GHGs emitted at cement plants could potentially be captured, transferred to be used or sequestered. Any potential reporting, monitoring, and verification for options under this category will need to be in compliance with regulations developed by CARB to implement SB 905. Once carbon dioxide is captured at cement plants, there are multiple options to contribute to emissions reductions through various types of carbon sequestration. This includes the potential to sequester CO₂ in geological formations or mineralize it in rocks that can be used as either aggregate or SCM products. For these projects to be eligible to contribute to SB 596 decarbonization, emissions reductions will need to meet permanence standards and be quantified using robust and consistent quantification methodologies. This includes: 1) the amount of carbon dioxide captured at cement plants, and 2) the fraction of captured carbon that was used and/or sequestered.

There may be other types of carbon capture and use projects, such as using captured carbon dioxide to make transportation fuels, at the end of which carbon is released into atmosphere.

In addition, there may be potential carbon dioxide absorption projects in which ambient carbon dioxide is absorbed by concrete in use or residual minerals generated from alternative cement manufacturing. These projects could require different accounting frameworks as project scope and methodologies to quantify the amount and permanence of absorbed carbon dioxide developed for geologic sequestration projects may not apply.

As different CCUS project types may be associated with different accounting frameworks, it is important to ensure that they conform to the equivalent level of project and quantification stringency.

Quantification of GHG emissions reductions associated with increased use of low-carbon cement

¹²⁴ If their annual emissions were below 10,000 MTCO2e, they could still opt-in to the Cap-and-Trade Program to report GHG emissions through MRR.

¹²⁵ CARB. 2024. Cap-and-Trade Workshop May 31, 2024. Staff Presentation. Slide 50-52.

Cement and/or alternative materials shipped to concrete producers or other cement users to finalize cement is associated with embodied GHG emissions. Downstream cement users can indirectly contribute to SB 596 goals by increasing the use of low-carbon cement, which will in turn decrease demand to produce emissions-intensive limestone-based clinker.

As discussed above, on-site GHG emissions associated with cement manufacturing, and potential GHG reductions from eligible CCUS or carbon absorption projects must be quantified accurately to be counted toward SB 596 goals. On the other hand, potential GHG emissions reductions from increased use of low-carbon cement will have indirect impact and not be counted towards net-zero emissions goals. However, estimating such reductions is critical to track and evaluate the progress to achieve the goal, as it will inform how fast market demand for low-carbon cement would increase toward 2045. It is critical for the concrete-construction value chain to shift from limestone-based cement to low-carbon cement, and such a shift must be closely monitored and incentivized.

For entities on the concrete-construction value chain, embodied GHG emissions associated with cement are upstream emissions. Environmental product declaration (EPD) is a tool to account for life cycle environmental impacts, including upstream emissions, associated with commonly used products such as cement and concrete. It is defined by ISO 14025 Type III (Environmental labels and declarations – Principles and procedures) based on which product category rules (PCR) are developed to specify how to quantify impacts such as GHG emissions associated with a given product. Conventional cement and concrete both have existing PCRs.

In recent years, environmental product declarations (EPD) are increasingly used as a policy tool to quantify embodied GHG emissions and/or set GHG limits allowed per unit of materials for construction/building materials. For example, the Buy Clean California Act (BCCA) used publicly available EPDs for four materials (structural steel, concrete reinforcing steel, flat glass, and insulation) commonly used in public works to set maximum acceptable limits of embodied GHG emissions. While improvements are needed, EPDs can serve as a benchmark for the data available to quantify embodied carbon for different products in the absence of robust data.

SB 596 could also leverage embodied carbon accounting through EPDs or elements of EPDs to quantify indirect GHG emissions reductions associated with the use of low-carbon cement. In doing so, it is important to acknowledge the difference between direct emissions quantification methods, such as MRR and EPDs. Whereas CARB's verified data collected through MRR uses primary, facility-specific information measured at covered facilities annually, EPDs typically use primary and secondary data, which could be aggregated and averaged by third parties as industry-wide values. This means that cement manufacturing-related GHG emissions for a concrete EPD could be based on secondary data compiled from third-party data sources. Depending on the source, the data used could be from a different set of manufacturing facilities, employ different quantification/estimation

methodologies, and used different data years, all of which make apples-to-apples comparisons challenging. Also, embodied carbon data may not be updated annually or may be subject to varying quality assurance and verification requirements. Additionally, if an EPD includes emissions reductions achieved by offsets or CCUS projects, it will need to meet relevant California requirements, including any applicable SB 905 requirements.

There is an increasing number of regulations and programs at federal, state and local level that use or plan to use and improve portions of EPDs as a tool to quantify GHG emissions and/or set GHG emissions intensity associated with building materials, including concrete. Examples include AB 43 (Embodied Carbon Emissions for Construction Materials), Buy Clean California, CalGreen Embodied Carbon Requirements, SB 253 the Climate Corporate Data Accountability Act and local low carbon concrete Requirements. ¹²⁶ Multiple efforts led by federal/state/local agencies, industry associations, NGOs and businesses are underway to improve the quality of EPDs. In 2024 U.S. EPA provided grants to 38 groups including organizations in the cement/concrete industry to help businesses develop robust, high-quality EPDs. ¹²⁷ It will be critical for CARB to ensure that GHG emissions associated with materials used to make cement are quantified in a consistent manner across programs.

It is also notable that embodied emissions accounting used by the concrete-construction value chain can contribute to identifying alternative materials that can have the least environmental impacts. For example, conventional byproduct SCMs, such as fly ash and GGBFS, are associated with emissions-intensive upstream industrial activities, such as coal-fired power generation or primary steel manufacturing. EPDs could potentially identify substitutes for them by comparing total environmental impacts among different alternative materials.

Rules that Govern GHG Emissions Reduction Projects and Associated Permitting Processes

The array of available emissions reduction options for the cement sector are subject to different rules administered by different local, state, and federal regulatory agencies, as well as private standard/code setting bodies. As one of the SB 596 requirements is to identify statutory and regulatory barriers that may delay implementation of potential decarbonization projects, we take a holistic view of all relevant rules.

It is expected that existing cement plants will implement on-site emissions reduction projects, such as adding carbon capture equipment or modifications of existing

¹²⁶ CARB. Embodied Carbon. Department of General Services. Buy Clean California Act. Department of General Services. California Green Building Standards Code 2022 Title 24, Part 11. Revision Record Supplement. County of Marin. Low Carbon Concrete Requirements.

¹²⁷ For details, see "Funding Opportunities" section.

equipment/practices. It is also possible that facilities that manufacture ACMs or SCMs start or expand operations in California. These projects will be subject to permitting requirements that regulate construction of new facilities or modification of existing facilities. First, conditional land use permits are generally needed to start or change operations at a site, and the city or county in which the project is located is typically the authority for this type of permit. Conditional land use permits are generally discretionary approvals that trigger the California Environmental Quality Act (CEQA), which may be applicable to any new project or modification/expansion. CEQA requires a rigorous review process to foster transparency and integrity in public decision-making while ensuring land-use decisions account for the impacts of development on our natural and human environments. Under CEQA, a lead agency, must prepare an environmental impact report for a construction project, which needs to be considered by all relevant state and local agencies during the project's permitting process.

Once a facility transitions to the operation phase, a facility is required to obtain operating permits from its local air district to limit criteria air pollutant emissions pursuant to the federal Clean Air Act. In addition, a local air district may determine that a facility is subject to the requirements of Air Toxics "Hot Spots" Information and Assessment Act for toxic substances it might release.¹²⁸

For GHG emissions, all seven cement plants in California are currently subject to CARB's MRR and Cap-and-Trade Regulation, which require them to report their GHG emissions and participate in a market-based emissions reduction program. A facility that manufactures low-carbon alternative materials in California will also be subject to MRR if its annual GHG emissions are greater than 10,000 MTCO₂e, and subject to the Cap-and-Trade Regulation if its annual GHG emissions are greater than 25,000 MTCO₂e.

When a cement plant in California uses a municipal solid waste-derived fuel, it must acquire a solid waste facility permit through a process co-regulated by CalRecycle and local enforcement agencies.¹²⁹ There may be additional permits a facility needs to obtain depending on the operations or processes, which would require additional administrative process.

Cement plants use substantial amounts of energy which is supplied by relevant utilities. California cement plants currently purchase electricity from investor-owned utilities and electric service providers that are regulated by the California Public Utilities Commission (CPUC). Lower carbon sources of energy such as renewable electricity or renewable natural

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¹²⁸ California Air Resources Board. Air Toxics "Hot Spots." "Hot Spots." *Prioritization Program*.

¹²⁹ Department of Resources Recycling and Recovery (CalRecycle). *Solid Waste Facilities, Sites, and Operations page*.

gas, as well as any energy-related activities on-site, may be subject to rates and rules set by the CPUC.

Furthermore, the use of cement and concrete are governed by multiple material specifications, building codes, and specifications. Materials used to make cement and concrete must conform to material standards set by national or international organizations, such as ASTM and AASHTO, to ensure performance. Construction of buildings and structures must conform to building codes written by the ACI, which are included in the International Building Code (IBC) and adopted as the California Building Code in California or by local governments. Project owners and contractors write specifications for construction projects. Specifications written by Caltrans are widely referenced by the local construction industry in California.

As shown in Figure 22, a single cement decarbonization project can require multiple permits and must comply with applicable rules, each of which can require time and resources. Each permit process and rule are governed by different authorities with different timelines. SB 596 offers the opportunity to discuss if there are pathways to make the overall permitting framework or other processes more efficient and to share knowledge among permitting agencies about new and emerging technologies.

Environmental Regulations/Programs U.S.EPA Rules for the use of cement/concrete CARB Other Regulatory Agencies Material Standards Local Air Districts **Building Codes** Other Impacts GHG Criteria Potential Carbon capture Cement Plants (+ CC units) Alt. material suppliers Concrete Producers Buildings/Structures **Energy Market Rules** Regulations for CCS Geological Pipeline Transportation

Figure 22: Illustrative Examples of Rules Governing Cement Decarbonization Projects

Overview of Rules Governing CCS Projects

Permitting carbon capture and sequestration (CCS) projects can be especially complex. As no geologic sequestration project has yet been approved in California, there are

uncertainties about the potential lead time and resources needed to obtain permits for that type of operation. To help streamline CCS project applications in California, SB 905 directs CARB to develop a unified permit application process for sequestration projects. All CCUS projects in the state will be subject to the SB 905 framework, which is currently under development.

In addition to complying with applicable CEQA requirements, a geologic CCS project needs to obtain permits from U.S. EPA under the Safe Drinking Water Act's Underground Injection Control (UIC) Class VI well program, which has five phases:

- 1. Pre-permitting phase: The prospective owner or operator notifies the permitting authority of their intent to prepare a Class VI permit application.
- 2. Pre-construction phase: The permitting authority will perform a thorough review of every component of the detailed permit application with a minimum 30-day public comment period.
- 3. Pre-operation phase: If a permit is issued, the Class VI well operator constructs the well, performs pre-operational testing, and submits additional information before they are authorized to inject CO₂.
- 4. Injection phase: Owners or operators begin operation of the injection well and perform testing and monitoring.
- 5. Post-injection phase: The Class VI well owner or operator plugs the injection well.

U.S. EPA aims to review complete Class VI applications and issue permits when appropriate within approximately 24 months. ¹³⁰ The actual time needed for the review process depends on several factors, such as the complexity of the project, technical detail to ensure the proposed project will not endanger underground source of drinking water, and the quality and completeness of the submitted application. Once the technical review determines that the permit application meets the requirements of the Class VI Rule and the proposed project is suitable for CO₂ injection, a draft permit will be prepared with specified conditions under which the well would be able to operate. It is followed by a public comment period before the final permit is prepared with modifications based on feedback received during the Public Comment Period, where appropriate. ¹³¹

In terms of potential geologic sequestration sites near California cement plants, Figure 23 shows a map of California's geologic carbon sequestration potential published by the California Department of Conservation. The map includes the locations of cement plants (red dots). It's likely that CO_2 captured at cement plants will need to be transported to a geologic storage site rather than sequestered on-site.

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¹³⁰ US Environmental Protection Agency. 2024. *Class VI- Wells used for Geologic Sequestration of Carbon Dioxide*.

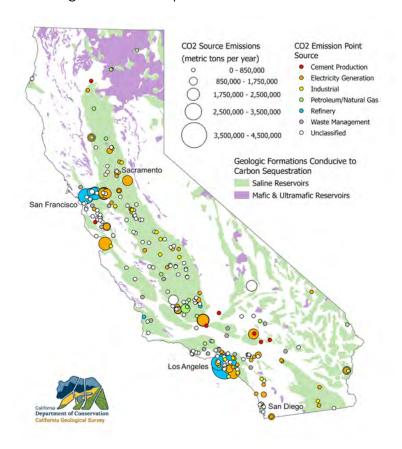


Figure 23: California's Geologic Carbon Sequestration Potential 132

Per the requirements of SB 905, if CO₂ captured at cement plants is transported to injection sites via pipelines, such transportation projects cannot happen in California until the U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA) concludes a rulemaking (RIN 2137-AF60) on safety standards for pipeline transportation of carbon dioxide. This rulemaking process was initiated in 2022. In January 2025, PHMSA announced new and comprehensive proposed requirements for carbon dioxide and hazardous liquid pipelines.¹³³ The rulemaking is currently open for public comment and will close in March of 2025.

Addressing Emissions Leakage

SB 596 requires CARB to "include provisions to minimize and mitigate potential leakage and account for embedded GHG emissions in imported cement in a similar manner to emissions of GHGs for cement produced in the state, such as through a border carbon adjustment mechanism." AB 32 passed in 2006 first defined emissions leakage as "a reduction in GHG

¹³² California Department of Conservation. *Geologic Carbon Sequestration in California*.

¹³³ US Department of Transportation. *USDOT Proposes New Rule to Strengthen Safety Requirements for Carbon Dioxide Pipelines.* January 2025.

emissions within the state that is offset by an increase in GHG emissions outside the state." In 2017, AB 398 (Garcia, Chapter 135, Statute of 2017) was passed to extend the Cap-and-Trade Program, an AB 32 program. It also required CARB to report to the Legislature, by December 31, 2025, on the program progress and recommend necessary statutory changes to the program to reduce emissions leakage, including the potential for a border carbon adjustment.

In California, the cement sector is covered by the Cap-and-Trade Program, which requires covered entities to acquire and surrender compliance instruments (allowances or a limited quantity of offset credits) that match their covered GHG emissions. Compliance instruments are either directly allocated to covered entities or purchased by covered entities, which means that there can be costs associated with complying with the Cap-and-Trade Program. Generally, there is a risk for emissions leakage if production from California cement plants shifts outside of California due to regulatory compliance costs and the production is replaced by imported cement. Currently, the Cap-and-Trade Program provides direct allowance allocation to minimize the risk of emissions leakage in covered industrial sectors. A border carbon adjustment (BCA) is an alternative to direct allowance allocation that could be used to minimize leakage. In principle, a BCA imposes an obligation on the importer of a product based on the GHG emissions associated with producing the product. In May 2024, CARB put forward an initial concept to have cement importers report GHG emissions as one step in evaluation of a potential BCA as required by SB 596.¹³⁴

The European Union (EU) puts a price on GHG emissions from industrial facilities via the EU Emissions Trading System, and the EU is the first jurisdiction to implement a carbon border adjustment (CBAM).¹³⁵ The CBAM took effect in October 2023 to cover emissions associated with on-site direct emissions and emissions associated with the use of electricity for cement, iron and steel, aluminum, fertilizers, electricity, and hydrogen. The first two years of CBAM is a transitional period during which importers of covered products must (1) register with national authorities, and (2) report the amount of production and GHG emissions associated with imported goods. There is no mandatory verification of reported data nor compliance obligations associated with imported products during this period.

¹³⁴ California Air Resources Board. *California Public Workshop: Potential Amendments to the Cap-and-Trade Regulation*. May 2024.

¹³⁵ The European Parliament. *Carbon leakage: preventing firms from avoiding emissions rules*. Final CBAM regulation can be accessed at the *Official Journal of the European Union*.

Existing and New Potential Policy Mechanisms

Previous sections identified barriers and current policy frameworks that govern each cement decarbonization lever and technology option. This section identifies a range of potential programs, voluntary actions, funding opportunities, and collaborations to address identified barriers of market acceptance, resource maturity, license to operate and lack of GHG quantification methods. The list includes options identified by CARB, as well as suggestions from interested parties. The evaluation of these options will be completed based on public input. As SB 596 is a long-term project, it's possible that new types of programs may be considered in the future.

Key questions for feedback

- Are there additional policies or programs that should be considered?
- Which potential programs should be prioritized and why?
- In addition to program effectiveness, administrative simplicity and implementation considerations, what other factors should CARB consider in identifying potential policies or programs that should to be prioritized?

Among potential programs, some existing programs can be leveraged as is, while others may require modifications or legislative action. CARB implements the majority of state-wide climate programs based on legislative mandates, regulations and policy direction in the most recent Scoping Plan. Some of these policies and requirements directly regulate or indirectly affect the cement manufacturers in California. At the same time, federal, state, and local agencies implement a variety of programs that regulate local air pollutants, cement and concrete used for construction projects and aspects of permitting and oversight of CCUS projects.

As discussed above, the SB 596 Cement Strategy aims to prioritize programs that are administratively simple and easy to implement, given the urgency to act quickly and create frameworks that can be used and implemented by other sectors or jurisdictions. To that end, different programs and voluntary actions face different degrees of time and resource requirements for implementation. For example, both CARB and other agencies can potentially implement regulatory programs, each of which will require an independent rulemaking process by the lead agency. During the public rulemaking process, the lead agency must address a variety of questions including the efficiency and effectiveness of the potential program implementation, potential economic impact on regulated communities and the state economy, and environmental impacts on local and/or disproportionally affected communities. Some identified programs may require additional legislative action. On the other hand, voluntary actions and collaborations do not require rulemaking processes and can generally be undertaken sooner but may not be sufficient to support the commitment and transparent actions needed to decarbonize the sector.

Some interested parties recommend implementing annual or bi-annual carbon intensity targets for cement produced in-state and imported into California from 2026 to 2035 to ensure that the SB 596 interim target is achieved. This approach may be infeasible as it presumes annual steady declines are achievable, where past experience shows incremental progress in the industrial sector emissions reductions are possible and that large reductions in GHG emissions generally occurs in stages with the implementation of decarbonization technologies.

Potential programs to address demand-side factors

Demand-side focus factors include demand uncertainty, market barriers to entry, limited or non-existent market for low-carbon products, and the lack of a path to deliver product from a producer to a customer along the value chain.

Energy-related decarbonization

New policy/supporting frameworks may be needed to facilitate industrial customers to access emerging fuels with limited supply or increased amount of electricity.

- Targeted support or policies may be needed to direct biomethane use to the industrial sector from its current use in the transportation and residential sectors.
- Targeted support or policies may be needed to support hydrogen use. SB 1075
 Hydrogen Development, Deployment and Use (CARB): SB 1075 requires CARB to
 prepare an evaluation that includes policy recommendations regarding the use of
 hydrogen and a description of strategies supporting hydrogen infrastructure. The
 evaluation report will cover the development, deployment, and use of hydrogen
 across all sectors in California, which may inform how hydrogen can become
 available for the cement industry.
- Electricity rate structure may need to be changed to incentivize industrial customers to promote electrification. 136

Increased use of low-carbon cement and concrete

As more than 75% of cement manufactured in California is used to make concrete, concrete/construction market must quickly adopt low-carbon cement.

- Demonstration projects to validate the performance of emerging low-carbon cement and concrete will increase market confidence to accelerate adoption.
- Caltrans has an existing process to write specifications and evaluate and approve new materials for use in Caltrans projects. It is possible that Caltrans could expedite the process to transition to performance-based standard and evaluate

¹³⁶ See page 53, AB 2109 exempts large industrial customers from paying certain surcharges on their reductions in electricity use if that reduction was achieved through an industrial process heat recovery technology with specified requirements.

low-carbon materials for approval. See Appendix B for details. It is also possible for Caltrans to carry out demonstration projects for emerging low-carbon cement/concrete.

- Global Warming Potential (GWP) limits for concrete could be tightened in CALGreen Embodied Carbon Requirements to achieve GHG reductions in eligible projects.
- Under the BCCA, DGS sets the maximum acceptable GWP limit for eligible products. Concrete could be added as an eligible product.
- Local authorities could adopt a low-carbon concrete building code similar to the ones adopted by Marin County, City of Santa Monica and City of Dublin.
- Construction material bidding requirements can include provisions to provide incentives for low-carbon cement/concrete per unit of volume purchased.



CASE STUDY: Minnesota DOT Demonstration Project

Demonstration projects can remove market acceptance barriers by testing how low-carbon materials perform in a real-world environment. However, they also require significant collaboration and investment. Two such collaborations are highlighted below.

MnROAD, owned and operated by the Minnesota Department of Transportation (MnDOT), is a 3.5-mile-long pavement-research test track made of various materials and pavements that receives high-volume interstate highway traffic. It is used as a demonstration space to test materials to improve road life, perform better, cost less to



Figure 1: MnROAD Facility Layout

The project started in the 1980's as a task force that included MnDOT, Federal Highway Administration (FHWA) and Strategic Highway Research Program administrators, industry representatives and university experts. The first test sections were constructed in early 1990's funded by state and federal sources. A partnership between MnDOT and the Minnesota Local Road Research Board (MRRB) provided most of the operations funding for the first ten years. Over time the MnROAD facilities and data have been used by researchers from around the nation and the world. In 2022, MnROAD started testing alternative low-carbon concrete-making materials. Tested materials included blended cement using calcined clay or natural pozzolan, Portland limestone cement with higher limestone content, and cement with carbon mineralization technology. It is expected that the project will produce multi-year results on how alternative cements behave in real field conditions in the next few years.

The funding for this phase of the research, test cell construction, and improvements in the data systems, cost about \$11million dollars and came from eleven different contributors including in-kind contributions from industry partners, other states, the LRRB, FHWA and MnDOT.

One lesson learned is that it is critical to establish a well-balanced partnership/funding structure to construct testing tracks and operate them for an extended period to obtain reliable test results.

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CASE STUDY: UC Pavement Research Center Demonstration

In California, University of California Pavement Research Center (UCPRC) launched the Sustainable Concrete Lab2Slab initiative in 2024 with support from industry, the American Concrete Institute Foundation (ACI Foundation), California Department of Transportation (Caltrans), and Department of Energy (DOE). The goal of the initiative is to accelerate the adoption of more sustainable and higher performing solutions in infrastructure projects from decades to a few years by advancing the evaluation of novel low-carbon materials and technologies for concrete, beginning with at the laboratory scale and progressing to constructing test beds as the technology scales up.

The next step focuses on transitioning these technologies from test beds to pilot scale, during which phase low-carbon materials will be tested in real-world street or highway sections to validate the performance. The resulting data will be published to help involved agencies to develop or revise specifications, as well as transitioning pilots into standard practice.

Potential programs to address supply-side factors

Supply-side focus factors include the need for significant capital investments to achieve production on a commercial scale and lack of adequate infrastructure. Funding can play a pivotal role to provide needed resources for emerging decarbonization technologies. See the following section for funding opportunities.

Increase supply of low- or zero-carbon fuels and electricity

Additional generation capacity for renewable electricity and/or biomass conversion will be needed to increase supply of low-carbon fuels and hydrogen production.

Increase the use of low-carbon cement

Currently, most alternative cementitious materials (ACMs) are still in the research, development, and demonstration phase. Product prices for these materials during the initial production stages are expected to be substantially higher than conventional cement, reflecting high costs for development. Higher product prices generally limit demand, which is a barrier to achieving wide commercialization. As ACMs have never been produced on a commercial scale, some interested parties recommended potential programs to accelerate their commercialization. For example, several environmental groups have suggested new types of credit trading programs under which cement manufacturers are required to purchase credits based on GHG emissions intensity performance standard. The revenue would be used to accelerate low-carbon cement production in California. Establishing a market-based program requires significant resources to establish, develop technical infrastructure, and continuously implement, and thus is a more effective option for a large market with many participants. There are currently less than five companies operating the seven in-state cement plants, making a establishing a resource-intensive trading program less cost-effective and infeasible due to small market size. Requiring participation in a market-based program by small entities, like concrete batch plants, is likely infeasible due to the administrative resources needed to participate in such a program. In addition, the seven in-state cement plants are already covered by a market-based program, the California Capand-Trade Program. In recognition of the requirement in SB 596 to reduce the costs of implementing GHG reduction technologies and the overall benefits that can be gained in leveraging existing programs, the SB 596 Cement Strategy highlights actions that the Capand-Trade Program can take to support the goals of SB 596. A simpler approach to design and implement a GHG reduction strategy also makes it more exportable to other regions where staffing resources may be limited. With these objectives and limitations in mind, below are two approaches suggested by interested parties.

- Zero Emissions Cement (ZEC) Standard: The objective of a ZEC standard is to trigger investment and construction of a first-of-kind near-zero emissions cement production facility in the near-term, such as in the 2025-2030 timeframe. A ZEC Standard is a market-based program based on crediting relative to a very stringent (near-zero) GHG emissions intensity performance standard for cement. A plant that meets the near-zero emissions performance standard generates ZEC credits for each ton of near-zero cement produced. Producers/sellers of conventional limestone-based cement are required to hold a fixed amount of ZEC credits for every ton of limestone-based cement they sell. As credits are tradable near-zero emissions cement producers could sell ZEC credits to conventional cement plants to generate revenue. The number of ZEC credits conventional cement producers/sellers are required to hold can start at a low percentage (~10%) of the amount of limestone-based cement sold and can gradually increase to ensure that there is a market for alternative cement until they reach full commercialization.
- Low-carbon Cement Standard: A low-carbon cement standard is a market-based program based on crediting relative to a GHG emissions intensity performance standard for cement. The standard can increase in stringency over time. Companies that make cement with an emissions intensity below the benchmark generate credits, whereas companies that produce cement with an emissions intensity above the benchmark must acquire and surrender credits.

Alternatively, funding can directly come from future buyers of ACMs. Advanced market commitments and/or offtake agreement can create long-term demand for nascent ACMs to provide steady financial support to realize commercialization. For programs that involve public purchasers of cement or concrete, leading authorities may be local/state agencies responsible for public procurement. Private companies can also enter into agreements.

Advanced Market Commitments (AMC): An AMC is aimed at accelerating the
development and market entry of emerging products, typically ones that are close
to commercialization. It takes the form of a legal contract that guarantees
purchase if the product is successfully developed, delivered, and satisfied agreedupon requirements. If used for concrete, an AMC can send a signal that there will
be a market for low-carbon alternatives rather than conventional limestone-based
cement. AMCs could potentially be adopted in both the private and public

sectors. Commitments by public agencies are also called advance procurement commitments (APC).

Offtake agreements: An offtake agreement is an agreement between a producer
and a buyer to purchase some of a producer's goods that haven't yet been made.
As it may be negotiated before the construction of manufacturing facilities and
before production begins, it can provide financial certainties for companies that
are transitioning from RD&D phase to full-scale production. It can also guarantee
buyers the supply of a product in anticipation of future demand.

Mechanisms that provide financial incentives can help accelerate commercialization of different decarbonization technologies. It may be possible to leverage funding from businesses outside the cement value chain to achieve the economies of scale necessary for cement decarbonization technologies through emerging approaches that enable businesses to purchase emissions reductions achieved by low-carbon cement production. This approach may not be applicable in California because cement sector emissions are under the cap and therefore cement sector emissions reductions achieved in California could potentially be double counted in other jurisdictions.

 Book-and-claim allows low-carbon product producers to "book" the emissions savings of a good they've produced in one place, and customers to "claim" the emissions benefit from these goods for climate disclosures in a different place. Any such scheme will need guardrails to ensure there is no double counting of emissions toward the state's climate targets.

Potential programs to address permitting and other non-economic factors

License to operate barriers include the complexity and resource requirements to fulfill local, state, and federal regulations or other requirements/standards, concerns for hazardous side effects or adverse events inherent to the production, transport, or use of the technology solution or product in the absence of sufficient controls, and concerns from local communities.

CCUS

• SB 905 Carbon Capture, Removal, Utilization, and Storage Program: SB 905 requires CARB to evaluate, demonstrate, and regulate CCUS. It is expected that GHG quantification protocols for CCUS projects will be developed in alignment with the requirements of SB 905, which can be applicable to cement-related projects. SB 905 also requires CARB to establish a unified permit application process for the construction and operation of CCUS projects.

Potential air pollutant emissions reductions from decarbonization projects CCUS and fuel switching

- Updates to plants could trigger BACT/BARCT, which could require plants to upgrade and update their emission control systems across the plant, not only systems related to new CCUS infrastructure.
- New fuels may trigger AB 2588 new source review, which could result in updated emission limits and permits.
- Alternative fuel use could require Title V permit updates from the local air districts, which could lead to changes in emissions limits for criteria and hazardous air pollutants.

Permitting

• In addition to developments under SB 905, potential CARB-developed information repository on cement decarbonization as a resource for interested parties, including permitting authorities.

Potential programs for GHG quantification

GHG quantification frameworks and requirements may be needed when there is the lack of an overarching framework to quantify, report, and verify GHG emissions reductions and removal projects in a consistent manner throughout the cement-concrete-construction value chain.

- Quantification protocols for CCUS are expected to be developed as part of the SB 905 implementation process.
- AB 43/AB 2446 will have a role in determining how to quantify embodied carbon in construction materials including concrete.

Potential programs to minimize risks of emissions leakage

The Mandatory Reporting Regulation and Cap-and-Trade Program directly regulate reporting and GHG emissions from California cement plants.

- MRR: The regulation requires stationary sources that emit a minimum of 10,000 MTCO₂e per year to report their annual GHG emissions to CARB. California's cement plants have been reporting their emissions and production data to CARB since 2009.
- California Cap-and-Trade Program: A market-based GHG emissions trading system that covers large stationary emission sources emitting a minimum of 25,000 MTCO₂e per year and puts a price on GHG emissions by requiring covered facilities to acquire and surrender tradable compliance instruments to cover their GHG emissions. The carbon price imparted by the Cap-and-Trade Program is California's primary policy tool to incentivize decarbonization of in-state industrial

facilities. However, the carbon price imparted by the Program may also increase the risk of emissions leakage, defined by AB 32 as a decrease in GHG emissions in-state that is offset by an increase in out-of-state GHG emissions. Cement plants in California have been covered by the Program since 2013. To fulfill legislative requirements to minimize emissions leakage, the Cap-and-Trade provides free allowances to specific covered industrial facilities including cement plants.

- CARB proposed the following initial concepts for potential changes to the Capand-Trade and MRR regulations in Spring 2024 that are applicable to SB 596:
 - o MRR: Potential inclusion of reporting by cement importers of amount of cement and associated GHG emissions.
 - o Cap-and-Trade Regulation: Modification of the product definition for the cement sector eligible for direct allocation to include alternative cementitious materials (ACMs) and supplementary cementitious materials (SCMs) used to finish cement. This would provide an equivalent level of emissions leakage protection and incentives for low-carbon materials produced in California and used to make cement.

Funding opportunities

Funding programs provide critical support for emerging decarbonization technologies that are at research, development, demonstration and pilot phase to address resource maturity barriers especially for CCUS and alternative low-carbon materials. Table 15 identifies recent funding opportunities and selected/awarded projects relevant to CCUS and cement decarbonization. CARB is closely monitoring the awarded projects to understand how decarbonization technologies are developing and achieving commercialization.

There is a need for additional funding for California facilities and projects to achieve the needed economies of scale to help achieve zero-emissions goal in a timely manner. To align future California funding with the requirements of SB 596, such funding could include requirements to address adverse air impacts and workforce development.

Table 15: List of Federal/State Funding Opportunities Related to Industrial Decarbonization

Funding Opportunity	Agency/ Statute	Deadline	Available Funding (\$million)
Industrial decarbonization / Federal			
Industrial Demonstrations Program to fund energy-intensive industrial subsectors decarbonization through transformational, commercial-scale demonstration projects.	DOE / IIJA, IRA	8/11/23	6,000

Selected/awarded projects

- Calcined Clay Production for Limestone Calcined Clay Cement Roanoke Cement Company, LLC (Up to \$61.7 million Troutville, Virginia)
- Mitchell Cement Plant Decarbonization Project Heidelberg Materials US, Inc. (Up to \$500 million -Mitchell, Indiana)
- Deeply Decarbonized Cement | Brimstone Energy, Inc. (d/b/a Brimstone) (Up to \$189 million TBD)
- First Commercial Electrochemical Cement Manufacturing Sublime Systems, Inc (Up to \$86.9 million Holyoke, Massachusetts)
- Lebec Net Zero Cement Plant Project National Cement Company of California, Inc. (Up to \$500 million Lebec, California) (see Case Study below)
- Low-Carbon Calcined Clay Cement Demonstration Summit Materials, Inc (Up to \$215.6 million Port Deposit, Maryland; McIntyre, Georgia; Elmendorf, Texas; Sulphur Springs, Texas)

Reducing Embodied Greenhouse Gas Emissions for Construction Materials and Products to support organizations including businesses that manufacture construction materials and products to develop and verify Environmental Product Declarations.	EPA / IRA	1/8/24	100
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Selected/awarded projects¹³⁷

- Heidelberg Materials US, Inc. (Selected Funding Amount: \$5,000,000): proposes to create a robust, web-based tool that can help ready-mixed concrete, cement and aggregate facilities produce EPDs
- Holcim US, Inc. (Selected Funding Amount: \$1,371,814): For cement, asphalt and ultra-high-performance concrete, the project supports the development, enhanced standardization and transparency, and reporting criteria for EPDs.
- International Code Council (Selected Funding Amount: \$3,500,000): through the Pacific Northwest EPD Partnership, the project focuses on developing facility-specific EPDs for materials including concrete.
- National Ready-Mixed Concrete Association (Selected Funding Amount: \$9,632,293): increase the quantity and robustness of ready-mixed concrete EPDs by providing grants to producers to create EPDs from an additional 3,000 plants (up from 1,500 currently).
- Portland Cement Association (Selected Funding Amount: \$2,457,063): (1) provide technical
 assistance to help cement/SCM manufacturers develop facility-specific EPDs; (2) improve
 cement/slag cement industry average EPDs and create new ones for coal ash/natural pozzolans; (3)
 develop a single cementitious materials PCR and (4) support an LCA and benchmarking tool for
 concrete mix design.
- Prestressed Concrete Institute (Selected Funding Amount: \$9,975,000): update the precast concrete PCR and producing product-specific EPDs across multiple trade associations.

¹³⁷ U.S. EPA. 2024. Summaries of the FY 23-24 IRA 60112 Grant Selections: Reducing Embodied Greenhouse Gas Emissions for Construction Materials and Products

Funding Opportunity	Agency/ Statute	Deadline	Available Funding (\$million)
Low-Carbon Transportation Materials Grants Program to fund low carbon materials that create less pollution by reducing the levels of embodied GHG emissions, including concrete (and cement), glass, asphalt mix, and steel.	DOT/ FHWA	6/10/24	2,000

In November 2024, the Federal Highway Administration (FHWA) announced the award of \$1.2 billion to 39 State DOTs including Caltrans. The grant will be used for activities including identifying eligible low-carbon materials, preparing acceptance and verification procedures for collecting material Environmental Product Declarations, coordinating with industry stakeholders, conducting training on new procedures, benchmarking the global warming potential of relevant sets of materials, identifying thresholds that define LCTM, testing and evaluating LCTM to ensure performance is satisfactory and adequate for use on Federal-aid construction projects. Specifications for materials and construction may be updated to accommodate new LCTMs and processes on construction projects. States will identify eligible construction projects to implement LCTM and set up monitoring a process after construction is complete.

Clean Construction Projects and Large-scale Contract Opportunities make federal buildings more sustainable, higher performing, and more cost-efficient through next generation technologies and low embodied carbon materials.	GSA	N/A	2,150 (low embodied carbon projects)
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Awarded projects in California

- NASA Ames Research Center, Sunnyvale
- San Francisco Appraisers Building facade repairs, San Francisco
- Otay Mesa Land Port of Entry Main Building and Primary Inspection sidewalk paving, San Diego
- Leo J. Rvan Federal Records Center pavement. San Bruno
- 801 | Street Federal Building parking lot repaying, Sacramento
- Calexico LPOE modernization, Calexico
- Calexico West Land Port of Entry Historic Custom House pavement, Calexico

Cement and Concrete Center of Excellence to accelerate the development and adoption of novel low-carbon cement and concrete technologies. U.S. national laboratories can receive up to \$9 million through an upcoming competitive lab call to develop and lead the center.	DOE	TBD	9
Hydrogen / Federal			
Regional Clean Hydrogen Hubs to support investment in the development of H2Hubs that demonstrate the production, processing, delivery, storage, and end-use of clean hydrogen.	DOE/ IIJA	4/7/2023	7,000

Selected/awarded projects

- California Hydrogen Hub (ARCHES) is a network of clean hydrogen production with the goal of decarbonizing public transportation, heavy duty trucking, and port operations. \$30 million of the total federal cost share of up to \$1.2 billion.
- Pacific Northwest Hydrogen Hub (PNWH2) to build a clean hydrogen ecosystem across Washington, Oregon, and Montana. \$27.5 million of the total federal cost share of up to \$1 billion.
- Appalachian Hydrogen Hub (ARCH2) is a network of projects that leverages the region's vast resources for diverse clean hydrogen production, storage, delivery, and end-use applications across

Funding Opportunity	Agency/ Statute	Deadline	Available Funding (\$million)
West Virginia, Ohio, and Pennsylvania. \$30 million of the total federal cost share of up to \$925 million			
Clean Hydrogen Production Tax Credit (45V) for a 10-year \$0.60/kg clean H2 credit (inflation adjusted); reward increases with lower lifecycle GHG emissions, up to a 100% multiplier for H2 produced with <0.45kg/CO ₂ e footprint (well to gate).	Treasury / IRA	12/31/32	-
Carbon capture, use, and sequestration / Federal			
Carbon Storage Validation and Testing to test, mature, and validate CCUS technologies at commercial scale.	DOE/ IIJA	11/30/22	2,250

In November 2023, Round 2 selected 16 projects (\$444 million) focused on economic/technical feasibility of reservoirs including the following:

- Colorado School of Mines (Golden, CO) aims to conduct a feasibility study to advance a carbon storage reservoir in the Sacramento Delta at the Carbon Terra Vault III project site. (DOE Funding: \$8,915,350)
- Electric Power Research Institute (Palo Alto, California) intends to confirm the commercial storage capacity and demonstrate the techno-economic feasibility of safely transporting CO2 and storing it at the onshore basalt storage complex on the Modoc Plateau in northeastern California. (DOE Funding: \$9,000,000)

In October 2024, Round 3 selected 23 projects (\$518 million) to support the development of new and expanded commercial large-scale carbon storage projects including the following:

- California State University Bakersfield (Bakersfield, California) plans to accelerate the development
 of transport and storage in multiple depleted oil and natural gas reservoirs that will be repurposed
 for UIC Class VI storage at the Elk Hills Oil Field in Kern County, California. (DOE Funding:
 \$26,984,027)
- Pelican Renewables LLC (Stockton, California) intends to develop a regional CO2 storage hub at the island of Rindge Tract in the eastern portion of the Sacramento-San Joaquin Delta in California ("Delta") that is accessible by barge and rail. (DOE Funding: \$45,221,386)

Carbon Capture Demonstration Projects to fund integrated CCS	DOE/	5/23/23	1.700
projects that demonstrate substantial improvements in efficiency, effectiveness, cost, and environmental performance.	IIJA	3/23/23	1,700

Selected/awarded projects

- Baytown Carbon Capture and Storage Project: Baytown, Texas to capture CO2 from a natural gas combined-cycle power plant. The CO2 will be transported using new and existing pipelines and seguestered in storage sites on the Gulf Coast.
- Project Tundra: Center, North Dakota is a carbon capture system for a coal-fired power plant. The
 captured CO2 will be safely and permanently stored in saline geologic formations beneath and
 surrounding the power plant.
- Sutter Decarbonization Project: Yuba City, California will demonstrate and deploy a commercialscale carbon capture system at a natural gas combined-cycle power plant. The project will then transport the CO2 and sequester it permanently and safely more than a half a mile underground in saline geologic formations.

Funding Opportunity	Agency/ Statute	Deadline	Available Funding (\$million)
Carbon Dioxide Transportation Infrastructure Finance and Innovation Program to finance companies building CO ₂ transport infrastructure projects that cost more than \$100 million.	DOE/ IIJA	-	-
Carbon Capture Large-Scale Pilot Projects provide the support needed to test novel technologies at intermediate scale and under relevant conditions in both the power and industrial sector.	DOE/ IIJA	6/21/23	820

Selected/awarded projects

- Carbon Capture Pilot at Cane Run Generating Station: Louisville, Kentucky to deploy a carbon capture system at a natural gas combined-cycle power plant.
- Carbon Capture Pilot at Vicksburg Containerboard Mill to build a carbon capture system at a pulp and paper mill.
- Carbon Capture Pilot at Big Spring Refinery: Big Spring, Texas to deploy an innovative post-combustion carbon capture process at a refinery's fluidized catalytic cracking Unit.
- Carbon Capture Pilot at Dry Fork Power Station: Gillette, Wyoming to deploy a carbon capture system a coal-fired power plant.

Carbon Utilization Procurement Grants FOA to support procurement and use of products developed through the conversion of captured CO ₂ and CO emissions.	DOE/ IIJA	4/30/25	100
Underground Injection Control Grants to support the development of UIC Class VI programs.	EPA / IIJA	3/20/23	50

Available funds have been allocated evenly among the 25 interested states and Tribes (Alabama, Alaska, Arizona, Colorado, Delaware, Georgia, Kansas, Kentucky, Louisiana, MHA Nation, Michigan, Mississippi, Montana, Navajo Nation, Nebraska, New Mexico, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Texas, Utah, West Virginia, and Wyoming) with an allotment of \$1,930,000 for each program.

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Credit for Carbon Oxide Sequestration (45Q) applies to any projects that commence construction before 2033, expands credit value from \$50/MT to \$85/MT sequestered (\$180/MT for direct air capture), and awards \$60/MT for utilization (\$130/MT for direct air capture).	Treasury / IRA	12/31/32	-
Funding Opportunities by the California Energy Commission			
The Industrial Grid Support and Decarbonization Program (INDIGO) supports industries that can benefit the electrical grid, reduce GHGs, achieve the state's clean energy goals, and reduce air pollution in underresourced communities.	22-23 Budget/ AB 209	TBD	90



CASE STUDY: Lebec Net-Zero Cement Plant Project

The Department of Energy's Office of Clean Energy Demonstrations has awarded up to \$500 million to the Lebec Net-Zero Cement Plant Project in California. This project aims to demonstrate how a combination of decarbonization levers can drive emissions associated with existing U.S. cement production facilities to net-zero.



https://www.nationalcement.com/news-main/national-cement-of-california

A Three-Pronged Approach to Achieve Net-Zero Cement

- 1. Replace fossil fuel with use locally sourced biomass from agricultural byproducts such as pistachio shells
 - The project aims to use 70% alternative fuels by its completion.
- 2. Replace clinker with a less carbon intensive alternative (calcined clay) to produce limestone calcined clay cement (LC3)
 - The Lebec cement plant manufactures Portland limestone cement (PLC), which uses up to 15% limestone.
 - The transition to solely producing the lower carbon LC3 cement needs additional market support and regulatory acceptance for its use across the state and country.
- 3. Capture and sequester the plant's remaining approximately 950,000 metric tons of carbon dioxide each year
 - The CCS portion of the project expects to capture and clean the flue gas from the cement manufacturing process and transport it to an offsite geologic sequestration site in Kern County. This portion of the project will require a range of permit approvals and emerging regulatory frameworks including implementation of state and federal regulation of pipeline transport of CO₂ for sequestration and inclusions of CCS in the Cap-and-Trade Program.

Public Engagement Process

SB 596 requires CARB to coordinate and consult with local communities surrounding cement plants in the development of the Strategy. To date, CARB hosted two public workshops (October 20, 2022, and May 31, 2023) and one community meeting (October 18, 2023) and received 28 total written public comments. A variety of interested parties have come forward to provide input and to express interest in working with CARB, and staff have also worked to engage with local communities. To identify community organizations and community members who might be interested in the Strategy, staff reached out to county supervisor offices, local air districts, and chambers of commerce in areas near cement plants, as well as the Environmental Justice Advisory Committee and representatives from cement plants and cement industry groups. Internet searches were conducted to identify potentially interested community groups and members. Table 16 is a complete list of all organizations contacted as part of this process.

Table 16: List of Organizations CARB Contacted in Alphabetical Order

Adventist Health Tehachapi Valley	Kern County Supervisor District 2	San Bernardino County Supervisor District 1
California Communities Against Toxics	Lucerne Valley Chamber of Commerce	San Bernardino County Supervisor District 3
Center for Community Action and Environmental	Lucerne Valley Economic Development Association	Shasta County Air Quality Management District
Cummings Valley Protective Association	Mojave Chamber of Commerce	Shasta County Public Information Office
Eastern Kern Air Pollution Control District	Mojave Desert Air Quality Management District	Shasta County Supervisor District 4
Friends of Sand Canyon	Mountain Communities Chamber of Commerce	Tehachapi Mountain Democrat Club
Greater High Desert Chamber of Commerce	North State Climate Action	Tehachapi Rotary Club
Greater Tehachapi Chamber of Commerce	Redding Chamber of Commerce	Victorville Planning Department
Kern County Public Information Office	San Bernardino County Public Information Office	

Public comments for the first workshop. Public comments for the second workshop. Public comments for the Community meeting.

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¹³⁸ Public comments can be accessed from CARB's website:

In addition, CARB's Tribal liaison contacted all tribes and tribal members near, or with ancestral lands near, California cement plants to ensure that tribes were aware of the Strategy and the associated process. Table 17 is the list of tribes contacted:

Table 17: List of Tribes in Alphabetical Order

Berry Creek Rancheria of Maidu Indians of California	Hoopa Valley Tribe	Quartz Valley Indian Reservation
Cachil DeHe Band of Wintun	Karuk Tribe	Redding Rancheria
Chemehuevi Indian Tribe	Kletsel Dehe Wintun Nation of the Cortina Rancheria	San Manuel Band of Mission Indians
Colorado River Indian Tribes	Mechoopda Indian Tribe of Chico Rancheria	Southern California Tribal Chairpersons Association
Enterprise Rancheria	Mooretown Rancheria of Maidu Indians of California	Susanville Indian Rancheria
Fort Mojave Indian Tribe	Paskenta Bank of Nomlaki Indians	Tejon Indian Tribe of California
Greenville Rancheria	Pit River Tribe	

CARB received one written response from a representative of the San Manuel Band of Mission Indians that expressed concerns about criteria pollutant emissions, the potential for increases of cement plant footprint into their ancestral territory, and possible impacts to Tribe health, well-being, and cultural resources. The San Manuel Band of Mission Indians did not wish to engage in formal consultation at that time, but they indicated a desire to be informed about public activities pertaining to the Strategy.

Interested parties are encouraged to provide additional suggestions for organizations, groups, or individuals CARB can contact to identify communities interested in the SB 596 process.

Appendix A: USGS Glossary of Terms

Additive: Material intermixed with hydraulic cement to form a different finished cement product.

Admixture: Ingredient (other than cement, water, and aggregates) added to a concrete mix.

Aggregates: Particulate materials such as sand, gravel, crushed stone, and crushed slag, used in construction.

Alite: A cement mineral, generally equated to C3S but usually somewhat impure.

ASR: Alkali-silica reactions or reactivity. Undesirable reactions in concrete between disordered silica in some aggregates and alkali hydroxides in the cement.

ASTM: American Society for Testing and Materials; organization has now been renamed ASTM International. Sets standards for testing and performance of construction and other materials.

AASHTO: American Association of State Highway Transportation Officials. An alternative to ASTM for setting of standards; however, many cement- related AASHTO standards are similar or even identical to those of ASTM.

Belite: A cement or clinker mineral, generally equated to C2S but usually somewhat impure.

Blended cement: A hydraulic cement made of a mixture of Portland cement (or clinker plus gypsum) plus pozzolans or other SCM.

Calcination: (1) The heat-induced removal, or loss, of chemically-bound volatiles, usually other than water. (2) In cement and lime manufacture, it involves the thermal decomposition of calcite and other carbonate minerals to a metallic oxide (mainly CaO) plus carbon dioxide

Carbonation: The re-formation of carbonate minerals through the absorption of carbon dioxide by metallic oxides (e.g., carbonation of lime yields calcite).

Cement: (1) A binding agent. In construction, this agent is a powder to which water is added and which develops binding properties either through hydration of the component minerals in the cement (hydraulic cement) or through carbonation (e.g., lime mortars). (2) informal term for cement paste.

Clinker: An intermediate product of hydraulic cement manufacture. Clinker is produced in a kiln and consists of semifused nodules that contain a controlled and intimate mix of clinker (or cement) minerals. Portland cement clinker consists, chiefly, of the four minerals C3S, C2S, C3A, and C4AF. Clinker is finely ground to make finished cement; in the case of portland cement, the clinker is interground with a small amount of gypsum and/or anhydrite.

Clinkering: The thermochemical formation of the actual clinker minerals, especially to those reactions occurring above about 1300 °C; also the zone in the kiln where this occurs. A.k.a. sintering or burning.

Concrete: A proportioned mix of hydraulic cement, water, fine and coarse aggregates, and sometimes additives, that hardens to a tough, rocklike material used for construction.

Curing: The process of maintaining the moisture content of concrete to allow full hydration of the component hydraulic cement minerals and hence the development of full strength.

Final customer: A term of convenience used in the cement industry to denote a purchaser of cement other than a rival cement company or a sister plant or terminal owned by the selling company. As a practical reporting matter, most final customers are concrete companies, construction contractors, or building material suppliers, and are not individual citizens or companies owning the location where the concrete or mortar was actually put into place. Blending plants independent of the originating or rival cement companies are included as final customers. In the case of swaps, the final customer is that which paid the originating company for the cement.

Flux: (1) A material that reduces the temperature and/or energy input requirements of a chemical reaction or physical change (such as melting). (2) In clinker manufacture, a material that lowers the temperature and energy requirements of the clinker-forming (especially the sintering) reactions by promotion of the development of a liquid phase. Casually synonymous with mineralizer.

Fly ash: Fine grained glassy silicate particles released through the burning of coal in power plants and recovered by scrubbers. Some varieties of fly ash are useful as pozzolans or SCM and others can be used as raw material for clinker manufacture and as fine-grained construction aggregates.

Granulated slag: A form of blast furnace slag that quenched through a water stream so as to form sand-sized grains of silicate glass. When very finely ground (GGBFS), this material is an SCM. Can also be used as a grinding aid in the finish mill.

Gray cement: Cement other than white or colored varieties. Generally synonymous with gray Portland cement, but would include other, similar use cements (e.g., blended cements). It may or may not include gray masonry cement.

Ground granulated blast furnace slag (GGBFS): A form of blast furnace slag produced by quenching molten slag in a water stream to form sand-sized grains of glass. When finely ground, this material is a latent cement, although it is generally included as a pozzolan or SCM. Increasingly, GGBFS is being sold under the imprecise term slag cement. See also pelletized slag.

Gypsum: Calcium sulfate dihydrate (CaSO4·2H2O or in shorthand C⁻SH2); it is a mineral component of portland cement, and its function is to control setting time.

Hydration: Chemical combination of water with another compound. Hydration of cement minerals (to form new minerals called hydrates) is the key reaction in the hardening and development of strength in concrete. 2) absorption of structural water into a crystal lattice.

Hydraulic: Refers to a cement's ability to set and harden under, or with excess, water (cement) through the hydration of the cement's constituent chemical compounds or minerals.

Kiln: The heating apparatus in a cement plant in which clinker is manufactured. Unless otherwise specified, may be assumed to refer to a rotary kiln.

Limestone: (1) A sedimentary rock composed primarily of calcium carbonate (generally as the mineral calcite). Limestone is generally the main raw material for cement manufacture. (2) locally, any rock (e.g., limestone, cement rock, marble) composed primarily of calcium carbonate and used by the plant as its primary raw material in cement manufacture.

Masonry: (1) Refers to construction using natural or manufactured blocks (e.g., bricks, dimension stone, cinderblock), either shaped or unshaped; (2) see masonry cement.

Masonry cement: A general term for cement used as the binder in mortars. Commonly consists of a mix of Portland cement plus plasticizing agents such as lime or ground limestone. Loosely, the term includes true masonry cements, portland-lime cements, plastic cements, and cements for stucco.

Mortar: (1) The binder in masonry construction. Generally, a proportioned mix of masonry (or similar) cement, water, and fine aggregates. (2) In the oldest historical literature, sometimes used synonymously with cement.

PCA: Portland Cement Association. The principal U.S. private organization representing the cement industry.

Portland cement: The most common hydraulic cement. A proportioned and finely interground mixture of Portland cement clinker and a small amount of calcium sulfate (generally as gypsum). In practice, minor amounts of other additives may also be incorporated. Strictly, the term in the United States is limited to the Types I through V varieties (and their air-entrained variants) as defined in ASTM C-150; these types are also collectively called straight Portland cement. Apart from the straight varieties, "Portland cement" when used loosely (a common industry practice) can also include a number of similar hydraulic cements,

including blended cements, that are based on Portland cement clinker plus gypsum.

Pozzolan(ic): (1) A natural or synthetic silicate material that develops hydraulic cementitious properties when interacted with hydrated lime. Pozzolans and similar materials are commonly lumped under the term SCM. (2) Used loosely, the term is synonymous with SCM.

Precalciner: A kiln line apparatus, usually combined with a preheater, in which partial to almost complete calcination of carbonate minerals is achieved ahead of the kiln itself, and which makes use of a separate heat source. A precalciner reduces fuel consumption in the kiln, and allows the kiln to be shorter, as the kiln no longer has to perform the full calcination function.

Preheater: An apparatus used to heat the raw mix before it reaches the dry kiln itself. In modern dry kilns, the preheater is commonly combined with a precalciner. Preheaters make use of hot exit gases from the kiln as their heat source.

Pyroprocessing: Chemical transformation using intense heat from a flame. In cement, it refers to the manufacture of clinker, which is achieved in a kiln utilizing the flame from an internal burner tube. The pyroprocessing circuit or line is also called the kiln line of a cement plant.

Ready-mix(ed): Also spelled as one word (readymix). Common type of concrete in which all the ingredients, including water, are pre-proportioned at the concrete plant and placed into the rotatable drum of a mixing truck. The concrete is then thoroughly mixed via drum rotation while the truck is in transit from the concrete plant to the jobsite. Data on ready-mixed concrete generally includes similar concrete made at semimobile batch plants positioned near the jobsite. Batch plants are used where the jobsite is too far from the main concrete plant to allow convenient delivery of ready-mixed concrete by truck.

Rotary kiln: A kiln consisting of a gently inclined, rotating steel tube lined with refractory brick. The kiln is fed with raw materials at its upper end and heated by flame from, mainly, the lower end, which is also the exit end for the product (clinker), c.f., vertical shaft kiln.

Set or setting: Hydration-induced stiffening of cement paste or concrete. Initial set is the loss of fluidity and plasticity of the material; final set is the development of a certain degree of hardness. Concrete is difficult to work once setting has commenced.

Silica: (1) Silicon dioxide, SiO2; denoted S in cement chemistry shorthand. (2) Pertaining to the silicon dioxide content of a material.

Silica fume: Ultrafine particles of disordered silica formed as a byproduct of the manufacture of silicon metal, silicon carbide, and silicon alloys (e.g., ferrosilicon). It is used as a pozzolan or SCM.

Slag: A silicate melt produced during metal smelting and which essentially is the residuum of the fluxing agents used and the impurities from the metal ores and fuels or reductants. The term also applies to the silicate material after it has cooled to a solid. In the general

context of cement and concrete, slag (unmodified) refers to iron or steel (furnace) slag. More specifically, as a cementitious component of finished cement or concrete admixture, slag refers to the granulated variety used either unground as a grinding aid in the finish mill or ground (GGBFS) as an SCM. As a raw material for clinker manufacture, slag generally refers to steel furnace slag. As an aggregate in concrete, slag generally refers to air-cooled blast furnace slag.

Slag cement: (1) Properly, an ASTM C-595 blended cement (Type S), defined as having ≥70% GGBFS; (2) Increasingly on the U.S. market, the term slag cement is used for a 100% GGBFS product that is sold as an SCM.

Sulfate attack: Deleterious expansion of concrete caused by reaction of certain hydrated monosulfate phases in the cement with sulfate-bearing groundwater or soils. The reaction re-forms ettringite (a higher-volume phase).

Supplementary cementitious material (SCM): Materials that can be incorporated within blended cements or in concrete mixes as partial substitutes for portland cement. Common examples are GGBFS, fly ash, silica fume, and pozzolana. Casually synonymous with pozzolan.

White cement: A cement made from white clinker and is based upon raw materials having very low contents of iron (oxides) or other transition elements to avoid the coloring effects of these elements. Unless otherwise specified (e.g., white masonry cement), white cement generally is confined to white Portland cement. White cement is used to make white concrete and mortar, and serves as a base for colored cements, and is generally much more expensive than equivalent-performance gray cement varieties.

Reference:

van Oss, H.G., 2005, Background facts and issues concerning cement and cement data: U.S. Geological Survey Open-File Report 2005-1152, 88p (Accessed July 1, 2023, at https://pubs.usgs.gov/of/2005-1152-2005-1152.pdf.)

Appendix B: Caltrans New Material Approval Process

Standards, building codes and specifications play a critical role for new low-carbon materials to be accepted by project owners, architects, engineers, and concrete producers. Specifications written by state DOTs are especially important as they set local standards in respective states. In California, Caltrans' specifications are widely referenced and used in construction projects including those by local agencies. Caltrans oversees much of California's extensive transportation infrastructure. It manages more than 50,000 miles of highway and freeway lanes, provides inter-city rail services, permits more than 400 publicuse airports and special-use hospital heliports¹³⁹ Caltrans is in the process of reviewing and approving a variety of alternative materials that could potentially lower GHG intensity of cement and concrete. This section discusses Caltrans' progress to date to approve low-carbon materials.

Portland Limestone Cement

PLC that conforms to ASTM C595 Type IL and AASHTO M240 can contain up to 15% uncalcined limestone powder. Caltrans approved the use of PLC in January 2022, paving the way for its wider use in California. The approval of PLC sent a strong signal to the state's concrete market that a strategic shift to lower-carbon cement was needed to meet the State's climate targets, provided they satisfied requirements for strength, durability and safety.

The review process for PLC started in 2016 and went through multiple committees and task groups comprised of Caltrans staff, industry representatives, engineers, national and regional experts. As Caltrans is responsible for the extensive portion of California's transportation system, the process considered a wide range of performance characteristics as shown in Table 18. It is notable that California has complex geology and topography (e.g. extensive coastal lines and mountain ranges covered with ice and snow) that can add extra stresses to concrete structure and local material availability, among other factors.

Table 18: List of Performance Characteristics Reviewed by Caltrans

1	Constituent material characterization	8	Corrosion of reinforcing steel
2	Alkali-silica reactivity	9	Air entrainment
3	Shrinkage and restrained shrinkage	10	External sulfate attack
4	Mechanical properties	11	Construction schedule
5	Transport properties	12	Environmental impact
6	Chloride binding	13	Thermodynamic simulations
7	Resistance to chloride ingression	14	Corrosion of reinforcing steel

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¹³⁹ Caltrans. About Caltrans. https://dot.ca.gov/about-caltrans

The approval process also involved a three-year study by the Oregon State University, who contracted with Caltrans and tasked with determining if PLC could replace Portland cement without the loss of mechanical and durability performance of concrete materials and mixtures specific to California. The results demonstrated that PLC was equally suitable for Caltrans' construction projects as ordinary cement. PLC was adopted into its Standard Specifications in October 2021 before it was officially approved in early 2022. The list of PLC products authorized by Caltrans is on its "Authorized Material List - Cementitious Materials for use in Concrete". Based on the experiences to approve PLC, Caltrans is in the process of reviewing other alternative SCMs such as harvested coal ash and the requirements related to low-carbon cement. The development of the Authorized Material List process for those approvals is expected to take 1-2 years. In the meantime, Caltrans is allowing project specific review and approval of harvested coal ashes that meet the AASHTO M 240 Class F requirements, Caltrans Section 90 Alkali-Silica Reactivity (ASR) expansion limits and are using innocuous aggregates. Once the Alternative Material List (AML) is developed the suppliers will submit their products through that program to be included on the list.

Supplementary Cementitious Materials (SCMs)

Blended SCMs

The 2024 Caltrans Standard Specifications¹⁴¹ have been updated to allow blended SCMs if they meet the state's criteria. This effort was led in partnership with industry through the Pavement Materials and Partnering Committee (PMPC). Some of the additional controls included in Section 90 for blended SCMs:

- Required to be on the AML
- Additional test data consistency criteria and test method requirements
- Additional Loss of Ignition (LOI) criteria
- Additional ASR expansion limitations
- Updates to the Certificate of Compliance language to require the suppliers clearly state the percentages of SCM, by weight, in the blend.
- Silo storage requirements with clarification that blended SCMs with differing targeted manufacturer masses are considered different cementitious materials. Caltrans requires silos to be emptied before using the silo for a different cementitious material.

140 Authorized Material Lists are specified in Caltrans specifications and are primarily a proactive measure used in conjunction with other acceptance activities as outlined in Department standards and guidance documents. The materials included on these lists are authorized for use on Caltrans construction projects.

¹⁴¹ California Department of Transportation. *2024 Standard Plans, Standard Specifications, and Contract Item Codes*

• Caltrans AML is open for blended SCMs and testing of new products is underway. Caltrans anticipates that this will help mitigate the fly ash supply issues that have come up in recent years as coal fire power plants are shut down.

Alternative SCMs

Caltrans, in partnership with UC Davis Pavement Research Center, is currently evaluating new types of SCMs and other additives as shown in Table 19 to reduce GHG emissions associated with cement and concrete and replace fly ash that is facing decreasing supply, by focusing on locally or regionally available materials. The findings from this research are expected to be published in 2025.

Table 19: List of Materials Reviewed by Caltrans

Material type	Evaluated Materials
SCMs	Harvested fly ash
	Class C fly ash
	Silica fumes
	Natural pozzolan
	Calcined clay
	Ashes from biomass
	(Rice hull ash)
	Ashes from MSW
	Glass pozzolan
Fillers	Seafood waste
	Carpet backing
Nanomaterials	Cellulose nanomaterials
	Chitin nanomaterials
Fillers/SCMs	Construction demolition waste powder
	Asphalt plant baghouse fines
	Dust from lightweight aggregate production
	Returned plastic concrete

Caltrans is conducting a research project with Oregon State University focusing on reclaimed coal ash, coal ash class C, and glass powder. This project aims to investigate the feasibility of using alternative SCMs in Caltrans applications. The alternative SCMs may include, but are not limited to:

- Harvested coal ash
- Class C coal ash
- Recycled glass powder
- Ashes from the combustion of biomass for electricity production
- Waste products of forest management, etc.

The outcomes of this research will shed light on the accessibility of such resources, along with required treatments, and impacts on concrete properties in fresh and hardened states.

It will provide Caltrans with data to make informed decisions on the potential availability, use, testing, and specification of alternative SCM materials. When incorporated, these SCMs can result in a 20 to 40% CO $_2$ reduction in concrete depending on the volume of cement replaced and the SCM used. The research is complete, and the final report is under review. Specification updates will follow.

<u>Implementation of Advanced Sustainability and Performance-Based Practices for Concrete</u> Infrastructure

This research seeks to enhance the sustainability of California's transportation infrastructure by conducting a risk-benefit analysis and performance evaluation of innovative advanced alternative materials in concrete. The innovative materials/technologies evaluated in this study includes:

- CO2 sequestration technologies used in concrete materials;
- Alkali activated concrete;
- Cement produced using sustainable or clean energy.

It involves selecting best practices, reviewing Caltrans' Standard Specifications, and developing performance criteria aligned with current and future infrastructure needs. The project also assesses computational platforms for integrating material properties into Life Cycle Assessments (LCAs) and recommends or develops a tool as needed.

This research will provide the readiness level of the existing new technologies for Caltrans and suggest an evaluation protocol for accepting novel materials. This project started in 2024 and is expected to take 3-4 years.

- Another research project is in partnership with UC Davis: Developing A Framework for the Assessment and Implementation of Innovative Concrete Construction Materials - UCD fiscal year 24/25.
- Performance-based Specification Update:
 This is a long-term goal and will take years to implement. This is a major change to how Caltrans accepts concrete mixes and there are many stakeholders and specification updates required. Caltrans has approved the Concrete Sustainability and Performance Roadmap in the summer of 2024 in conjunction with the PMPC. The goal is to provide a performance-based specification option to start and eventually remove the outdated prescriptive specifications. Key points:
 - o Allows the suppliers to develop mixes and prove they meet design and environmental criteria.
 - o Performance testing data is submitted for review as part of the acceptance.

Moving to a performance-based specification is supported by ACI and outlined in ACI's Report on Performance Based Requirements for Concrete. Caltrans plans to align the requirements with this report.

<u>Caltrans Low-carbon Transportation Materials (LCTM) Grant Update</u>

- From the Inflation Reduction Act, the FHWA has \$2 Billion in grant funding for the use of construction materials and products determined to have "Substantially lower levels of embodied greenhouse gas emissions."
- June 2024 Materials Engineering and Testing Services (METS) submitted application
- November 2024 METS awarded \$31,933,577
- Currently Working with FHWA to obligate funds awaiting on final determination from the executive order.
- February 2025 Caltrans Specification requires submittal of Concrete and Asphalt EPDs for projects with bid opening date after February 1, 2025.

Irrespective of federal funding Caltrans is continuing the commitments already made in line with Caltrans strategic goal of "lead climate action".

- Environmental Product Declarations (EPDs)
- Concrete performance-based specifications
- Research to accelerate new product evaluations
- Balanced Mix Design (BMD) for hot mix asphalt

EPD Update

• Through the Climate Challenge, 142 FHWA is providing funding and technical assistance to quantify GHG emissions from materials and practices for the design, construction, and maintenance of pavements.

- Caltrans was awarded \$312,000 to incentivize the development of EPDs and funds expire April 1, 2026.
- Caltrans has received some increased interest after increasing reimbursement amount, but EPD collection is slow and will not suffice to establish CA benchmarks and thresholds.

To accelerate EPD collection, Caltrans and industry, through the Pavement and Materials Partnering Committee (PMPC), implemented a new specification to be inserted into applicable projects starting February 1st, 2025. The new specification change only applies to large projects with quantities over a set limit for Asphalt and Concrete EPDs. There are financial penalties for not providing the EPDs. Based on collected data, Caltrans will eventually perform regional benchmarking that helps support improve plant efficiencies while promoting local businesses.

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¹⁴² Federal Highway administration. *FHWA Climate Challenge - Quantifying Emissions of Sustainable Pavements*

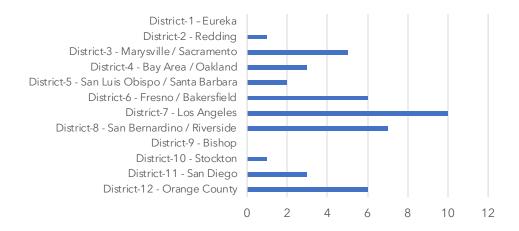
Appendix C: Results of Online Concrete Producers Survey

To promote the use of low-carbon cement including Portland limestone cement (PLC), it is critical to ensure that the users of cement - concrete producers, constructors, architects, engineers and project owners - are ready to accept it. To understand the status of market acceptance after Caltrans approval of PLC in 2021, CARB conducted an online survey of California ready-mixed concrete plant owners that are members of CalCIMA from May to November 2023. The survey was sent to 33 CalCIMA member companies that own about 325 ready-mixed concrete plants out of the approximately 375 total plants in California. Of 33 companies, 19 are vertically integrated or owned by other businesses. They operate about 300 concrete plants. The rest are owned by 14 small/independent companies, showing that concrete industry is diverse in sizes and types of ownership. The survey received 22 responses for a 63% response rate. The average time to respond to the online survey was 25 minutes, and many respondents provided thoughtful written responses.

1. Describe your company.

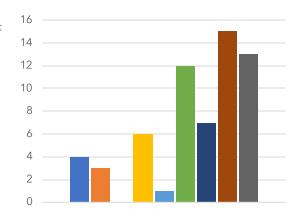
Vertically integrated cement/aggregate/concrete producer		
Integrated cement manufacturer		
Concrete batch plant	12	
Concrete batch plant and cement toll blender	1	
Integrated aggregate producer	2	
Integrated aggregate producer/concrete batch plants	1	
Precast concrete manufacturer	2	
Total	22	

2. What market area(s) do you operate in? Choose up to three areas, which are organized by Caltrans district.



3. Who are your main customers? Please select at most 3 options.

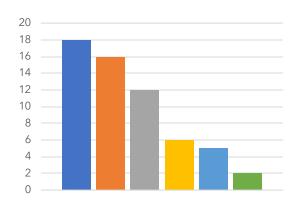
- California Department of Transportation
- State agencies outside of California Department of Transportation
- Federal government agencies
- Local government agencies
- Schools and hospitals
- Commercial project owners
- Residential project owners
- Construction companies
- Subcontractors



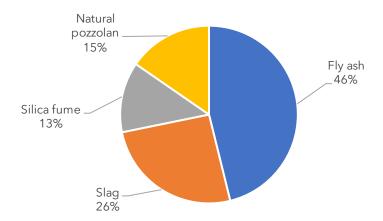
4. To what extent do you typically have a say in what concrete mixes are supplied? Please provide details using the "other" textbox.

To some extent (it is negotiable if we can show options to meet requirements)	18				
None (the contractor or owner makes decisions)	2				
Other comments					
 We are often confined to the project's concrete specification. However, we have been trying to change the practice and there has been an increase in requests by projects teams/architects/engineers for us to review their concrete specifications and make suggestions for low carbon concrete. 					
 We have more flexibility with private builders to provide options that meet end performance requirements. Many public works projects have very restrictive material requirements which limit or prohibit the use of low carbon alternative mix designs. 					
 We work with contractors who provide the job specifications to customize mix designs. 					
 I design the mixes, but engineers and architects specify them who over-cement mixes. 					

- 5. What factors are considered by owners, specifiers, contractors, and suppliers to determine an order for concrete mix? Choose up to three answers that are most frequently brought up. Please provide details using the "other" textbox.
 - Cost
 Certainty to fulfill specifications
 Building codes and other regulations that apply to the project
 Concrete acceptance testing
 Availability
 Sustainability/ LEED considerations

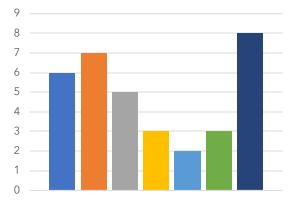


6. Which types of supplementary cementitious materials (SCMs) have you been blending? Select all that apply. Please provide details using the "other" textbox.



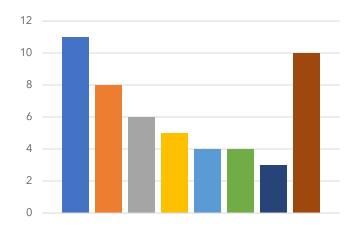
7. If you are seeing increased orders for Portland Limestone Cement (PLC), choose up to three factors contributing to the increased demand. Please provide details using the "other" textbox.





Our capacity/experience to offer PLC to fulfill customers' requirements		
California Department of Transportation's decision to approve PLC		
Project owners' decision to use low-carbon concrete	5	
Cost/performance competitiveness of PLC relative to OPC	3	
Contractors' decision to use low-carbon concrete	2	
No inquires or do not sell PLC	8	
One response included that they tested the strength, but the results were not good.		
Other	3	
 In some cases, customers request PLC for color requirements (PLC is brighter than Portland cement) 		
Supply/availability in the market affects the order.		
We promote PLC to be incorporated into the concrete specifications as a strategy to reduce environmental impacts of cement when cement producer have it available.		

- 8. If you are NOT using or considering using Portland Limestone Cement (PLC), choose up to three reasons. Please provide details using the "other" textbox.
 - It requires additional storage at our facility
 - New materials potentially require additional process (e.g. sampling, testing, application)
 - Contractors are hesitant to use PLC
 - Perceived concern for liability associated with the use of PLC
 - Perceived concern for additional labor/curing time to handle PLC
 - Cost concerns
 - Project owners are hesitant to use PLC
 - Text comments



Text comments

Technical concerns

- PLC does not work with Class F fly ash.
- PLC produces weaker concrete; more PLC is needed per mix to defeat the purpose to lower embodied carbon of concrete.
- PLC strength is lower than normal Portland Cement.
- It requires additional equipment and workforce training at our facility.
- We will use it when product is a reality and proven material.

Availability/acceptance issues

- I do not believe it is offered in our area. (Serves District 3 (Marysville/Sacramento))
- When in-state cement plants shut down, it affects material availability as well as the overall environmental performance of cement used in the state, especially if imports come from regions with weak environmental regulations.
- Some structural engineers do not allow the use of PLC, and/or some contractors are unfamiliar with it.

Other

- We are fully committed to the use of PLC and are determined to work through the challenges to accomplish the goal to fully transition from Portland cement.
- We are using Type 1L PLC as much as possible.
- 9. If you consider supplying new materials such as additional SCMs or alternatives to ordinary Portland cement, what additional actions do you need to take? Which material specifications or testing standards (e.g., ASTM C 31) are you most concerned about when introducing new materials?

Technical Concerns

- Testing is needed for water demand, strength, ASR, chloride attack, etc.
- Some PLC cements can generate higher concrete shrinkage, fast drying and finishing issues and some SCMs could be less effective combating ASR of aggregates.

- Concerns include if the material meet specifications, and if the material will be sustainable in a harsh environment like the Sierra Nevada's.
- There need to be more field testing in the freeze thaw environment.
- Initial research and in-house testing are crucial for any new materials used in concrete mixes.
- Current Caltrans specifications require high levels of fly ash, and current testing protocols will cause high content natural pozzolan mix designs to fail as they do not meet material specifications or cure in the required time.
- ASTM C-618 (Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete) is important
- We are working toward using more Natural Pozzolan, but no standard exists for it.
- Primary concern is spec compliance and meeting customer expectations.
- Concerns include testing and assurance of any performance differences, cost considerations, plant capacities and available silo space, and consistency of materials between locations in a shared market.
- Cost, reliability, customer education are needed
- We need standards that allow the use of these novel materials for concrete.
- We would need to do a substantial amount of additional testing to determine strength. We anticipate it would take more cementitious material to keep strength levels where they are now.
- We are most concerned about project specific specifications, which tend to put the most limitations on the use of SCM's. We don't think ASTM C 31 (Standard Practice for Making and Curing Concrete Test Specimens in the Field) is a concern.

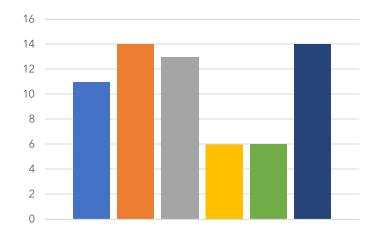
Storage

• Three respondents commented that they needed increased or added silo storage.

Recommendations/statements

- Although most private sector SE firms are still specifying C150 cement, we are constantly advocating for the use of PLC whenever and wherever possible toward a complete PLC transition.
- Please refer to the CNCA roadmap to carbon neutrality update which discusses the role of government in reaching the 2045 zero carbon goals. Additionally, you should access and read the companion CalCIMA roadmap to carbon neutrality for Concrete.
- To easily/quickly/effectively reduce use of cement, simply require all concrete to have 25 oz/cy of high-range water reducer. This will immediately reduce cement consumption by 13 to 15% or more. Reduce cement usage another 15% by extending the test age from 28 days to 56 days.
- SCMs such as fly ash have the same damage to the environment during their process of fabrication as standard cement. It is our belief that using those SCMs is not beneficial if the desire is to reduce a carbon footprint. There are no coal fired plants in California, and bringing in fly ash from plants outside the state further increases its carbon footprint during the delivery process.
- We are largely through the conversion process from II/V cement to PLC at nearly all concrete plants. All of our projects quoted since Q4 2022 have been "Not per Spec" when we see C150 and we quote C595 PLC.
- 10. What additional resources are needed to increase the use of low-carbon cement/concrete? Please provide details using the "other" textbox.

- California Department of Transportation's approval/endorsement of additional materials
- Contractor/architect specifications
- Investment in additional storage, equipment and labor training at our facility
- Low carbon concrete building codes by local authorities
- Opportunities for education, workshops and/or trainings to handle low-carbon cement and concrete
- cement and concrete
 Revisions of existing building codes and standards



- A change from prescriptive to performance specifications is needed.
- Key is pricing and availability of SCMs, then testing.
- The quickest initial way to reduce the carbon content of ready-mixed concrete is provide for alternate ages of maturity for concrete when reasonable. The current standard of 28 days assumes the structure will be fully in use or under load or stress at 28 days. That is almost never the case. Later ages of maturity for testing of concrete such as 42, 56, 90 or 120 days would encourage a decrease in the amount of high carbon cement used and the increase in the use of low carbon SCM's. Another issue is the storage and integration of additional SCM's or PLC. Most ready-mixed facilities do not have the resources to store or use additional SCM's or PLC.
- Standard Specifications for Public Works Construction (the "Greenbook") and County specification to approve low-carbon concrete mix and products.
- 11. Provide details in response to any of the questions and/or comments/concerns/suggestions related to use and promotion of low-carbon concrete.
 - There needs to be more testing in a freeze thaw environment.
 - The cement and concrete industries are faced with regulations to reduce their embodied carbon, and many such as ourselves are willing to make the move and do so when possible. The engineering community is not required to permit the use of low carbon products, and many continue to use their old prescriptive specifications. This must change. There also other barriers that must be removed.
 - Use performance base specification for concrete, that includes changing Caltrans Specification.
 - Provide financial incentives to add additional silo capacity in the ready-mixed plants.
 - Provide regulations to extent the time of final strength of concrete from 28 days to 56, 90 and 120 days.
 - My concerns are in the availability and reasonable expectations in production while
 maintaining a competitive supplier market. For those that have the ability to add silo space
 and invest significant capital into their facilities, they will have an edge.
 - To reduce CO₂ from concrete, nearly ALL mixes should have at least 25 oz/cy of high-range water reducer. That would substantially reduce the amount of Portland cement in concrete mixes. A 6-sack mix could be reduced to a 5.25-sack mix with 25 oz/cy of HRWR for equal strength.

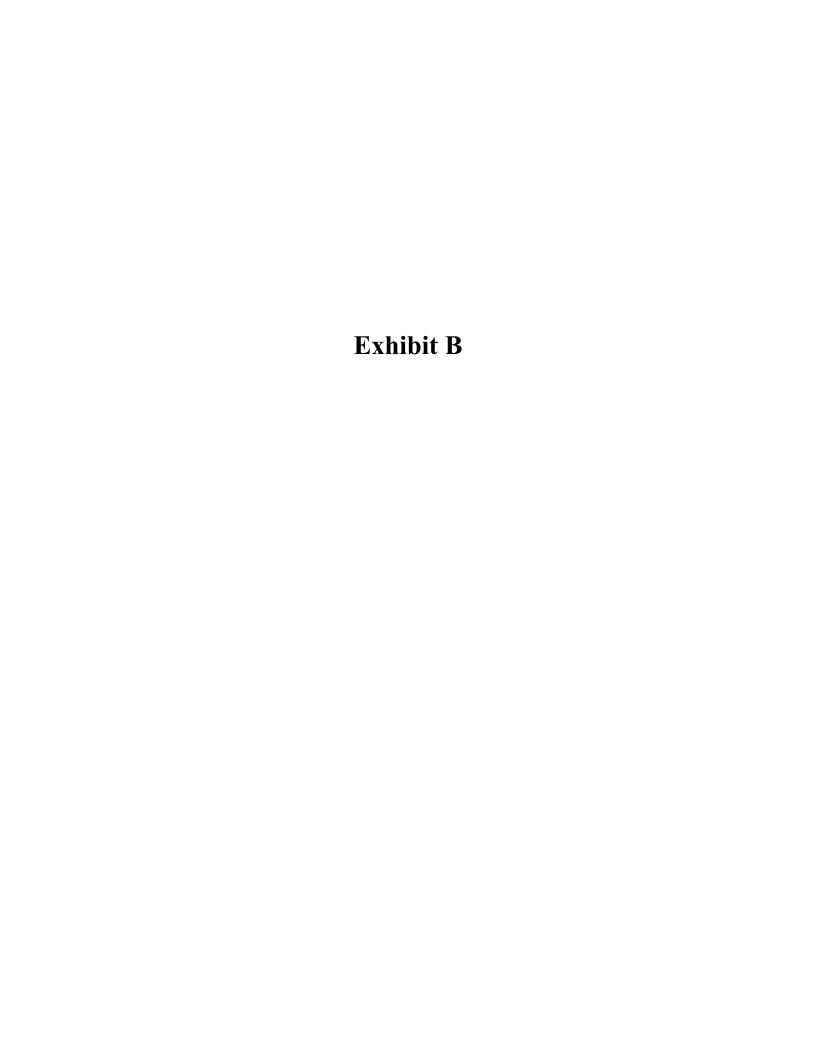
- If the state is requiring businesses to go green, from the cement they use to the equipment used in its production, it must understand that providing a tax incentive to those businesses would jumpstart the process. Plenty of companies are willing to push the green initiative, but many of us need help getting that started.
- In order to achieve "net-zero" it will take more than just the cement producers and concrete producers to develop low-carbon products. The design community must also embrace the transition through creative design.
- There are a number of ways to lower the carbon content of concrete. Many will require contractors, architects, engineers, and agencies to rethink the design and construction methods to accommodate the innovations.
- Ready-mixed plants need additional silo capacity to store multiple types of cements at their facilities. This takes time and resources to accomplish. Additionally, CARB needs to recognize the long pathway to an electrified or hydrogen powered concrete truck and should continue to support bridge fuels such as Recycled Natural Gas.
- Architects and engineers employ prescriptive specifications (defining maximum water-cement ratios, maximum slumps, etc.). NRMCA has been promoting performance specifications for the past 25 years (define what strength and plastic/hardened properties are needed and let the professional concrete mix designers figure out the best way to achieve those results). As it is, architects and engineers constantly over-specify concrete which results in way too much cement being used.
- Education on what "Low Carbon Concrete" is, 90% of people that call asking for "Low Carbon Concrete" don't even know what it is or what it takes to make it a "Low Carbon Concrete." And then when they find out, they get push back from their own Engineers.

Appendix D: Summary of Public Comments

To date, CARB hosted two public workshops (October 20, 2022, and May 31, 2023) and one community meeting (October 18, 2023) and received a total of 28 public comments.

Commenter	Comment Summary
First Workshop	
Berland-Shane, Laura, Blue Planet Systems	Supported CCU technology that mineralized CO2 in synthetic aggregates
Brandler, Simon, Brimstone	Supported alternative cement technology using calcium silicate
Guerra, Erika, CSCME	Provided comprehensive suggestions on principles of cement decarbonization strategy
Theodoridi, Christina, Natural Resources Defense Council	Offered comprehensive suggestions on cement decarbonization pathways
DeRousseau, Mikaela, Building Transparency	Suggested leveraging and improving EPD and PCR to quantify embodied carbon
Brown, Nora, Charm Industrial	Supported carbon removal technology using biomass
Harper, Adam, CalCIMA	Expressed support for the program
Mayer, Katie, Rondo Energy	Supported technology to provide high heat using heat battery and intermittent electricity
Flanagan, Jordan, Leilac	Supported technology to capture CO2 directly from calcination process
Epstein, Bob, Project 2030	Offered modeling combinations of example GHG reduction solutions related to the cement sector
TOBEY, Alann,	Encouraged innovations such as graphene
Bogdan Tejeda, Victoria, Center for Biological Diversity	Opposed to the use of CCS and biomass as cement decarbonization strategy
Kennedy, Kevin, World Resources Institute	Supported low cement product standard
Second Workshop	
Charley Rea, CalCIMA	Opposed to the idea for concrete producers to report the amount of SCM consumption
Simon Brandler, DC2	Support for advance procurement to promote market entry of alternative materials
Doug Robinson, Solidia	Supported technology to produce cement/concrete that mineralized CO2
Laura Berland-Shane, Blue Planet	Supported CCU technology that mineralized CO2 in synthetic aggregates
Jordan Flanagan, Leilac	Supported technology to capture CO2 directly from calcination process

Steve Bryan, Ecocem	Supported technology to produce high filler low water cement/concrete
Rebecca O'Brien, True North Renewable Energy	Supported expansion of LCFS to allow fuel providers to generate credits supplied to industrial sectors
Cassandra Farrant, Amp Americas	Supported expansion of LCFS or amendment of C&T to allow fuel providers to generate credits supplied to industrial sectors
Bernard Fenner, Ductor	Supported expansion of LCFS to allow fuel providers to generate credits supplied to industrial sectors
Steve Bryan, Ecocem	Support technology to produce high filler low water cement/concrete
Sam Morton, AquaHydrex	Supported green electrolytic hydrogen
Simon Brandler, Brimstone	Supported new policy mechanisms for alternative cement that reduce/eliminate GHG emissions
Christina Theodoridi, NRDC and RMI	Supported novel SCMs, public procurement, advanced purchase commitments, zero emissions cement standard among other strategies
Erika Guerra, CSCME	Provided perspectives on questions raised during the workshop, including definitions of "net-zero" and "cement," treatment SCMs, emissions baseline, and emissions leakage
Atle Lygren, EMC	Supported energetically modified cement
Community Meeting	
Todd Jones, Shasta Economic Development Corp	Voiced support for the economic impacts of startup SCM company in their community
Laura Berland-Shane, Blue Planet	Supported CCU technology that mineralized CO2 in synthetic aggregates
Simon Brandler, DC2	Supported advance procurement commitments to promote market entry of alternative materials
Kevin Barker, SoCalGas	Supported CO ₂ pipeline infrastructure network and clean fuels to achieve GHG emissions reduction strategy
Atle Lygren, EMC	Supported energetically modified cement
Charley Rea, CalCIMA	Proposed new cement definition





Low Carbon Fuel Standard

Tier 2 Pathway Application

Application No. B0688

<u>Updated: 4/1/2025 (See Underlined Text)</u>

Staff Summary

FIVE POINTS PIPELINE LLC FIVE POINTS PIPELINE LLC, Riverdale, California Compressed Natural Gas (CNG) from Dairy Manure

Intermediate Facility:

Open Sky Power, LLC (F00607), Riverdale, California Van der Kooi Dairy Power LLC (F00608), Riverdale, California L&J Vanderham Energy, LLC (F00609), Riverdale, California Wilson Dairy Biogas, LLC (F00610), Riverdale, California Van der Hoek Dairy Biogas, LLC (F00705), Helm, California

Joint Applicant: Clean Energy

Deemed Complete Date: 10/16/2024 Posted for Comment Date: 3/12/2025 Carbon Intensity (CI) Certified Date: 4/1/2025 CI Start Date: 10/1/2024

Pathway Summary

FIVE POINTS PIPELINE LLC seeks provisional certification of five Tier 2 pathways for biomethane (Bio-CNG) ¹ production at FIVE POINTS PIPELINE LLC facility in Riverdale, California. Biogas is produced from anaerobic digestion of dairy manure sourced from five farms: Open Sky Power, LLC (Open Sky), Van der Kooi Dairy Power LLC (Van Der Kooi), L&J Vanderham Energy, LLC (Vanderham) and Wilson Dairy Biogas, LLC (J&D Wilson), all located in Riverdale, California, and Van der Hoek Dairy Biogas, LLC (Van Der Hoek), located in Helm, California. Biogas is purified and upgraded to biomethane to meet common carrier pipeline specifications, injected into Pacific Gas and Electric Company (PG&E) pipeline co-located with upgrading facility, and ultimately dispensed for transportation use in CNG vehicles in California using bookand-claim accounting. ²

FIVE POINTS PIPELINE LLC owns the environmental attributes associated with the

¹ "Bio-CNG" means biomethane which has been compressed to CNG. Also referred to herein as biomethane or renewable natural gas (RNG).

² All citations to the LCFS Regulation are found in Title 17, California Code of Regulations (CCR), section 95480-95503. Book-and-claim accounting for biomethane is primarily addressed in section 95488.8(i) of the LCFS Regulation.

biomethane and sells these attributes using book-and-claim accounting through its contracted California transportation fuel dispensers.

Five Points Pipeline LLC participates in the U.S. EPA Renewable Fuel Standard program but has not participated in California's Cap-and-Trade Offset program. Open Sky Dairy has previously participated in the California Cap-and-Trade Offset Program.

The Five Points Pipeline LLC upgrading skid commenced RNG production in 2022, with the initial RNG injection taking place in February 2022. The table below summarizes the information of participating farms including year the farm was founded, year the lagoons were constructed, year the digesters were installed, approximate livestock population (i.e., dairy cows, non-milking dairy cows, heifers, and calves), and the distance from the dairies that are co-located with the digesters to the Five Points Pipeline LLC upgrading facility.

Farm Name	Year Founded	Year Anaerobic Lagoons Built	Year Digesters Installed	Approximate Livestock Population	Distance between Farm and Upgrading Facility (miles)
Open Sky	2005	2007	2015	10,763	0.7
J&D Wilson	2005	2005	2022	3,900	7.5
Van Der Hoek	2004	2004	2023	3,790	6.3
Vanderham	2004	2004	2021	6,117	7.5
Van Der Kooi	2005	2005	2021	7,679	2.1

For Open Sky dairy, there is an original digester was completed in 2008 and was operated until 2009. A new digester was installed on the same lagoon in 2015, allowing Open Sky to operate solely as a genset project. Since RNG skid has been added, a partial amount of biogas is sent to the upgrading facility associated with this application; rest of biogas is sent to the facility in the previously certified application³. The ratio of the gas can be seen in the mass balance. Under the baseline condition, manure was captured and collectively flushed from the free stalls, Saudi barns, and open lots. The manure flowed through a sand lane into a pit and then was lifted over a vibrating screen separator. The separated solids were passively dried and used as bedding or field applied. The thin portion flowed into a series of settling and storage lagoons before being field applied. Under the project condition, manure is collected from the same flush system and the vibrating screen separator with certain downstream modifications. This modified system now has a covered lagoon digester.

³ Application No. B0019.

The same amount of manure is captured as before. The separated solids and thick portion are passively dried and used as bedding or field applied. The thin portion flows into the covered digester. The liquids then flow from the digester to the effluent ponds and eventually field applied. The covered lagoon digesters capture methane that would otherwise be emitted to the atmosphere under baseline manure treatment in the anaerobic lagoons.

For J&D Wilson dairy, under the baseline condition, dairy cow manure was collected using a flush system on feed lanes that pumped water to the high end of the sloped lanes, flowed along the lanes, and flushed out the manure. At the low end of these lanes, the manure flowed into a processing pit and then passed over a stationary screen separator. The separated solids were passively dried and used as bedding or field applied. The thin portion flowed into a series of settling ponds before entering a storage lagoon. Under the project condition, manure is collected from the same flush system and the stationary screen separator with certain downstream modifications. This modified system now has a sand lane and a covered lagoon digester added before the settling ponds. All the manure still passes over a stationary screen separator. The separated solids and thick portion are passively dried and used as bedding or field applied. The thin portion then flows through a sand lane before entering the covered digester. The liquids then flow from the digester to the effluent ponds and eventually field applied. The covered lagoon digesters capture methane that would otherwise be emitted to the atmosphere under baseline manure treatment in the anaerobic lagoons.

For Van Der Hoek dairy, under the baseline condition, dairy cow manure was collected using a flush system on feed lanes that pumped water to the high end of the sloped lanes, flowed along the lanes, and flushed out the manure. Manure was captured from the free stalls and open lots and was collectively flushed. The manure flowed through a sand lane into a pit and then was lifted over a stationary screen separator. The separated solids were passively dried and used as bedding or field applied. The thin portion flowed into a series of settling and storage lagoons before being field applied. Under the project condition, manure is still collected from the flush system with certain downstream modifications. An extra flush pump and a separator are added. All the manure now passes over a vibrating screen separator. The separated solids and thick portion are passively dried and used as bedding or field applied. The thin portion flows into a covered lagoon digester. The liquids then flow from the digester to the effluent ponds and eventually field applied. The covered lagoon digesters capture methane that would otherwise be emitted to the atmosphere under baseline manure treatment in the anaerobic lagoons.

For Vanderham dairy, under baseline conditions, manure was collected using a flush system on feed lanes that pumped water to the high end of the sloped lanes, flowed along the lanes, and flushed out the manure. At the low end of these lanes, the manure flowed into a processing pit and then passed over a stationary screen separator. The separated solids were passively dried and used as bedding or field applied. The thin portion flowed into a series of settling ponds before entering a

storage lagoon. Under the project condition, manure is still collected from the flush system and the stationary screen separator with certain downstream modifications. This modified system now has a sand lane and a covered lagoon digester added before the settling ponds. The sand lane is designed to separate the sand from manure. The same amount of manure is captured as before. The separated solids and thick portions are passively dried and used as bedding or field applied. The thin portion then flows through a sand lane before entering the covered digester. The liquids then flow from the digester to the effluent ponds and eventually field applied. The covered lagoon digesters capture methane that would otherwise be emitted to the atmosphere under baseline manure treatment in the anaerobic lagoons.

For Van Der Kooi dairy, under the baseline condition, manure was collected through a flush system on feed lanes that pumped water to the high end of the sloped lanes, flowed along the lanes, and flushed out the manure. A similar system collected manure in the milking parlor. The manure was captured from the free stalls and open lots and flushed into a pit and then was lifted over a stationary screen separator. The manure then flowed into a series of settling ponds before entering a storage lagoon. The separated solids were passively dried and used as bedding or field applied. The thin portion flowed into a series of storage lagoons before being field applied. Under the project condition, manure is still collected from the flush system with certain downstream modifications. This modified system now has a sand lane, an additional separator, and a covered lagoon digester added before the settling ponds. The manure flows into the processing pit and goes over vibrating slope screen separator. More manure is now captured through the vibrating screen separator. The solids and thick portions are passively dried and used as bedding or field applied. The thin portion then flows through a sand lane before entering the covered digester. The liquids then flow from the digester to the effluent ponds and eventually field applied. The covered lagoon digesters capture methane that would otherwise be emitted to the atmosphere under baseline manure treatment in the anaerobic lagoons.

The lagoon systems at all dairy farms have never performed complete cleanouts; therefore, no lagoon cleanout is modeled.

The Five Points Pipeline LLC upgrading facility receives biogas from its nearby dairy digesters via pipeline. After minor processing at each of the dairy digester locations, the biogas enters the pipeline and travels to the cleanup facility. Upon arrival at the cleanup facility, biogas enters the hydrogen sulfide (H₂S) removal system. This scrubbing process reduces the H₂S. It then travels to activated carbon beds for polishing to remove H₂S. The desulfurized biogas will then be dehydrated. Post dehydration, carbon dioxide will be removed from the biogas in a membrane system. The biomethane that is produced post-carbon dioxide membranes will be compressed. Once at pressure, the gas will be injected into the PG&E common carrier gas pipeline through a utility meter set. Pipeline-injected RNG is delivered to CNG vehicle fueling stations in California using indirect ("book-and-claim") accounting.

Carbon Intensity of Fuel Type Pathways

The CI is determined from life cycle analysis conducted using a modified version of the Board-approved Tier 1 Simplified CI Calculator for Biomethane from Anaerobic Digestion of Dairy and Swine Manure.⁴ The calculator was modified to explain calculation changes, specifically new process units/life cycle stages or inputs. The modified calculator has been determined to be equivalent to CA-GREET3.0 pursuant to section 95488.7(a)(1) of the LCFS regulation. The applicant has provided operational data and supporting documentation for the listed life cycle stages, including unit operations and transport of feedstock and/or fuel (e.g., digester, gas cleanup, and pipeline injection of biomethane), for the following periods: 23 months for Open Sky, Vanderham and Van Der Kooi, from February 2022 to December 2023; 16 months for J&D Wilson, from September 2022 to December 2023; and 11 months for Van Der Hoek, from February 2023 to December 2023.

The CI scores listed in the table below reflect the CI calculated using the modified version of the Board-approved Tier 1 Simplified CI Calculator for Biomethane from Anaerobic Digestion of Dairy and Swine Manure, along with a conservative margin of safety added by the applicant.

	Proposed Pathway CI			
Pathway Number	Fuel & Feedstock	Pathway FPC	Pathway Description	Carbon Intensity (gCO2e/MJ)
B068801	CNG from Dairy Manure	CNG026B06880100	Biogas from dairy manure at Open Sky Power, LLC in Riverdale, CA; upgraded to pipeline quality at FIVE POINTS PIPELINE LLC; pipelined to CA for transportation use	-201.74

⁴ The Tier 1 Simplified CI Calculator for Biomethane from Anaerobic Digestion of Dairy and Swine Manure (August 13, 2018), incorporated by reference in the LCFS Regulation, section 95488.3(b).

	Proposed Pathway CI			
B068802	CNG from Dairy Manure	CNG026B06880200	Biogas from dairy manure at Wilson Dairy Biogas, LLC in Riverdale, CA; upgraded to pipeline quality at FIVE POINTS PIPELINE LLC; pipelined to CA for transportation use	-227.61
B068803	CNG from Dairy Manure	CNG026B06880300	Biogas from dairy manure at Van der Hoek Dairy Biogas, LLC in Helm CA; upgraded to pipeline quality at FIVE POINTS PIPELINE LLC; pipelined to CA for transportation use	-401.12
B068804	CNG from Dairy Manure	CNG026B06880400	Biogas from dairy manure at L&J Vanderham Energy, LLC in Riverdale, CA; upgraded to pipeline quality at FIVE POINTS PIPELINE LLC; pipelined to CA for transportation use	-199.97
B068805	CNG from Dairy Manure	CNG026B06880500	Biogas from dairy manure at Van der Kooi Dairy Power LLC in Riverdale, CA; upgraded to pipeline quality at FIVE POINTS PIPELINE LLC; pipelined to CA for transportation use	-183.56

Operating Conditions

The certified CI value in the above table may be used to report and generate credits for fuel quantities that are produced at the facility in the manner described in the applicant's Life Cycle Analysis (LCA) report, and dispensed for transportation use in California, subject to the following requirements and conditions:

- 1. Fuel pathway holders are subject to the requirements of the California Air Resources Board's (CARB) Low Carbon Fuel Standard (LCFS) regulation, which appears at sections 95480 to 95503 of title 17, California Code of Regulations. Requirements include ongoing monitoring, reporting, recordkeeping, and third-party verification of operational CI and a controlled process for providing product transfer documents or other similar records to counterparties or CARB.
- 2. CARB has reviewed the contractual agreements between the pathway holder/biogas upgrader, and marketer(s). All unredacted contract agreements relevant to this biomethane fuel pathway were submitted to CARB as part of the application, pursuant to section 95488.8(i)(2)(B). To confirm compliance with Annual Fuel Pathway Report requirements, the pathway holder shall notify CARB of any change in existing contracts that were submitted to CARB with the fuel pathway application, including any new contracts and termination of existing contracts, with any entity engaged in the transfer, purchase, or sale of biomethane and its environmental attributes. Failure to notify CARB of such a change could result in enforcement action and could invalidate this fuel pathway.

Fuel pathway holders must update the list of Bio-CNG dispensing entities and any biomethane end users at the time of Annual Fuel Pathway Report submission. Contractual agreements from the fuel dispensing entities do not need to be submitted in the original fuel pathway application or the Annual Fuel Pathway Reports; instead, they must be verified as part of the annual verification of the Quarterly Fuel Transactions Reports.

- 3. The biomethane and its environmental attributes claimed under this pathway shall not be claimed by any entity for any other purpose, nor under any other program notwithstanding the exceptions listed in LCFS Regulation section 95488.8(i)(2). The LCFS places no restriction on the use of any emission reduction credits generated by the project for emission reductions that are demonstrated to be additional to reductions claimed under the LCFS.
- 4. The fuel pathway holder must include the assumptions and calculations used to establish the fraction of solids input to each manure management system in its Annual Fuel Pathway Report submitted to CARB for third-party verification of the operational CI.
- 5. Any quantity of biomethane metered at inlet to the upgrading facility that cannot be demonstrated by meter records to have been pipeline injected or destroyed,

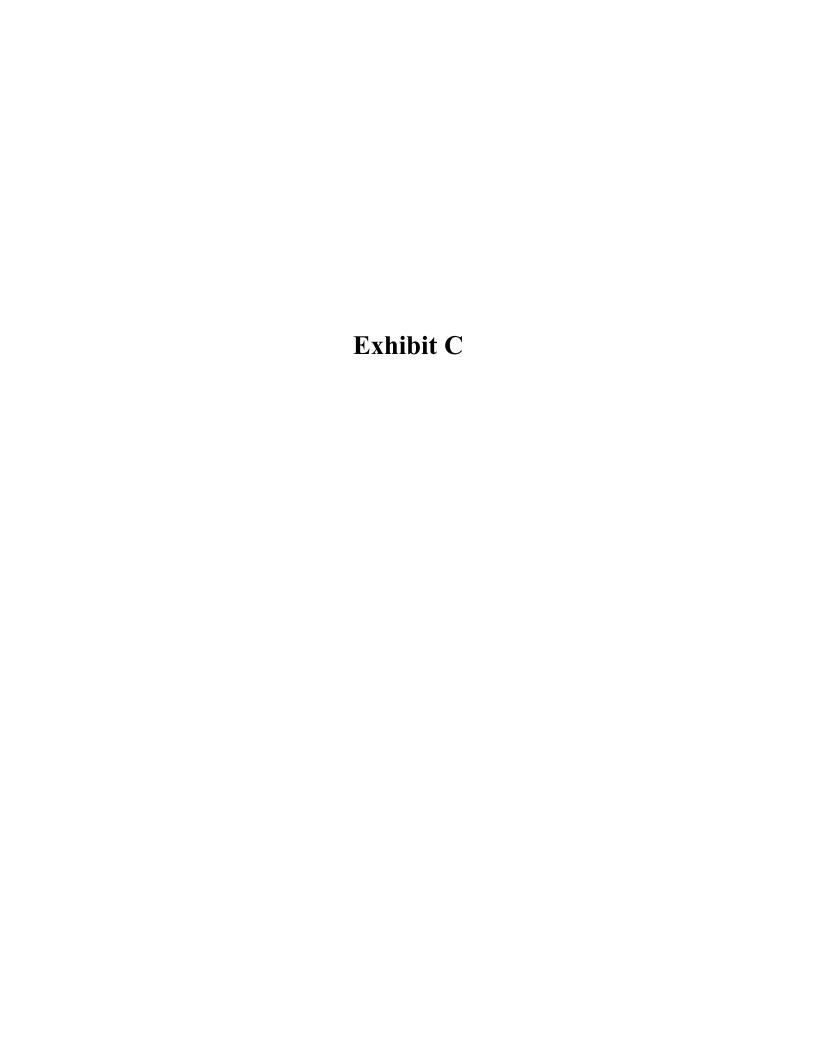
- must be calculated by energy balance and accounted for in the CI as a fugitive methane emission if the calculated value exceeds the default 2% fugitive emission.
- 6. Each dairy/swine farm supplying manure to a digester will be subject to third-party verification to support the fraction of volatile solids inputs to the modified Simplified CI Calculator for Biomethane from Anaerobic Digestion of Dairy and Swine Manure for baseline and project modeling (Manure-to-Biogas (LOP Inputs) tab). CARB must be immediately notified through the AFP of any changes to dairy/swine manure suppliers and sources (e.g., additional suppliers or manure from different types of livestock) are made from the certified pathway. Modifications to the dairy/swine manure suppliers and sources may require submission of a new pathway for review, validation, and certification. Failure to notify CARB of such a change may result in the invalidation of the fuel pathway, invalidation of associated LCFS credits, and enforcement action.
- 7. The fuel pathway holder must report total upgrading facility energy use and biogas flow, and the calculations used to allocate these parameters to each digester pathway based on its monthly share of total biogas measured at inlet to upgrading, in its Annual Fuel Pathway Report submitted to CARB and subject to third-party verification of the operational CI.
- 8. The fuel pathway holder must report total injection facility energy use and biomethane flow, and the calculations used to allocate these parameters to each digester pathway based on its monthly share of total biomethane measured at the injection facility, in its Annual Fuel Pathway Report submitted to CARB and subject to third-party verification of the operational CI.
- 9. If the pipeline injection statement indicated a biomethane quantity less than the sum of the conservative monthly offloading quantities for all facilities injecting biomethane at the Pacific Gas and Electric common carrier pipeline, each of the facility's biomethane quantities must be adjusted on a pro-rata basis so that the aggregate Final Monthly Quantity does not exceed the pipeline injection statement quantity.
- 10. If the pipeline injection statement quantity is greater than or equal to the sum of all facilities injected biomethane at the Pacific Gas and Electric common carrier pipeline, the quantity attributable to Five Points Pipeline, LLC is equal to the biomethane metered production at Five Points Pipeline, LLC.

Staff Analysis and Recommendation

Staff has reviewed the application and has replicated, using the Tier 1 modified version of the Simplified CI Calculator, the CI values calculated by the applicant. Ashworth Leininger Group (H3-20-003) submitted a Positive validation statement. Staff recommends this application be certified on a provisional basis after all the comments received during the 10-day comment period are addressed satisfactorily by the applicant. The certification is subject to the operating conditions set forth in this document.

Comments and Certification

CARB has reviewed the applicant's response to comments received during the 10-day comment period, determined that these adequately address factual and methodological errors, and certified the pathway.



March 26, 2025

Submitted via ca.gov

Liane M. Randolph, Chair California Air Resources Board 1001 I Street Sacramento, CA 95814

Re: Tier 2 Pathway Application B0688

Dear Chair Randolph,

Leadership Counsel for Justice & Accountability, Central Valley Defenders of Clean Water & Air ("Defensores"), Food & Water Watch, and Animal Legal Defense Fund (collectively, "Commenters") write in opposition to Five Points Pipeline LLC's Tier 2 pathway application. As Commenters have explained through numerous comments, the Petition for Rulemaking to Exclude All Fuels Derived from Biomethane from Dairy and Swine Manure from the Low Carbon Fuel Standard Program (included and incorporated here as Exhibit A), and the Petition for Reconsideration (included and incorporated here as Exhibit B), the California Air Resources Board's (CARB) treatment of factory farm gas under the Low Carbon Fuel Standard (LCFS) is flawed, and staff's assessment of this application is no different. We urge CARB to either deny this application or at least exercise its clear authority¹ to defer consideration of the application during the pendency of the LCFS rulemaking.²

Commenters oppose this application for several reasons. First, the application incorporates an unlawfully truncated system boundary that ignores feedstock production at the source factory farms around Riverdale, California—which collectively confine 32,200 cows³—and other emissions such as those from storage and disposal of digestate, resulting in artificially low Carbon Intensity (CI) values and inflated credit generation. For example, the applicant's system boundary in their life cycle analysis report explicitly excludes enteric fermentation—a major source of methane emissions that cannot be disentangled from the process of creating applicant's factory farm gas.⁴ A fuel pathway life cycle analysis must take into account "feedstock production" and "waste generation, treatment and disposal." In addition to the evidence provided in Exhibits A and B, more recent research indicates that emissions from factory farm gas production are significantly higher than currently appreciated, with especially high emissions from digestate storage. This recent study did not consider additional emissions from digestate handling and application, which is another potentially large source of emissions resulting from factory farm gas

¹ The LCFS provides that the Executive Officer "may" consider provisional pathway applications. Cal. Code Regs. tit. 17, § 95488.9(c).

² Decision of Disapproval of Regulatory Action (OAL Matter Number 2025-0103-01), Office of Administrative Law (Feb. 18, 2025), available at https://oal.ca.gov/wp-content/uploads/sites/166/2025/02/LINDSEY-2025-0103-01S.pdf (detailing the Office of Administrative Law's disapproval of CARB's 2024 LCFS amendments).

³ Application No. B0688 Staff Summary at 2.

⁴ Application No. B0688 Life-Cycle Assessment of Five Points Pipeline RNG to CNG Project at 33.

⁵ Cal. Code Regs. Tit. 17 §§ 95481(a)(66), 95488.7(a)(2)(B).

⁶ Semra Bakkaloglu et al., *Methane Emissions Along Biomethane and Biogas Supply Chains Are Underestimated*, 5 ONE EARTH 724–736 (June 17, 2022), https://www.sciencedirect.com/science/article/pii/S2590332222002676.

production that must be included in the pathway life cycle analysis. Yet, CARB and the pathway applicant ignore these and other emissions. In other words, this application dramatically undercounts the greenhouse gas emissions associated with this fuel by failing to apply the required "well-to-wheel" analysis.

Concurrently, this application overcounts environmental benefits by ignoring that this is, in one factory farm owner's words, "*lucrative*" feedstock production.⁸ Liquified manure rotting anaerobically in massive waste "lagoons" is not an unavoidable and natural consequence of animal agriculture operations.

The methane emissions created by these dairies are the result of intentional management decisions designed to maximize profits and externalize pollution costs. CARB cannot ignore that the emissions the pathway applicant claims as captured from the factory farms' lagoons are intentionally created in the first place. The manure handling practices at these factory farms is an integrated part of generating and using factory farm gas. Thus, the gas generated is an intentionally produced product and cannot now be claimed as "captured" to secure a lucrative negative CI value.

Second, CARB has failed to ensure that the additionality requirements of Health and Safety Code section 38562 are met. This program participates in the federal Renewable Fuel Standard. All of the digesters were built with funding from the Dairy Digester Research and Development Program, totaling over \$6,500,000 in public investment. As we explained in both of our petitions, both CARB and the California Department of Food and Agriculture (CDFA) have already claimed the purported methane emission reductions from these digesters.

It appears that CARB has not analyzed whether these purported emissions reductions "otherwise would occur." For example, Open Sky dairy, which is the largest dairy represented in this application, built its first digester in 2008. While Open Sky installed a new digester in 2015, it operates on the same lagoon as the old digester. ARB should treat the Open Sky's

⁷ Id. at 728; Michael A. Holly et al., Greenhouse Gas and Ammonia Emissions from Digested and Separated Dairy Manure During Storage and After Land Application, 239 AGRIC. ECOSYSTEMS & ENV'T 410, 418 (Feb. 15, 2017), https://doi.org/10.1016/j.agee.2017.02.007; Roger Nkoa, Agricultural Benefits and Environmental Risks of Soil Fertilization with Anaerobic Digestates: a Review, 34 AGRONOMY FOR SUSTAINABLE DEV. 473 (2014), https://link.springer.com/article/10.1007/s13593-013-0196-z; F. Montes et al., Special Topics — Mitigation of methane and nitrous oxide emissions from animal operations: II. A Review of Manure Management Mitigation Options, 91 J. OF ANIMAL Sci. 5070 (2013), https://academic.oup.com/jas/article/91/11/5070/4731316; Kurt Möller & Walter Stinner, Effects of Different Manuring Systems with and without Biogas Digestion on Soil Mineral Nitrogen Content and on Gaseous Nitrogen Losses (Ammonia, Nitrous Oxides), European J. Of Agronomy (2009), https://www.sciencedirect.com/science/article/abs/pii/S1161030108000695?via%3Dihub.

⁸ Stacey Smart, *Deer Run Dairy Wins National Sustainability Award*, DAIRY STAR (June 27, 2022), https://dairystar.com/Content/Home/Home/Article/Deer-Run-Dairy-wins-national-sustainability-award/80/254/18626 (emphasis added) ("Installed in 2011, the digester supplied power to nearly 600 homes. In 2020, the farm converted over to renewable natural gas that is injected into the pipeline, which Duane said is a more lucrative option.").

⁹ See Ex. A, Petition for Rulemaking, section III.A.2; Ex. B, Petition for Reconsideration, section III.A.3.

¹⁰ Application No. B0688 Staff Summary at 2.

¹¹ Report of Funded Projects – Dairy Digester Research and Development Program, Cal. Dep't of Food and Agric. 20, 26-27 (2023) available at https://perma.cc/2M9G-JRVQ.

¹² Health & Saf. Code, § 38562, subd. (d)(2).

¹³ Application No. B0688 Staff Summary at 2.

¹⁴ Commenter Association of Irritated Residents ("AIR") raised similar concerns about Open Sky's 2019 LCFS pathway application. CARB approved this application despite this concerns which have borne out. *See Comment 25*,

baseline as operating with the old digester, since this is what the dairy was doing immediately before the LCFS came into effect. Without an additionality analysis, CARB cannot know whether the purported emissions reductions would have occurred but-for the LCFS program, or whether similar reductions would have occurred regardless through operation of the old digester.

Third, this application is a exemplifies how CARB's flawed approach is rewarding the biggest factory farm polluters and incentivizing further expansion and herd consolidation, which does more climate harm than good. These farms are new operations that have only been established in the last twenty years: they are not sustainable family farms. Instead, they are massive industrial operations that confine *up to 10,700 cows each, and 32,200 cows collectively*. The largest dairy in this application, Open Sky Dairy, has *grown its herd by more than 80%* over that past 13 years. CARB should not allow these factory farms—or their applicant—to profit from the LCFS.

Fourth, this application is so opaque that it is impossible for Commenters or other stakeholders to meaningfully evaluate it.¹² Several supporting documents are unavailable to Commenters and other stakeholders because they are purportedly "confidential" and the lifecycle analysis report redacts myriad values, including nearly every value used to calculate the CI for the fuel pathway.¹⁸

Fifth, the inflated CI values CARB proposes here work an additional environmental injustice on California citizens who will be exposed to higher levels of pollution from fossil transportation fuel and dirty vehicles made possible by excessive credit generation at factory farms. CARB has acknowledged that pollution from transportation fuels inflicts a racially disparate impact, so this continued certification of fuel pathways with extreme negative CI values to allow more pollution from deficit holders contributes to this injustice. ¹⁹

Finally, the certification of these pathways would result in a discriminatory impact, in conflict with CARB's obligations under California Government Code 11135 and Title VI of the Civil Rights Act, which impose an affirmative duty on CARB to ensure that its policies and practices do not have a discriminatory impact on the basis of race. The source factory farms are located in the vicinity of several communities, including Lanare and Riverdale. These communities have populations with a significantly higher percentage of Latino/a/e ethnicity than California as a whole (approximately 91% in Lanare and 75% in Riverdale, compared to approximately 40% for California generally) according to US Census Data.²⁰ Additionally,

ASS'N OF IRRITATED RESIDENTS (2019), available at

 $https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/fuelpathways/comments/tier2/B001901_Comment%20Log\%20Display.pdf.$

¹⁵ Application No. B0688 Staff Summary at 2.

¹⁶ *Id*.

¹⁷ According to CADD data, Open Sky housed 5,871 animals in 2012, 9,235 animals in 2015 when the current digester was installed, and 10,700 in 2025 according to this application. *See CADD Facility Herd Size Table*, CARB (last visited Mar. 26, 2025) available at https://ww2.arb.ca.gov/resources/documents/california-dairy-livestock-database-cadd?keywords=2025.

¹⁸ See Application No. B0688 Cover Page at 2; Application No. B0698 Life-Cycle Assessment of Five Points Pipeline RNG to CNG Project at 36-40.

¹⁹ See 2020 Mobile Source Strategy at 26–27, CARB (2020) https://perma.cc/4P3H-HG3Z.

²⁰ Riverdale, California, U.S. CENSUS BUREAU,

https://data.census.gov/profile/Riverdale_CDP,_California?g=160XX00US0661096; *Lanare, California*, U.S. CENSUS BUREAU, https://data.census.gov/profile/Lanare CDP, California?g=160XX00US0640116.

Lanare has a significantly higher poverty rate than California as a whole, at 28.3% versus 12%, and Riverdale residents' median household incomes are just 57% of the state median.²¹

The communities that these facilities occupy already face substantial and disproportionate pollution burden, including extreme and disproportionate impacts from ozone, PM 2.5, drinking water contamination, and groundwater threats, ²² all of which are caused and exacerbated by dairy operations. According to a study by UC Davis, Fresno County already has one of the highest asthma-related emergency room visit rates for children in the state. ²³ This tragic prevalence of childhood asthma will only be made worse if CARB certifies this fuel pathway, which incentivizes further herd expansion in the area.

The communities that these factory farms occupy also suffer from critical groundwater overdraft and water pollution.²⁴ The source factory farms are located in the Kings Subbasin, which is critically overdrafted under the Sustainable Groundwater Management Act (SGMA). By granting the application, CARB would further incentivize expansion and herd consolidation—as well as the production of cow manure—in an area that cannot support continued unreasonable groundwater use and abuse by the dairy industry.²⁵ As explained in the Petition for Reconsideration, wells are already going dry and other adverse effects of overdraft, including further impaired water quality, are already affecting residents and communities in this region.²⁶

In Lanare, for example, the public water system is reliant on a single operational well, with documented exceedances of the drinking water standard for Trihalomethanes.²⁷ Prior source wells are currently relegated to standby status due to high levels of arsenic and benzene.²⁸ Reliance on the single well due to groundwater source contamination is coupled with declining water levels to pose serious challenges to the community's groundwater security.²⁹ Water provided by systems in both Lanare and Riverdale also exceeds secondary maximum contaminant levels for contaminants that impact the perceived quality of drinking water.³⁰ This

²¹ *Id*.

²² CalEnviroScreen 4.0, OEHHA, https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40 (last visited Mar. 21, 2024) (showing that Riverdale and the surrounding areas are in the 96th percentile for groundwater threats, 78th percentile for ozone, 87th percentile for PM 2.5, and 68th percentile for drinking water contaminants).

²³ CALIFORNIA'S SAN JOAQUIN VALLEY: A REGION AND ITS CHILDREN UNDER STRESS, UC DAVIS 21–22 (2017), https://perma.cc/Y8V4-KQWL.

²⁴ Critically Overdrafted Basins, CAL. DEP'T OF WATER RES. (last visited Dec. 20, 2024) https://water.ca.gov/programs/groundwater- management/bulletin-118/critically-overdrafted-basins (listing the Kings Subbasin as critically overdrafted).

²⁵ CAL. CONST., art. X, § 2; see Cal. Water Code § 100.

²⁶ Ex. B, Petition for Reconsideration, section III.A.4.a-b.

²⁷ Lanare Community Services District Consolidation Feasibility Study – Revised Draft, NV5, INC. 4 (2024).

²⁸ Monitoring Results for Individual Sampling Points (CA1000053), CA DRINKING WATER WATCH (last visited Mar. 26, 2025), available at

 $https://sdwis.waterboards.ca.gov/PDWW/JSP/NMonitoringSchedules.jsp?tinwsys_is_number=356\&tinwsys_st_code=CA\&ReportFormat=SR.$

²⁹ Lanare Community Services District Consolidation Feasibility Study – Revised Draft, NV5, INC. 17 (2024).

³⁰ Monitoring Results for Individual Sampling Points (CA1000053), CA DRINKING WATER WATCH (last visited Mar. 26, 2025), available at

https://sdwis.waterboards.ca.gov/PDWW/JSP/NMonitoringSchedules.jsp?tinwsys_is_number=356&tinwsys_st_cod e=CA&ReportFormat=SR; *Monitoring Results for Individual Sampling Points (CA1010028)*, CA DRINKING WATER

is on top of the dairy industry's dangerous nitrate loading and other water pollution, which have greatly harmed community health.³¹ CAFO operations have already contributed to significant levels of nitrate leaching to regional groundwater resources.³² This has resulted in elevated levels of risk to human health for households dependent on domestic wells for water supply, including for residents of the area surrounding the applicant dairies who are outside the service areas of either the Lanare or Riverdale water system.³³ Domestic wells located in the vicinity are already impacted by elevated nitrate levels.³⁴ Granting this application would undermine SGMA and encourage the dairy industry to continue its unreasonable use of water.

The certification of this pathway would do nothing to remedy these myriad disproportionate impacts. Rather, it would incentivize the most polluting herd and manure management practices and incentivize the expansion of herd populations. Further, it would violate section 38562 by failing to ensure that such certification would not disproportionately impact low-income communities (§ 38562(b)(2)) and by failing to ensure that it would not interfere with efforts to achieve and maintain federal and state ambient air quality standards (§ 38562(b)(4)).

As this application highlights, CARB's unlawful and unjust administration of the LCFS program is causing environmental and public health harms in California by incentivizing and rewarding some of the worst factory farm practices by making them more "*lucrative*." If California is serious about being a climate leader, this is not the example to set.

Commenters request that CARB deny the application. To do otherwise will violate California law, further destroy the integrity of the LCFS market, undermine the state's climate change mitigation efforts, and harm California communities.

Respectfully,

Evan Levy Litigation Fellow Animal Legal Defense Fund (707) 795-2533 ext. 1092 elevy@aldf.org

WATCH (last visited Mar. 26, 2025), available at

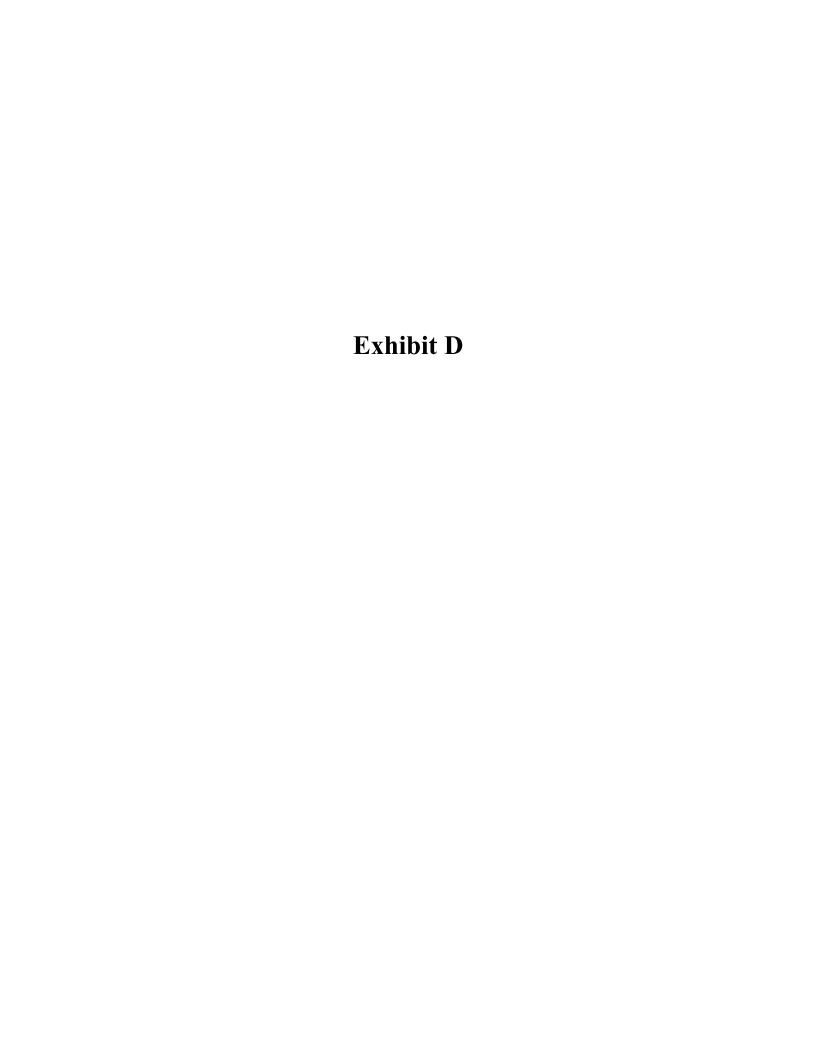
 $https://sdwis.waterboards.ca.gov/PDWW/JSP/NMonitoringSchedules.jsp?tinwsys_is_number=892\&tinwsys_st_code=CA\&ReportFormat=SR.$

³¹ *Id*.

³² THOMAS HARTER, ET AL., TECHNICAL REPORT 2: NITROGEN SOURCES AND LOADING TO GROUNDWATER WITH A FOCUS ON TULARE LAKE BASIN AND SALINAS VALLEY GROUNDWATER, UC DAVIS CENTER FOR WATERSHED SCIS. 135-62 (2012), available at https://watershed.ucdavis.edu/sites/g/files/dgvnsk8531/files/products/2022-05/Groundwater%20Sources.pdf.

³³ 2025 Aquifer Risk Map, STATE WATER RES. CONTROL BD. (last visited Mar. 26, 2025), https://gispublic.waterboards.ca.gov/portal/apps/experiencebuilder/experience/?id=18c7d253f0a44fd2a5c7bcfb42cc 158d.

³⁴ GAMA OnLine Tool: Is My Property Near a Nitrate Impacted Water Well?, STATE WATER RES. CONTROL BD. (last visited Mar. 26, 2025), https://experience.arcgis.com/experience/b115fff724a74cd08c3787aa70d3053f/.





Low Carbon Fuel Standard

Tier 2 Pathway Application

Application No. B0308

<u>Updated: 6/30/2022 (See Underlined Text)</u>

Staff Summary

WOF SW GGP 1 LLC Green Gas Partners Stanfield, Stanfield, AZ Compressed Natural Gas (CNG) from Dairy Manure

Intermediate Facility:
Shamrock Farms Dairy, Stanfield, AZ
T&K Red River Dairy, Maricopa, AZ
Zinke Dairy Inc, Stanfield, AZ

Joint Applicant: Clean Energy, Newport Beach, CA

Deemed Complete Date: 3/1/2022 Posted for Comment Date: 6/15/2022 CI Certified Date: 6/30/2022 CI Start Date: 1/1/2022

Pathway Summary

WOF SW GGP 1 LLC (WOF) seeks provisional certification of a Tier 2 pathway for biomethane (Bio-CNG) from anaerobic digestion of dairy manure produced by Green Gas Partners Stanfield located in Stanfield, Arizona. WOF owns and operates an RNG facility which upgrades biogas. Biogas is upgraded to biomethane, pipeline injected, and supplied to CNG vehicles in California as bio-CNG using book-and-claim accounting for biomethane. WOF owns the environmental attributes associated with the biomethane and sells these attributes using book-and-claim accounting through its contracted California transportation fuel dispensers.

This project participates in the federal Renewable Fuel Standard (RFS) and has never participated in the California Cap-and-Trade program.

This project consists of six digesters, five of which process 100% dairy manure as the feedstock and one of which does not process manure as the feedstock. Biogas from all digesters is sent to the same upgrading facility and upgraded biomethane allocated between the cumulative digesters processing dairy manure and the digester processing non-manure feedstock. For upgraded biomethane reporting, the fraction

¹ All citations to the LCFS Regulation are found in Title 17, California Code of Regulations (CCR), section 95480-95503. Book-and-claim accounting for biomethane is primarily addressed in section 95488.8(i) of the <u>LCFS Regulation</u>.

of upgraded biomethane attributed to the non-manure feedstock cannot be reported using this fuel pathway.

Three dairy farms supply manure to five individual enclosed vessel digesters located at a centralized location. Manure from all participating farm is deposited in a digester mix pit prior to entering the digesters. Biogas produced from all five digesters is sent to the co-located upgrading facility and upgraded biomethane is directly pipeline injected as it exits the upgrading facility. The table shown below summarizes the year each farm was constructed, the year the manure from the participating farms started transferring to the anaerobic digesters, and the approximate livestock population per farm.

Farm Name	Year Farm was Constructed	Pipeline built to transfer manure to digester	Approximate Livestock Population
Shamrock Farms Dairy	2003	2020	10,700
T&K Red River Dairy	1997	2020	16,200
Zinke Dairy Inc	2017	2017	6,000

Prior to the installation of the digester, all participating farms collected their manure via flush and either sent it directly to long term anaerobic storage, as was the case for T&K, or removed solids prior to long term anaerobic storage as follows: stationary screen solids separator for Shamrock and to weeping walls for Zinke. In the case of Shamrock, the final fate of solids removed was modeled as solid storage. Detailed flow diagrams are included in the LCA report. For all participating farms, there was no complete lagoon system cleanouts modeled with manure deposited in open lots left to dry aerobically.

After the installation of the digester, 100% of the collected manure from each farm is sent to a receiving pit co-located with the anaerobic digesters. Once in the receiving pit, the manure is distributed to the various digesters. The stationary screen separator and weeping wall were removed from Shamrock and Zinke, respectively. No other modifications were performed at each dairy farm, with solids removed continuing to be used for long term storage and manure deposited in open lots left for aerobic breakdown. Digester effluent is pumped to one of the first stage lagoons at T&K Red River Dairy.

Raw biogas exiting the digester is sent to the co-located upgrading facility and the raw biogas upgraded to remove moisture, carbon dioxide, hydrogen sulfide, and upgraded to pipeline quality biomethane. This project is configured to flare raw biogas or upgraded biomethane. The upgrading facility produces pipeline quality RNG. The upgrading facility has a pipeline injection point such that upgraded biomethane does not need to be transported for pipeline injection into the common carrier pipeline. Pipeline injected biomethane is delivered to CNG stations in California for use as transportation fuel.

During the operational period, one of the five digesters was down for maintenance.

Carbon Intensity of Fuel Type Pathways

The CI is determined from life cycle analysis conducted using a modified version of the Board-approved Tier 1 Simplified CI Calculator for Biomethane from Anaerobic Digestion of Dairy and Swine Manure.² The calculator was modified to explain calculation changes, especially new process units/life cycle stages or inputs. The modified calculator has been determined to be equivalent to CA-GREET3.0 pursuant to section 95488.7(a)(1) of the LCFS regulation. The applicant has provided operational data and supporting documentation to support lifecycle assessment for a period of three months, from June 2021 to August 2021. The following table lists the proposed CI for this pathway.

Proposed Pathway CI

Pathway Number	Fuel & Feedstock	Pathway FPC	Pathway Description	Carbon Intensity (gCO2e/MJ)
B030801	CNG from Dairy Manure	CNG026B03080100	Biogas from dairy manure at Shamrock Farms, T&K Red River, and Zinke Dairy in Stanfield and Maricopa, AZ; upgraded to pipeline quality at Green Gas Partners Stanfield and pipelined to CA for transportation use	-362.84

Operating Conditions

The certified CI value in the above table may be used to report and generate credits for fuel quantities that are produced at the facility in the manner described in the applicant's Life Cycle Analysis (LCA) report, and dispensed for transportation use in California, subject to the following requirements and conditions:

 Fuel pathway holders are subject to the requirements of the California Air Resources Board's (CARB) Low Carbon Fuel Standard (LCFS) regulation, which appears at sections 95480 to 95503 of title 17, California Code of Regulations. Requirements include ongoing monitoring, reporting, recordkeeping, and third-

² The Tier 1 Simplified CI Calculator for Biomethane from Anaerobic Digestion of Dairy and Swine Manure (August 13, 2018), incorporated by reference in the LCFS Regulation, section 95488.3(b).

party verification of operational CI and a controlled process for providing product transfer documents or other similar records to counterparties or CARB.

2. CARB has reviewed the contractual agreements between the pathway holder/biogas upgrader, and marketer(s). All unredacted contract agreements relevant to this biomethane fuel pathway were submitted to CARB as part of the application, pursuant to section 95488.8(i)(2)(B). To confirm compliance with Annual Fuel Pathway Report requirements, the pathway holder shall notify CARB of any change in existing contracts that were submitted to CARB with the fuel pathway application, including any new contracts and termination of existing contracts, with any entity engaged in the transfer, purchase, or sale of biomethane and its environmental attributes. Failure to notify CARB of such a change could result in enforcement action and could invalidate this fuel pathway.

Fuel pathway holders must update the list of Bio-CNG dispensing entities and any biomethane end users at the time of Annual Fuel Pathway Report submission. Contractual agreements from the fuel dispensing entities do not need to be submitted in the original fuel pathway application or the Annual Fuel Pathway Reports; instead, they must be verified as part of the annual verification of the Quarterly Fuel Transactions Reports

- 3. The biomethane and its environmental attributes claimed under this pathway shall not be claimed by any entity for any other purpose, nor under any other program notwithstanding the exceptions listed in LCFS Regulation section 95488.8(i)(2). The LCFS places no restriction on the use of any emission reduction credits generated by the project for emissions that are demonstrated to be additional to reductions claimed under the LCFS.
- 4. The fuel pathway holder must include the assumptions and calculations used to establish the fraction of solids input to each manure management system in its Annual Fuel Pathway Report submitted to CARB for third-party verification of the operational CI.
- 5. Biogas produced from other non-manure feedstock not included in this pathway and supplying biogas to the upgrading facility, cannot be attributed to this fuel pathway and will require a separate pathway certification to generate credits in the LCFS program. The fuel pathway holder must report total upgrading facility energy use and biogas flow, and the calculations used to allocate these parameters to each digester pathway based on its monthly share of total biogas measured at inlet to upgrading, in its Annual Fuel Pathway Report submitted to CARB and subject to third-party verification of the operational CI.
- 6. Any quantity of biomethane metered at inlet to the upgrading facility that cannot be demonstrated by meter records to have been pipeline injected or destroyed, must be calculated by energy balance and accounted for in the CI as

- a fugitive methane emission if the calculated value exceeds the default 2% fugitive emission.
- 7. Biogas produced from additional manure supplied from other sources not listed in fuel pathway application B0256 cannot be attributed to this fuel pathway and will require a separate pathway certification to generate credits in the LCFS program. To allocate biogas between manure sourced from pathway manure sources and new manure sources, CARB approves the following allocation methodology for entering site-specific input values in Fields 2.4, 2.6, 2.8-2.21, and 2.23-2.26 in the DSM Calculator 'Biogas-to-RNG':

$$Allocated\ Input = \left(\frac{Livestock\ Population\ of\ Fuel\ Pathway\ Manure\ Sources}{Livestock\ Population\ for\ All\ Manure\ Sources}\right) \times (Unallocated\ Input\ Value)$$

All allocation calculations must be provided in a supplemental worksheet of the calculator that shows the livestock population associated with each additional manure source. Livestock population data in this supplemental calculator will be subject to annual verification and should be added to the site-specific inputs list for this pathway.

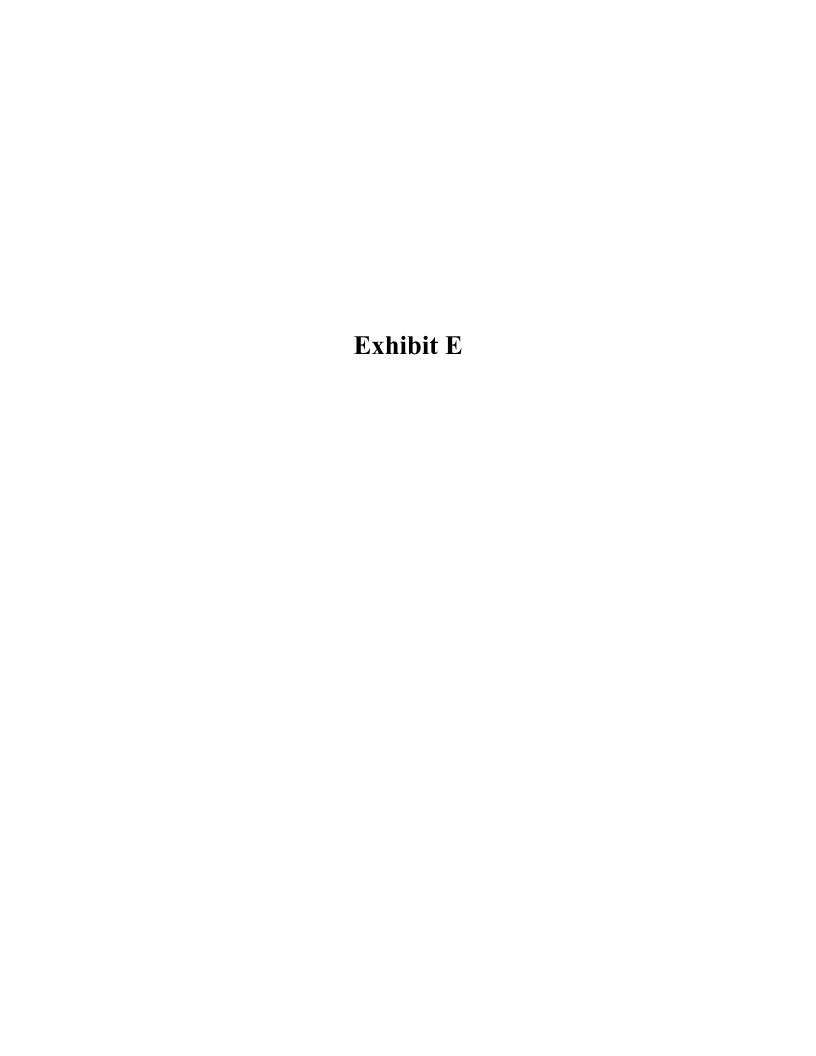
8. Each dairy/swine farm supplying manure to a digester will be subject to third-party verification to support the fraction of volatile solids inputs to the modified Simplified CI Calculator for Biomethane from Anaerobic Digestion of Dairy and Swine Manure for baseline and project modeling (Manure-to-Biogas (LOP Inputs) tab). CARB must be immediately notified through the AFP if any changes to dairy/swine manure suppliers (e.g., additional suppliers) are made from the certified pathway. Modifications to the dairy/swine manure suppliers may require submission of a new pathway for review, validation, and certification. Failure to notify CARB of such a change may result in invalidation of this fuel pathway and/or associated LCFS credits generated, and/or associated enforcement action.

Staff Analysis and Recommendation

Staff has reviewed the application and has replicated, using the Tier 2 modified version of the Simplified CI Calculator, the CI values calculated by the applicant. EcoEngineers (H3-20-008) submitted a positive validation statement. Staff recommends this application be certified on a provisional basis after all the comments received during the 10-day comment period are addressed satisfactorily by the applicant. The certification is subject to the operating conditions set forth in this document.

Comments and Certification

CARB has reviewed the applicant's response to comments received during the 10-day comment period, determined that these adequately address factual and methodological errors, and certified the pathway.





Low Carbon Fuel Standard

Tier 2 Pathway Application

Application No. B0698

Updated: 3/28/2025 (See Underlined Text)

Staff Summary

WOF SW GGP 1 LLC Green Gas Partners Stanfield, Stanfield, Arizona Compressed Natural Gas (CNG) from Dairy Manure

Intermediate Facility:
Shamrock Farms Dairy (F00318), Stanfield, Arizona
T&K Red River Dairy (F00316), Maricopa, Arizona
Zinke Dairy, Inc (F00317), Stanfield, Arizona
Dickman & Sons Dairy LLC (F00612), Coolidge, Arizona
D&I Holstein, LLC (F00613), Stanfield, Arizona
Feenstra Friesians (F00614), Stanfield, Arizona
Arizona Dairy Co. LLP (F00615), Gila Bend, Arizona

Joint Applicant: Clean Energy

Deemed Complete Date: 11/13/2024 Posted for Comment Date: 3/10/2025 Carbon Intensity (CI) Certified Date: 3/28/2025 CI Start Date: 10/1/2024

Pathway Summary

WOF SW GGP 1 LLC (WOF) seeks provisional certification of a Tier 2 pathway for biomethane (Bio-CNG) ¹ production at Green Gas Partners Stanfield (GGP RNG) in Stanfield, Arizona. Biogas is produced from anaerobic digestion of dairy manure sourced from seven farms: Shamrock Farms Dairy (Shamrock), Zinke Dairy, Inc. (Zinke), D&I Holstein, LLC (D&I), Feenstra Friesians (Feenstra) in Stanfield, Arizona, T&K Red River Dairy (T&K) in Maricopa, Arizona, Dickman & Sons Dairy LLC (Dickman & Sons) in Coolidge, Arizona, and Arizona Dairy Co. LLP (AZDC) in Gila Bend, Arizona. Biogas is purified and upgraded to biomethane to meet common carrier pipeline specifications, injected into Kinder Morgan pipeline co-located with upgrading facility, and ultimately dispensed for transportation use in CNG vehicles in California using book-and-claim accounting. ²

¹ "Bio-CNG" means biomethane which has been compressed to CNG. Also referred to herein as biomethane or renewable natural gas (RNG).

² All citations to the LCFS Regulation are found in Title 17, California Code of Regulations (CCR), section 95480-95503. Book-and-claim accounting for biomethane is primarily addressed in section 95488.8(i) of the LCFS Regulation.

WOF owns the environmental attributes associated with the biomethane and sells these attributes using book-and-claim accounting through its contracted California transportation fuel dispensers. The GGP RNG facility participates in the federal Renewable Fuel Standard and has never participated in the California Cap-and-Trade Offset Program.

The GGP RNG facility commenced digester and upgrading operations in December 2018 and began injecting RNG into the pipeline in May 2019. The table below summarizes the information of participating farms including years farms were founded, years the lagoons were constructed, years farms started sending manure to the digesters, approximate livestock population (i.e., dairy cows, non-milking dairy cows, heifers, and calves), and the distances from the dairy farms to the digesters' location.

Farm Name	Year Founded	Year Anaerobic Lagoons Built	Year Manure Sent to Digester	Approximate Livestock Population	Driving Distance between Farm and Upgrading Facility (miles)
Shamrock	2003	2003	2018	18,500	1.1
T&K	1997	1997	2018	16,200	Co-located
Zinke	2016	2016	2020	5,900	2.5
Dickman & Sons	1950	2005	2022	3,400	33
D&I	2000	2001	2022	3,300	2.7
Feenstra	2001	2002	2022	2,500	3.0
AZDC	1973	2010	2023	4,800	56

Shamrock, T&K and Zinke farms were included in a previously certified LCFS Tier 2 pathway³ which will be retired and replaced by this application. Under the baseline conditions, Shamrock, T&K, and Zinke farms collected their manure via flush systems. At Shamrock, manure was flushed to a sand vault to remove sand, passed over the stationary slope screen separators, and then sent to an anaerobic storage lagoon. The solids removed were modeled as solid storage. At T&K, manure was flushed from the barns to lagoons, with no mechanical solid separation. At Zinke, manure was flushed into a central reception pit and pumped to weeping cells where solids were retained, and the liquids drained to the lagoon. In all cases, manure deposited in dry lots was left to dry in the sun before being scraped and hauled to fields. Under the

³ Application No. B0308.

project conditions, manure is directly collected from Shamrock, T&K and Zinke dairy farms and sent to the digester. The stationary screen separator and weeping wall were removed at Shamrock and Zinke, respectively. Manure is either collected via the flush system and sent directly to the digester through a pipeline or vacuumed to a pit and then pumped to the digesters. No other modifications were made at Shamrock, T&K and Zinke dairy farms, with solids removal continuing to be used for long-term storage and manure deposited in open lots left for aerobic breakdown. The enclosed vessel digesters capture methane that would otherwise be emitted to the atmosphere under baseline manure treatment in the anaerobic lagoons.

Manure is transported to the digesters using CNG-powered trucks from the four remote farms: Dickman & Sons, D&I, Feenstra, and AZDC. Under the baseline condition, manure was collected via a flush system to a collection pit at these farms. The manure in the pit was passed over slope screen separators and then sent to the anaerobic lagoons. Solids were stored in piles for bedding use, and any uncollected manure remained in the dry lots. For D&I and Feenstra, some manure was scraped into the dry lots. Under the project condition, the manure collected at the four remote farms is similar to the baseline condition. Manure from all barns, except for the milking parlors, is collected using a vacuum wagon, while manure from the milking parlors continues to be flushed and separated over the slope screen as in the baseline. Collected manure is loaded into CNG trucks and delivered to the digesters. The enclosed vessel digesters capture methane that would otherwise be emitted to the atmosphere under baseline manure treatment in the anaerobic lagoons.

The lagoon systems at all seven dairy farms have never performed complete cleanouts; therefore, no lagoon cleanout is modeled.

This project consists of seven digesters located at a centralized location, five of which process only dairy manure as the feedstock and two of which process non-manure feedstock. The volume of raw biogas production is measured for all digesters, and upgraded biomethane is allocated proportionally to the manure feedstock. The fraction of upgraded biomethane attributed to the non-manure feedstock cannot be reported using this fuel pathway.

Flushed manure received in sand lanes is pumped to the drum screens to separate solids and liquid prior to entering the digester mix pit. Manure from vacuum and tanker trucks received in sand lanes is pumped directly to the digester mix pit. The raw biogas from all digesters is sent to the same co-located upgrading facility. Digestate is sent to the fiber separation area, accumulated in a reception pit, and then pumped to six screw presses arranged in parallel. Solids removed are trucked for use as bedding or soil amendment. Effluent water from the screw presses is sent to an effluent pit and returned lagoons on the dairies.

At the GGP upgrading facility, the raw biogas enters the amine skid to remove carbon dioxide and hydrogen sulfide (H_2S) and then flows to a H_2S polisher. The product gas from the H_2S polisher is then compressed and dehydrated. The upgraded

biomethane is then directly injected into Kinder Morgan common carrier pipeline adjacent to the upgrading facility. The injected RNG is delivered to CNG vehicle fueling stations in California using indirect ("book-and-claim") accounting.

Carbon Intensity of Fuel Type Pathways

The CI is determined from life cycle analysis conducted using a modified version of the Board-approved Tier 1 Simplified CI Calculator for Biomethane from Anaerobic Digestion of Dairy and Swine Manure.⁴ The calculator was modified to explain calculation changes, specifically new process units/life cycle stages or inputs. The modified calculator has been determined to be equivalent to CA-GREET3.0 pursuant to section 95488.7(a)(1) of the LCFS regulation. The applicant has provided operational data and supporting documentation for the listed life cycle stages, including unit operations and transport of feedstock and/or fuel (e.g., digester, gas cleanup, and pipeline injection of biomethane), for a period of 3 months, from March 2024 to May 2024. The following table lists the proposed CI for this pathway.

		Proposed Path	ıway Cl	
Pathway Number	Fuel & Feedstock	Pathway FPC	Pathway Description	Carbon Intensity (gCO2e/MJ)
B069801	CNG from Dairy Manure	CNG026B06980100	Biogas from dairy manure at Shamrock Farms Dairy, Zinke Dairy, Inc., D&I Holstein, LLC, Feenstra Friesians in Stanfield, AZ, T&K Red River Dairy in Maricopa, AZ, Dickman & Sons Dairy LLC in Coolidge, AZ, and Arizona Dairy Co. LLP in Gila Bend, AZ; upgraded to pipeline quality at Green Gas Partners Stanfield; pipelined to CA for transportation use	-367.79

⁴ The Tier 1 Simplified CI Calculator for Biomethane from Anaerobic Digestion of Dairy and Swine Manure (August 13, 2018), incorporated by reference in the LCFS Regulation, section 95488.3(b).

Operating Conditions

The certified CI value in the above table may be used to report and generate credits for fuel quantities that are produced at the facility in the manner described in the applicant's Life Cycle Analysis (LCA) report, and dispensed for transportation use in California, subject to the following requirements and conditions:

- 1. Fuel pathway holders are subject to the requirements of the California Air Resources Board's (CARB) Low Carbon Fuel Standard (LCFS) regulation, which appears at sections 95480 to 95503 of title 17, California Code of Regulations. Requirements include ongoing monitoring, reporting, recordkeeping, and third-party verification of operational CI and a controlled process for providing product transfer documents or other similar records to counterparties or CARB.
- 2. CARB has reviewed the contractual agreements between the pathway holder/biogas upgrader, and marketer(s). All unredacted contract agreements relevant to this biomethane fuel pathway were submitted to CARB as part of the application, pursuant to section 95488.8(i)(2)(B). To confirm compliance with Annual Fuel Pathway Report requirements, the pathway holder shall notify CARB of any change in existing contracts that were submitted to CARB with the fuel pathway application, including any new contracts and termination of existing contracts, with any entity engaged in the transfer, purchase, or sale of biomethane and its environmental attributes. Failure to notify CARB of such a change could result in enforcement action and could invalidate this fuel pathway.

Fuel pathway holders must update the list of Bio-CNG dispensing entities and any biomethane end users at the time of Annual Fuel Pathway Report submission. Contractual agreements from the fuel dispensing entities do not need to be submitted in the original fuel pathway application or the Annual Fuel Pathway Reports; instead, they must be verified as part of the annual verification of the Quarterly Fuel Transactions Reports.

- 3. The biomethane and its environmental attributes claimed under this pathway shall not be claimed by any entity for any other purpose, nor under any other program notwithstanding the exceptions listed in LCFS Regulation section 95488.8(i)(2). The LCFS places no restriction on the use of any emission reduction credits generated by the project for emission reductions that are demonstrated to be additional to reductions claimed under the LCFS.
- 4. The fuel pathway holder must include the assumptions and calculations used to establish the fraction of solids input to each manure management system in its Annual Fuel Pathway Report submitted to CARB for third-party verification of the operational CI.
- 5. Any quantity of biomethane metered at the inlet to the upgrading facility that cannot be demonstrated by meter records to have been pipeline injected or

destroyed, must be calculated by energy balance and accounted for in the CI as a fugitive methane emission if the calculated value exceeds the default 2% fugitive emission.

- 6. Each dairy/swine farm supplying manure to a digester will be subject to third-party verification to support the fraction of volatile solids inputs to the modified Simplified CI Calculator for Biomethane from Anaerobic Digestion of Dairy and Swine Manure for baseline and project modeling (Manure-to-Biogas (LOP Inputs) tab). CARB must be immediately notified through the AFP of any changes to dairy/swine manure suppliers and sources (e.g., additional suppliers or manure from different types of livestock) are made from the certified pathway. Modifications to the dairy/swine manure suppliers and sources may require submission of a new pathway for review, validation, and certification. Failure to notify CARB of such a change may result in the invalidation of the fuel pathway, invalidation of associated LCFS credits, and enforcement action.
- 7. The fuel pathway applicant/holder must attest to the quantity (or fraction) of the transferred manure, and whether or not any origin points of the transferred manure (all satellite farms) supply manure to any destination other than this project's anaerobic digester site. The fuel pathway holder must implement a recordkeeping system to document the manure transfer activity. Records may be bills of lading or a daily log and must include the following information:
 - a. Description of the material transported (e.g., liquid dairy manure after solid removal by stationary screen)
 - b. Name, physical address, and contact information of the location(s) where manure is sourced
 - c. Name, physical address, and contact information of the location where manure is deposited (e.g., digester site)
 - d. Quantity of manure delivered, including units, vehicle capacity, number of trips from each farm, if applicable
 - e. Transaction date
 - f. Any temporary or uncommon practices (e.g., major spillage, equipment swap due to maintenance)
- 8. CNG usage for trucking of manure must be reported in field 2.13 of the Tier 1 Simplified CI Calculator for Biomethane from Anaerobic Digestion of Dairy and Swine Manure and is subject to third-party verification. The methodology to assess CNG usage must include disclosure of make, model, and capacity of equipment used to load, transport, and offload the manure. The same methodology must be included in the fuel pathway holder's monitoring plan.
- 9. The fuel pathway holder must report total upgrading facility energy use and biogas flow, and the calculations used to allocate these parameters to each

digester pathway based on its monthly share of total biogas measured at inlet to upgrading, in its Annual Fuel Pathway Report submitted to CARB and subject to third-party verification of the operational CI.

- 10. Biogas produced from other non-manure feedstock not included in this pathway and supplying biogas to the upgrading facility, cannot be attributed to this fuel pathway and will require a separate pathway certification to generate credits in the LCFS program. The fuel pathway holder must report total upgrading facility energy use and biogas flow, and the calculations used to allocate these parameters to each digester pathway based on its monthly share of total biogas measured at inlet to upgrading, in its Annual Fuel Pathway Report submitted to CARB and subject to third-party verification of the operational CI.
- 11. Biogas produced from additional manure supplied from other sources not listed in this application cannot be attributed to this fuel pathway and will require a separate pathway certification to generate credits in the LCFS program. To allocate biogas between manure sourced from pathway manure sources and new manure sources, CARB approves the following allocation methodology for entering site-specific input values in Fields 2.4, 2.6, 2.8-2.21, and 2.23-2.26 in the DSM Calculator 'Biogas-to-RNG':

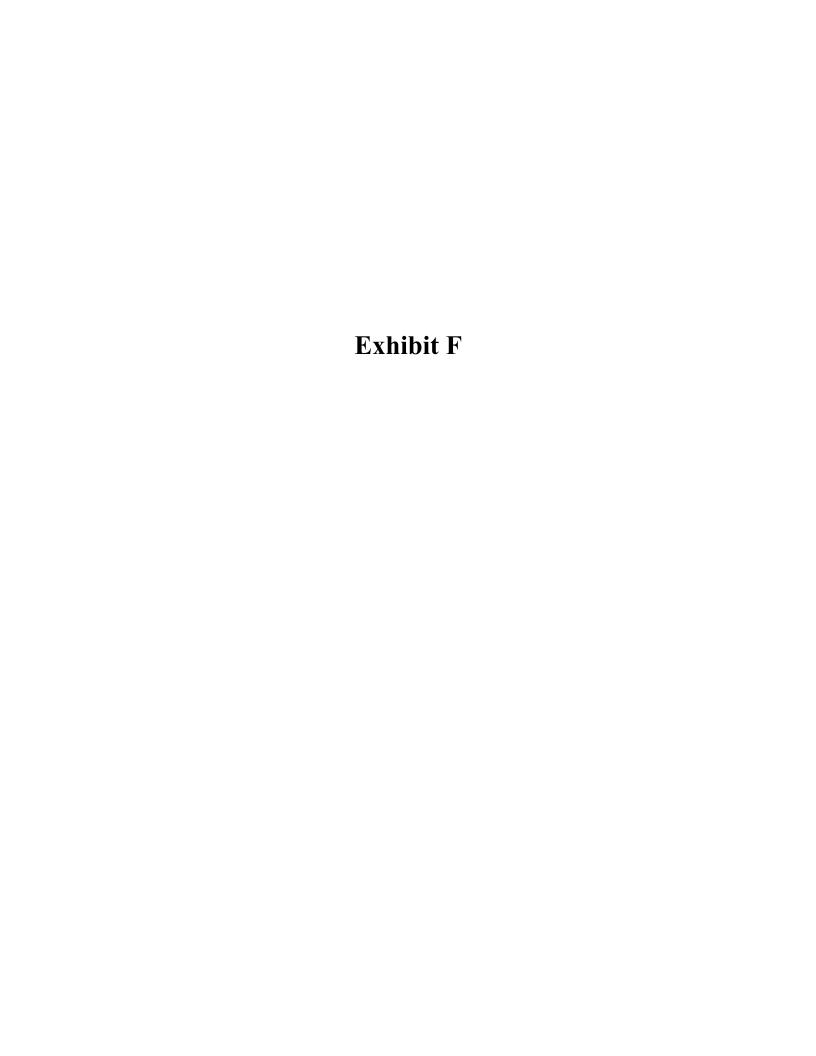
$$Allocated\ Input = \left(\frac{Livestock\ Population\ of\ Fuel\ Pathway\ Manure\ Sources}{Livestock\ Population\ for\ All\ Manure\ Sources}\right) \times (Unallocated\ Input\ Value)$$

All allocation calculations must be provided in a supplemental worksheet of the calculator that shows the livestock population associated with each additional manure source. Livestock population data in this supplemental calculator will be subject to annual verification and should be added to the site-specific inputs list for this pathway.

Staff Analysis and Recommendation

Staff has reviewed the application and has replicated, using the Tier 1 modified version of the Simplified CI Calculator, the CI values calculated by the applicant. Trinity Consultants, Inc. (H3-20-146) submitted a Positive validation statement. Staff recommends this application be certified on a provisional basis after all the comments received during the 10-day comment period are addressed satisfactorily by the applicant. The certification is subject to the operating conditions set forth in this document.

CARB has revie	wed the applicant's response to comments receive	d during the 10-
day comment p	period, determined that these adequately address f	<u>actual and</u>
<u>methodologica</u>	l errors, and certified the pathway.	



March 24, 2025

Submitted via ca.gov

Liane M. Randolph, Chair California Air Resources Board 1001 I Street Sacramento, CA 95814

Re: Tier 2 Pathway Application No. B0698

Dear Chair Randolph,

Leadership Counsel for Justice & Accountability, Central Valley Defenders of Clean Water & Air ("Defensores"), Food & Water Watch, and Animal Legal Defense Fund (collectively, "Commenters") write in opposition to WOF SW GGP 1, LLC's Tier 2 pathway application. As Commenters have explained through numerous comments, the Petition for Rulemaking to Exclude All Fuels Derived from Biomethane from Dairy and Swine Manure from the Low Carbon Fuel Standard Program (included and incorporated here as Exhibit A), and the Petition for Reconsideration (included and incorporated here as Exhibit B), the California Air Resources Board's (CARB) treatment of factory farm gas under the Low Carbon Fuel Standard (LCFS) is flawed, and staff's assessment of this application is no different. We urge CARB to either deny this application or at least exercise its clear authority¹ to defer consideration of the application during the pendency of the LCFS rulemaking.²

Commenters oppose this application for several reasons. First, the application incorporates an unlawfully truncated system boundary that ignores feedstock production at the source factory farms around Stanfield, Arizona—which collectively confine 54,600 cows³—and other emissions such as those from storage and disposal of digestate, resulting in artificially low Carbon Intensity (CI) values and inflated credit generation. For example, the applicant's system boundary in their life cycle analysis report explicitly excludes enteric fermentation—a major source of methane emissions that cannot be disentangled from the process of creating applicant's factory farm gas.⁴ Applicant's system boundary also fails to include the massive amount of power used to keep their dairy herds alive in the scorching desert. ⁵ Nor does the application describe where that power comes from or its greenhouse gas impact. A fuel pathway life cycle analysis must take into account

¹ The LCFS provides that the Executive Officer "may" consider provisional pathway applications. Cal. Code Regs. tit. 17, § 95488.9(c).

² Decision of Disapproval of Regulatory Action (OAL Matter Number 2025-0103-01), Office of Administrative Law (Feb. 18, 2025), available at https://oal.ca.gov/wp-content/uploads/sites/166/2025/02/LINDSEY-2025-0103-01S.pdf (detailing the Office of Administrative Law's disapproval of CARB's 2024 LCFS amendments).

³ Application No. B0698 Staff Summary at 2.

⁴ Application No. B0698 Life-Cycle Carbon Intensity Analysis Report: Dairy Manure Biogas to Compressed Natural Gas Pathway for WOF SW GGP 1 LLC GREET Modeling Technical Support Document at 9 (*hereinafter* Application No. B0698 LCA Report).

⁵ See Barbara Duckworth, *Arizona Dairy Manages 12,500 Cows and 52,000 Steers*, THE WESTERN PRODUCER (Feb. 22, 2018), https://www.producer.com/livestock/arizona-dairy-manages-12500-cows-52000-steers/ (stating that T&K Farms racks up a \$300,000 monthly power bill in the summer).

"feedstock production" and "waste generation, treatment and disposal." In addition to the evidence provided in Exhibits A and B, more recent research indicates that emissions from factory farm gas production are significantly higher than currently appreciated, with especially high emissions from digestate storage. This recent study did not consider additional emissions from digestate handling and application, which is another potentially large source of emissions resulting from factory farm gas production that must be included in the pathway life cycle analysis. Yet, CARB and the pathway applicant ignore these and other emissions. In other words, this application dramatically undercounts the greenhouse gas emissions associated with this fuel by failing to apply the required "well-to-wheel" analysis.

Concurrently, this application overcounts environmental benefits by ignoring that this is, in one factory farm owner's words, "*lucrative*" feedstock production. Liquified manure rotting anaerobically in massive waste "lagoons" is not an unavoidable and natural consequence of animal agriculture operations.

The methane emissions created by these dairies are the result of intentional management decisions designed to maximize profits and externalize pollution costs. CARB cannot ignore that the emissions the pathway applicant claims as captured from the factory farms' lagoons are intentionally created in the first place. The manure handling practices at these factory farms is an integrated part of generating and using factory farm gas. Thus, the gas generated is an intentionally produced product and cannot now be claimed as "captured" to secure a lucrative negative CI value.

Second, CARB has failed to ensure that the additionality requirements of Health and Safety Code section 38562¹⁰ or the terms of Operating Condition 3 are met.¹¹ This program already participates in the federal Renewable Fuel Standard.¹² Further, it appears that CARB has not analyzed whether these purported emissions reductions "otherwise would occur," or whether the applicant or another entity is claiming these environmental attributes elsewhere for any other purpose, such as utility or consumer programs in Arizona, other state low carbon fuels programs,

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⁶ Cal. Code Regs. Tit. 17 §§ 95481(a)(66), 95488.7(a)(2)(B).

⁷ Semra Bakkaloglu et al., *Methane Emissions Along Biomethane and Biogas Supply Chains Are Underestimated*, 5 ONE EARTH 724–736 (June 17, 2022), https://www.sciencedirect.com/science/article/pii/S2590332222002676.

⁸ Id. at 728; Michael A. Holly et al., Greenhouse Gas and Ammonia Emissions from Digested and Separated Dairy Manure During Storage and After Land Application, 239 AGRIC. ECOSYSTEMS & ENV'T 410, 418 (Feb. 15, 2017), https://doi.org/10.1016/j.agee.2017.02.007; Roger Nkoa, Agricultural Benefits and Environmental Risks of Soil Fertilization with Anaerobic Digestates: a Review, 34 AGRONOMY FOR SUSTAINABLE DEV. 473 (2014), https://link.springer.com/article/10.1007/s13593-013-0196-z; F. Montes et al., Special Topics — Mitigation of methane and nitrous oxide emissions from animal operations: II. A Review of Manure Management Mitigation Options, 91 J. OF ANIMAL Sci. 5070 (2013), https://academic.oup.com/jas/article/91/11/5070/4731316; Kurt Möller & Walter Stinner, Effects of Different Manuring Systems with and without Biogas Digestion on Soil Mineral Nitrogen Content and on Gaseous Nitrogen Losses (Ammonia, Nitrous Oxides), European J. Of Agronomy (2009), https://www.sciencedirect.com/science/article/abs/pii/S1161030108000695?via%3Dihub.

⁹ Stacey Smart, *Deer Run Dairy Wins National Sustainability Award*, DAIRY STAR (June 27, 2022), https://dairystar.com/Content/Home/Home/Article/Deer-Run-Dairy-wins-national-sustainability-award/80/254/18626 (emphasis added) ("Installed in 2011, the digester supplied power to nearly 600 homes. In 2020, the farm converted over to renewable natural gas that is injected into the pipeline, which Duane said is a more lucrative ontion.").

¹⁰ See Ex. A, Petition for Rulemaking, section III.A.2; Ex. B, Petition for Reconsideration, section III.A.3.

¹¹ Condition 3 states that "biomethane and its environmental attributes claimed under this pathway shall not be claimed by any entity for any other purpose, nor under any other program notwithstanding the exceptions listed in LCFS Regulation 95488.8(i)(2)."

¹² Application No. B0698 Staff Summary at 2.

¹³ Health & Saf. Code, § 38562, subd. (d)(2).

product marketing,¹⁴ et cetera. Moreover, without an additionality analysis, it is unclear whether these digesters would have been built regardless of the LCFS incentives.

Third, this application is a exemplifies how CARB's flawed approach is rewarding the biggest factory farm polluters and incentivizing further expansion and herd consolidation, which does more climate harm than good. Zinke Dairy and its 6,000 cows, established in 2016 (or 2017, according to the B0308 application), did not exist when LCFS implementation began in 2011. Additionally, the population of cows at Shamrock Dairy has expanded from 10,700 in applicant's B0308 fuel pathway application in 2022 to 18,500 cows in the current application. This expansion of at least 13,800 cows since the beginning of the LCFS demonstrates how the LCFS encourages herd expansion. Further, the source factory farms are not sustainable family farms—they are massive industrial operations that confine *up to 18,500 cows each, and 54,600 cows collectively*. CARB should not allow these factory farms—or their applicant—to profit from the LCFS.

Fourth, Staff has failed to demonstrate how the current application, which involves extensive trucking of manure with fossil fuels, attains a lower CI than the previous application, which involved no trucking. The current application is for seven dairies, three of which are enrolled in the B0308 fuel pathway, which this application will retire. The three dairies in B0308 pathway involve no trucking of manure, and staff admits that "[n]o other modifications were made" at these three dairies from the time of B0308's approval to the current application. The B0698 application adds four new dairies, each of which requires hauling manure via CNG truck to the upgrading facility. These haul routes are 2.7, 3, 33, and 56 miles away from the upgrading facility. Incredibly, the new application involving this extensive, CNG-based trucking network has a *lower* CI than the truck-less B0308 pathway (-362.84 CI for B0308 versus -367.79 CI for B0698). Most of the values from the Tier 1 Calculator Output were redacted from the B0308 application, so commenters cannot determine how applicants obtain a lower CI value for B0698, which is a seemingly more carbon intensive fuel pathway. Similarly, this application does not explain, or has redacted, how many truckloads of manure this project will add per month.

In addition, several supporting documents are unavailable to Commenters and other stakeholders because they are purportedly "confidential," and the LCA report redacts many more

¹⁴ See Economically, Socially, and Environmentally Responsible, SHAMROCK FARMS (last visited Mar. 20, 2025) https://perma.cc/KKE2-THDW (claiming that Shamrock dairy has a goal of "achieving greenhouse gas neutrality by 2050"). If Shamrock and applicant's other dairies claim the environmental attributes of their dairy digester projects for their own promotional purposes, that would impermissibly double-count the same reductions because those environmental attributes will have already been enrolled in the LCFS.

¹⁵ Application No. B0698 Staff Summary at 2.

¹⁶ Compare Application No. B0308 Staff Summary at 2 with Application No. B0698 Staff Summary at 2.

¹⁷ Application No. B0698 Staff Summary at 2.

¹⁸ *Id*. at 2.

¹⁹ *Id*. at 3.

²⁰ *Id*.

²¹ *Id*. at 2.

²² Compare Application No. B0308 Staff Summary at 3 with Application No. B0698 Staff Summary at 4.

²³ Application No. B0698 LCA at 62.

crucial values.²⁴ Due to these deficiencies and others, this application is so opaque that it is impossible for Commenters or other stakeholders to meaningfully evaluate it.²⁵

Lastly, the inflated CI values CARB proposes here impose additional environmental injustices on California citizens who will be exposed to higher levels of pollution from fossil transportation fuel and dirty vehicles made possible by excessive credit generation at factory farms. CARB has acknowledged that pollution from transportation fuels inflicts a racially disparate impact, so this continued certification of fuel pathways with extreme negative CI values to allow more pollution from deficit holders contributes to this injustice.²⁶

As this application highlights, CARB's unlawful and unjust administration of the LCFS program is causing environmental and public health harms in California and elsewhere—in this case Arizona—by incentivizing and rewarding some of the worst factory farm practices by making them more "*lucrative*." In addition to using vast amounts of power, these dairies also use massive amount of water in the famously over-allocated Colorado River Basin.²⁷ CARB cannot ignore this fundamental unsustainability of factory farms in the arid desert when assessing these applications. If California is serious about being a climate leader, this is not the example to set.

Commenters request that CARB deny the application. To do otherwise will violate California law, further destroy the integrity of the LCFS market, undermine the state's climate change mitigation efforts, and harm California communities.

Respectfully,

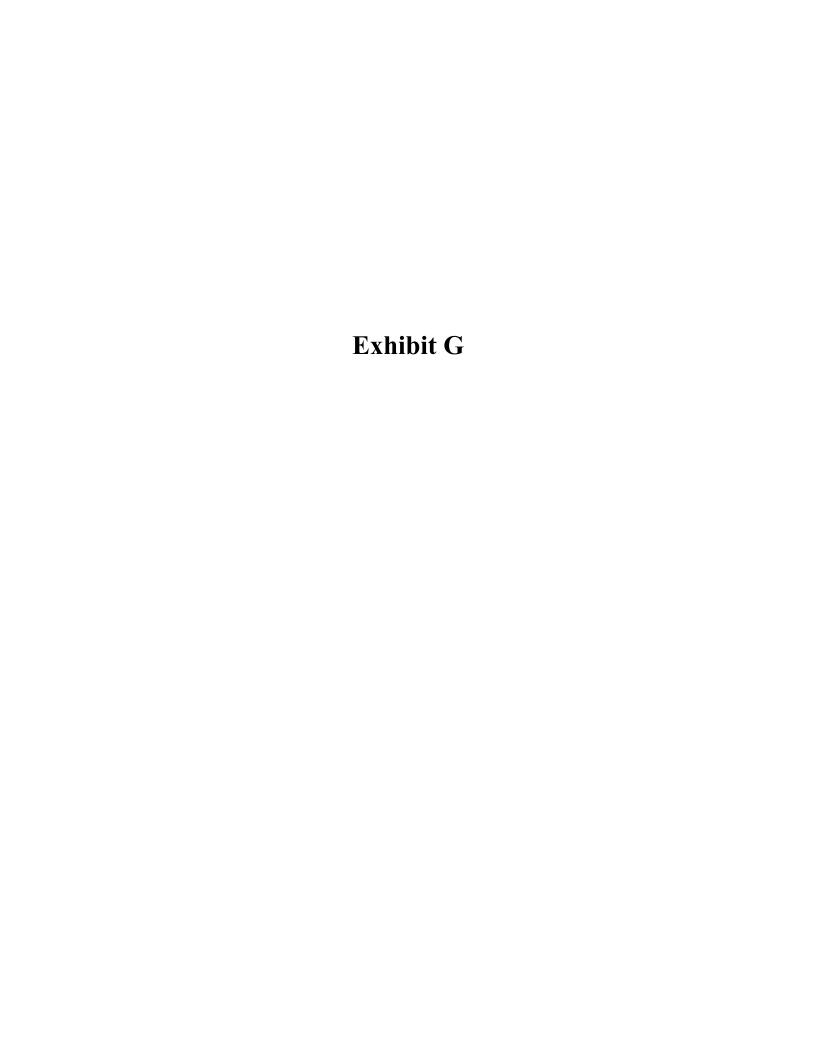
Evan Levy Litigation Fellow Animal Legal Defense Fund (707) 795-2533 ext. 1092 elevy@aldf.org

²⁴ See Application No. B0698 Cover Page at 2; Application No. B0698 LCA at 7, 11, 14-15, 17, 19, 25-28, 31-33, 36-39, 42-45, 47-48, 71-84.

²⁵ Publicly posted application materials "must provide sufficient information to allow for meaningful stakeholder review." LOW CARBON FUEL STANDARD (LCFS) GUIDANCE, CARB 20-051 (Apr. 2020), https://perma.cc/856Y-CVVZ.

²⁶ See 2020 Mobile Source Strategy at 26–27, https://perma.cc/4P3H-HG3Z.

²⁷ Debbie Weingarten & Tony Davis, *A Mega-Dairy is Transforming Arizona's Aquifer and Farming Lifestyles*, HIGH COUNTRY NEWS (Aug. 1, 2021) https://perma.cc/2D4B-GPDC (describing how the fast-expanding dairy industry in southern Arizona is stressing already over-tapped water sources).



March 18, 2025

Submitted via ca.gov

Liane M. Randolph, Chair California Air Resources Board 1001 I Street Sacramento, CA 95814

Re: Tier 2 Pathway Application No. B0725

Dear Chair Randolph,

Leadership Counsel for Justice & Accountability, Central Valley Defenders of Clean Water & Air ("Defensores"), Food & Water Watch, and Animal Legal Defense Fund (collectively, "Commenters") write in opposition to Gevo NW Iowa RNG, LLC's Tier 2 pathway application. As Commenters have explained through numerous comments, the Petition for Rulemaking to Exclude All Fuels Derived from Biomethane from Dairy and Swine Manure from the Low Carbon Fuel Standard Program (included and incorporated here as Exhibit A), and the Petition for Reconsideration (included and incorporated here as Exhibit B), the California Air Resources Board's (CARB) treatment of factory farm gas under the Low Carbon Fuel Standard (LCFS) is flawed, and staff's assessment of this application is no different. We urge CARB to either deny this application or at least exercise its clear authority¹ to defer consideration of the application during the pendency of the LCFS rulemaking.²

Commenters oppose this application for several reasons. First, in 2022, *the applicant spilled 376,000 gallons of manure* from the leaking digester at Winding Meadows Dairy into Lizard Creek.³ Rather than mitigating the leak, the Iowa Department of Natural Resources found that the applicant "ignored indications of the leak and filled [the digester] further[.]" The Iowa Department of Natural Resources has found manure leaking from Winding Meadows digester at least two more times since this massive spill.⁵ Under no circumstances should CARB approve this application—the applicant operates this project for the purpose of profiting from the LCFS.⁶ The

¹ The LCFS provides that the Executive Officer "may" consider provisional pathway applications. Cal. Code Regs. tit. 17, § 95488.9(c).

² Decision of Disapproval of Regulatory Action (OAL Matter Number 2025-0103-01), Office of Administrative Law (Feb. 18, 2025), available at https://oal.ca.gov/wp-content/uploads/sites/166/2025/02/LINDSEY-2025-0103-01S.pdf (detailing the Office of Administrative Law's disapproval of CARB's 2024 LCFS amendments).

³ Jared Strong, *Company filled massive manure container despite signs of a leak, DNR says*, IOWA CAPITAL DISPATCH (July 6, 2022), https://iowacapitaldispatch.com/2022/07/06/company-filled-massive-manure-container-despite-signs-of-a-leak-dnr-says/.

⁴ *Id*.

⁵ 'More Manure Means More Energy' Iowa Dairies with Biogas Digesters are Growing Their Herds, Which Concerns Water Quality Advocates, The Gazette (Nov. 3, 2024), https://www.thegazette.com/agriculture/more-manure-means-more-energy-iowa-dairies-with-biogas-digesters-are-growing-their-herds-which-c/ (finding "manure leaking from a tile line" in April 2022 and "500 gallons of manure 'foam'" released into the environment in January 2023).

⁶ *Id.* ("The digester is one of three in that part of the state built by Colorado-based Gevo, which processes the methane it captures from dairy farm manure into renewable natural gas to power low-emissions vehicles in California.")

LCFS incentives for factory farm gas production have already done enough harm in the Iowa community that this project occupies.

Second, the application incorporates an unlawfully truncated system boundary that ignores feedstock production at the source factory farms in Rock Valley, Iowa and Inwood, Iowa—which collectively confine nearly 23,870 cows⁷—and other emissions such as those from storage and disposal of digestate, resulting in artificially low Carbon Intensity (CI) values and inflated credit generation. For example, the applicant's system boundary in their life cycle analysis report explicitly excludes enteric fermentation—a major source of methane emissions that cannot be disentangled from the process of creating applicant's factory farm gas.⁸ A fuel pathway life cycle analysis must take into account "feedstock production" and "waste generation, treatment and disposal." In addition to the evidence provided in Exhibits A and B, more recent research indicates that emissions from factory farm gas production are significantly higher than currently appreciated, with especially high emissions from digestate storage. 10 This recent study did not consider additional emissions from digestate handling and application, which is another potentially large source of emissions resulting from factory farm gas production that must be included in the pathway life cycle analysis. 11 Yet, CARB and the pathway applicant ignore these and other emissions. In other words, this application dramatically undercounts the greenhouse gas emissions associated with this fuel by failing to apply the required "well-to-wheel" analysis.

Concurrently, this application overcounts environmental benefits by ignoring that this is, in one factory farm owner's words, "*lucrative*" feedstock production. ¹² The Iowa *Gazette* remarked that the gas from dairy digesters "can be sold for big-time profits" of "tens of thousands of dollars per day by pumping renewable natural gas to states like California." ¹³ Liquified manure rotting anaerobically in massive waste "lagoons" is not an unavoidable and natural consequence of animal agriculture operations. This system and the methane emissions that it causes are the result of the source factory farms' intentional management decisions designed to maximize profits and externalize pollution costs. CARB cannot ignore that the emissions the pathway applicant claims as captured from the factory farms' lagoons are intentionally created in the first place. The

⁷ Application No. B0725 CARB Staff Summary at 2.

⁸ Application No. B0725 Life-Cycle Carbon Intensity Analysis Report at Fig. 1.

⁹ Cal. Code Regs. Tit. 17 §§ 95481(a)(66), 95488.7(a)(2)(B).

¹⁰ Semra Bakkaloglu et al., *Methane Emissions Along Biomethane and Biogas Supply Chains Are Underestimated*, 5 ONE EARTH 724–736 (June 17, 2022), https://www.sciencedirect.com/science/article/pii/S2590332222002676.

¹¹ Id. at 728; Michael A. Holly et al., Greenhouse Gas and Ammonia Emissions from Digested and Separated Dairy Manure During Storage and After Land Application, 239 AGRIC. ECOSYSTEMS & ENV'T 410, 418 (Feb. 15, 2017), https://doi.org/10.1016/j.agee.2017.02.007; Roger Nkoa, Agricultural Benefits and Environmental Risks of Soil Fertilization with Anaerobic Digestates: a Review, 34 AGRONOMY FOR SUSTAINABLE DEV. 473 (2014), https://link.springer.com/article/10.1007/s13593-013-0196-z; F. Montes et al., Special Topics — Mitigation of methane and nitrous oxide emissions from animal operations: II. A Review of Manure Management Mitigation Options, 91 J. OF ANIMAL Sci. 5070 (2013), https://academic.oup.com/jas/article/91/11/5070/4731316; Kurt Möller & Walter Stinner, Effects of Different Manuring Systems with and without Biogas Digestion on Soil Mineral Nitrogen Content and on Gaseous Nitrogen Losses (Ammonia, Nitrous Oxides), European J. Of Agronomy (2009), https://www.sciencedirect.com/science/article/abs/pii/S1161030108000695?via%3Dihub.

¹² Stacey Smart, *Deer Run Dairy Wins National Sustainability Award*, DAIRY STAR (June 27, 2022), https://dairystar.com/Content/Home/Home/Article/Deer-Run-Dairy-wins-national-sustainability-award/80/254/18626 (emphasis added) ("Installed in 2011, the digester supplied power to nearly 600 homes. In 2020, the farm converted over to renewable natural gas that is injected into the pipeline, which Duane said is a more lucrative option.").

¹³ 'More Manure Means More Energy' Iowa Dairies with Biogas Digesters are Growing Their Herds, Which Concerns Water Quality Advocates, The Gazette (Nov. 3, 2024), https://www.thegazette.com/agriculture/more-manure-means-more-energy-iowa-dairies-with-biogas-digesters-are-growing-their-herds-which-c/.

manure handling practices at these factory farms is an integrated part of generating and using factory farm gas. Thus, the gas generated is an intentionally produced product and cannot now be claimed as "captured" to secure a lucrative negative CI value.

Third, CARB has failed to ensure that the additionality requirements of Health and Safety Code section 38562 are met. ¹⁴ Without an additionality analysis, it is unclear whether these digesters would have been built regardless of the LCFS incentives.

Fourth, this application is a exemplifies how CARB's flawed approach is rewarding the biggest factory farm polluters and incentivizing further expansion and herd consolidation, which does more climate harm than good. The source factory farms are not sustainable family farms—they are massive industrial operations that collectively confine *23,870 cows*.¹⁵ In fact, the number of cows confined on these dairies has nearly doubled since the LCFS began.¹⁶ The largest of the three dairies in this application—Rock River Jerseys—did not began operations until 2016.¹⁷ The fifteen dairies with digesters in Iowa have increased their overall herd size by at least 23% since 2021, with further herd expansions planned at applicant's Winding Meadows Dairy and Rock River Jerseys.¹⁸ CARB should not allow these factory farms—or their applicant—to profit from the LCFS.

Fifth, this application is so opaque that it is impossible for Commenters or other stakeholders to meaningfully evaluate it.¹⁹ For example, the lifecycle analysis redacts information critical to understanding the output of the applicant's CI calculation.²⁰

Lastly, the inflated CI values CARB proposes here impose additional environmental injustices on California citizens who will be exposed to higher levels of pollution from fossil transportation fuel and dirty vehicles made possible by excessive credit generation at factory farms. CARB has acknowledged that pollution from transportation fuels inflicts a racially disparate impact, so this continued certification of fuel pathways with extreme negative CI values to allow more pollution from deficit holders contributes to this injustice.²¹

As this application highlights, CARB's unlawful and unjust administration of the LCFS program is causing environmental and public health harms in California and elsewhere—in this case Iowa, and nearby Minnesota, South Dakota, and Nebraska—by incentivizing and rewarding

¹⁴ See Ex. A, Petition for Rulemaking, section III.A.2; Ex. B, Petition for Reconsideration, section III.A.3.

¹⁵ Application No. B0725 Staff Summary at 2.

¹⁶ Rock River Jerseys did not exist as a dairy until 2016, where it added over 11,000 of the nearly 24,000 cows represented in this fuel pathway application.

¹⁷ Application No. B0725 Life-Cycle Carbon Intensity Analysis Report at 9.

¹⁸ 'More Manure Means More Energy' Iowa Dairies with Biogas Digesters are Growing Their Herds, Which Concerns Water Quality Advocates, The Gazette (Nov. 3, 2024), https://www.thegazette.com/agriculture/more-manure-means-more-energy-iowa-dairies-with-biogas-digesters-are-growing-their-herds-which-c/ (showing a 66% increase of cows from fall of 2022 to fall of 2024 for Rock River Jerseys, and stating that Winding Meadows dairy "got a permit in May [of 2024] to boost the herd 45 percent').

¹⁹ Publicly posted application materials "must provide sufficient information to allow for meaningful stakeholder review." CAL. AIR RES. BD., LOW CARBON FUEL STANDARD (LCFS) GUIDANCE 20-051 (Apr. 2020), https://perma.cc/856Y-CVVZ.

²⁰ See Application No. B0725 Life-Cycle Carbon Intensity Analysis Report at 5, 16, 19, 20 (redacting important information used to calculate carbon intensity values).

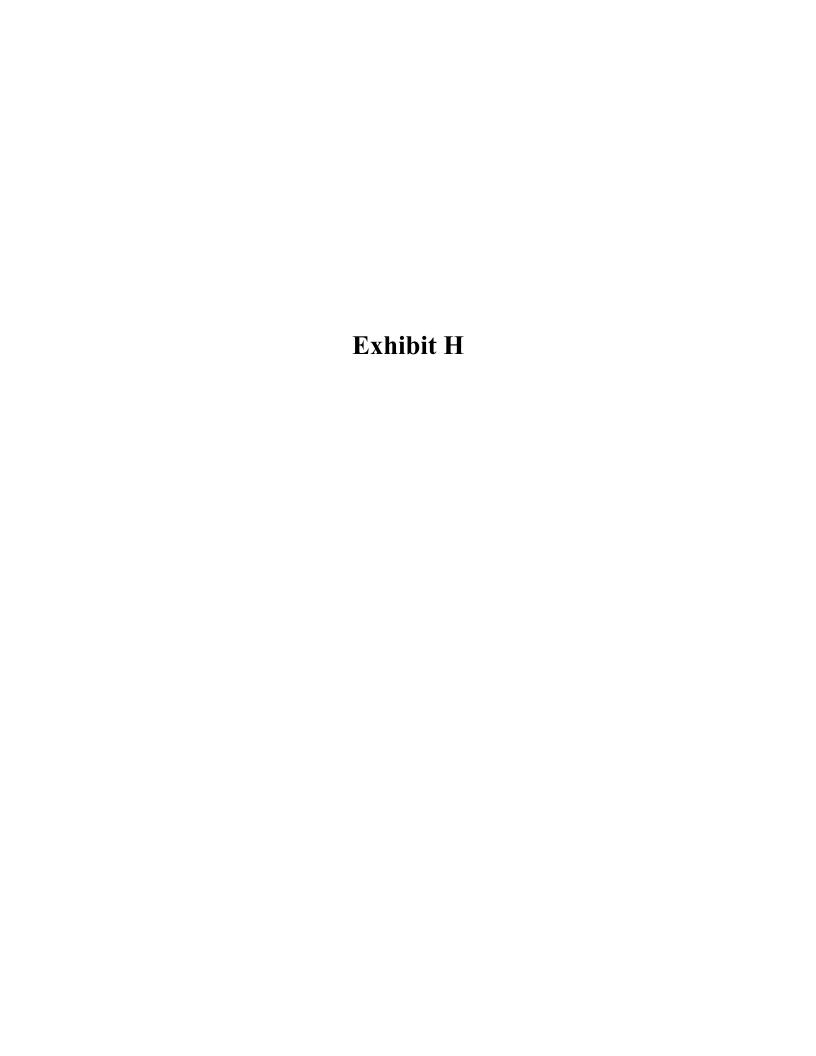
²¹ See 2020 Mobile Source Strategy at 26–27, https://perma.cc/4P3H-HG3Z.

some of the worst factory farm practices by making them more "*lucrative*." If California is serious about being a climate leader, this is not the example to set.

Commenters request that CARB deny the application. To do otherwise will violate California law, further destroy the integrity of the LCFS market, undermine the state's climate change mitigation efforts, and harm California communities.

Respectfully,

Evan Levy Litigation Fellow Animal Legal Defense Fund (707) 795-2533 ext. 1092 elevy@aldf.org





Low Carbon Fuel Standard

Tier 2 Pathway Application

Application No. B0725

Updated: 3/26/2025 (See Underlined Text)

Staff Summary

GEVO NW IOWA RNG, LLC
Gevo NW Iowa RNG, LLC, Doon, Iowa
Compressed Natural Gas (CNG) from Dairy Manure

Intermediate Facility:
Meadowvale Dairy, LLC (F00574), Rock Valley, Iowa
Rock River Jerseys, LLC (F00575), Inwood, Iowa
Winding Meadows Dairy, Inc. (F00576), Rock Valley, Iowa

Joint Applicant: Clean Energy

Deemed Complete Date: 10/16/2024 Posted for Comment Date: 3/4/2025 Carbon Intensity (CI) Certified Date: 3/26/2025 CI Start Date: 10/1/2024

Pathway Summary

GEVO NW IOWA RNG, LLC seeks provisional certification of three Tier 2 pathways for biomethane (Bio-CNG) ¹ production at Gevo NW Iowa RNG, LLC (Gevo Facility) in Doon, Iowa. The pathways source biogas from the anaerobic digestion of dairy manure from three farms: Meadowvale Dairy, LLC (MVD), Rock River Jerseys, LLC (RRJ), and Winding Meadows Dairy, Inc (WMD). MVD and WMD are in Rock Valley, Iowa and RRJ is in Inwood, Iowa. Biogas is purified and upgraded to biomethane to meet common carrier pipeline specifications, then directly injected into Northern Natural Gas pipeline, and ultimately dispensed for transportation use in CNG vehicles in California as bio-CNG using book-and-claim accounting. ²

GEVO NW IOWA RNG, LLC owns the environmental attributes associated with the biomethane and sells these attributes using book-and-claim accounting through its contracted California transportation fuel dispensers. Gevo Facility participates in the U.S. EPA Renewable Fuel Standard program but has not participated in California's Cap-and-Trade Offset program.

¹ "Bio-CNG" means biomethane which has been compressed to CNG. Also referred to herein as biomethane or renewable natural gas (RNG).

² All citations to the LCFS Regulation are found in Title 17, California Code of Regulations (CCR), section 95480-95503. Book-and-claim accounting for biomethane is primarily addressed in section 95488.8(i) of the LCFS Regulation.

The table below summarizes the information of participating farms including years the farms were founded, years the lagoons were constructed, years manure started to be sent to the digesters, approximate livestock population (i.e., dairy cows, non-milking dairy cows, heifers, and calves), and the distance from the dairies/digesters to the upgrading facility.

Farm Name	Year founded	Year Anaerobic Lagoons built	Year digester(s) Built	Approximate Livestock Population	Driving Distance between farm and upgrading facility (mile)
MVD	1992	2004, 2010, 2021	2022	10,690	14.3
RRJ	2016	2015	2022*	11,180	2.7
WMD	1983	2003, 2013, 2020	2022	2,000	1.6

^{*} Enclosed Vessel Digester was constructed during 2021-2022 and Lagoons were covered in 8/2022.

For MVD, under the baseline condition, the manure was collected via vacuum trucks, sand was separated out of the manure, and the manure flowed to a system of lagoons. The MVD lagoon system never performed complete cleanouts; therefore, no lagoon cleanout is modeled. Under the project condition, the manure capture method is the same as baseline. Following mechanical sand separation, the manure is piped to the anaerobic digester. The digestate from the anaerobic digester is stored in open lagoons before being land applied and incorporated into the soil for farming in the fall of each year. The enclosed vessel digester captures methane that would otherwise be emitted to the atmosphere under baseline manure management scenario.

For RRJ, under the baseline condition, the manure was collected via vacuum trucks and skid-steered loaders into a flushed flume, sand was separated out of the manure, and the manure was sent to a lagoon system. Although one or multiple lagoons are pumped down as needed each year, the whole lagoon system is never completely cleaned out. Under the project condition, the manure capture method is the same as baseline. Following mechanical sand separation, the manure is piped to the anaerobic digesters. Following enclosed vessel anaerobic digestion, the digestate is pumped into the solid separation building. A screw press removes fibers from the manure. The fibers are used for animal bedding. The remaining digestate is pumped into the covered lagoons. The covered lagoons are pumped annually and are never fully emptied. The digestate stored in the covered lagoons is land applied and incorporated into the soil for farming in the fall of each year. The covered lagoons and enclosed vessel digesters capture methane that would otherwise be emitted to the atmosphere under baseline manure management scenario.

For WMD, under the baseline condition, the manure was collected via skid-steered loaders into the flushed flume, sand was separated out of the manure, and the manure flowed to a lagoon system. Although one or multiple lagoons are pumped down as needed each year, the whole lagoon system is never completely cleaned out. Under the project condition, the manure capture method is the same as baseline. Following mechanical sand separation, the manure is piped to the anaerobic digester. The digestate from the anaerobic digester is stored in open lagoons before being land applied and incorporated into the soil for farming in the fall of each year. The enclosed vessel digester captures methane that would otherwise be emitted to the atmosphere under baseline manure management scenario.

The raw biogas is sent via pipeline from the digesters (covered lagoons and enclosed vessels) to the gas conditioning skid located at each farm. The conditioning skid removes the water, pressurizes, and measures the methane concentration and flow of the biogas and then pumps the biogas into an underground raw biogas pipeline system that connects all three of the dairies to the biogas upgrading site. At the biogas upgrading site, combined raw biogas from all three dairies is fed into either a feed compression skid for the Pressure Swing Adsorption system or the feed compression skid for the Separation system to remove carbon dioxide and hydrogen sulfide (H₂S) and other impurities. The product gas from the feed compressor unit is sent through an H₂S cleaning system to be within pipeline hydrogen sulfide specifications. The waste gases from both systems are then sent to a H₂S scrubber iron sponge system and then to a thermal oxidizer. The clean methane recovered from both Separation and PSAs systems is tested for quality to ensure the RNG meets the Northern Natural Gas commercial pipeline specifications. After passing through gas analytical equipment to confirm specification, the RNG is sent to a high-pressure gas compression skid to be compressed into the Northern Natural Gas pipeline interconnect. Pipeline-injected RNG is delivered to CNG vehicle fueling stations in California using indirect ("book-and-claim") accounting.

Carbon Intensity of Fuel Type Pathways

The CI is determined from a life cycle analysis conducted using a modified version of the Board-approved Tier 1 Simplified CI Calculator for Biomethane from Anaerobic Digestion of Dairy and Swine Manure.³ The calculator was modified to explain calculation changes, specifically new process units/life cycle stages or inputs. The modified calculator has been determined to be equivalent to CA-GREET3.0 pursuant to section 95488.7(a)(1) of the LCFS regulation. The applicant has provided operational data and supporting documentation for the listed life cycle stages, including unit operations and transport of feedstock and/or fuel (e.g., digester, gas cleanup, and pipeline injection of biomethane), for a period of 3 months, from

³ The Tier 1 Simplified CI Calculator for Biomethane from Anaerobic Digestion of Dairy and Swine Manure (August 13, 2018), incorporated by reference in the LCFS Regulation, section 95488.3(b).

September 2023 to November 2023. The following table lists the proposed CI for this pathway.

The CI scores listed in the table below reflect the CI calculated using the modified version of the Board-approved Tier 1 Simplified CI Calculator for Biomethane from Anaerobic Digestion of Dairy and Swine Manure, along with a conservative margin of safety added by the applicant.

Proposed Pathway CI								
Pathway Number	Fuel & Feedstock	Pathway FPC	Pathway Description	Carbon Intensity (gCO2e/MJ)				
B072501	CNG from Dairy Manure	CNG026B07250100	Biogas from dairy manure at Meadowvale Dairy, LLC in Rock Valley, IA; upgraded to pipeline quality at Gevo NW lowa RNG, LLC; pipelined to CA for transportation use	-345.33				
B072502	CNG from Dairy Manure	CNG026B07250200	Biogas from dairy manure at Rock River Jerseys, LLC in Inwood, IA; upgraded to pipeline quality at Gevo NW Iowa RNG, LLC; pipelined to CA for transportation use	-332.36				

Proposed Pathway CI								
B072503	CNG from Dairy Manure	CNG026B07250300	Biogas from dairy manure at Winding Meadows Dairy, Inc. in Rock Valley, IA; upgraded to pipeline quality at Gevo NW lowa RNG, LLC; pipelined to CA for transportation use	-351.61				

Operating Conditions

The certified CI value in the above table may be used to report and generate credits for fuel quantities that are produced at the facility in the manner described in the applicant's Life Cycle Analysis (LCA) report, and dispensed for transportation use in California, subject to the following requirements and conditions:

- 1. Fuel pathway holders are subject to the requirements of the California Air Resources Board's (CARB) Low Carbon Fuel Standard (LCFS) regulation, which appears at sections 95480 to 95503 of title 17, California Code of Regulations. Requirements include ongoing monitoring, reporting, recordkeeping, and third-party verification of operational CI and a controlled process for providing product transfer documents or other similar records to counterparties or CARB.
- 2. CARB has reviewed the contractual agreements between the pathway holder/biogas upgrader, and marketer(s). All unredacted contract agreements relevant to this biomethane fuel pathway were submitted to CARB as part of the application, pursuant to section 95488.8(i)(2)(B). To confirm compliance with Annual Fuel Pathway Report requirements, the pathway holder shall notify CARB of any change in existing contracts that were submitted to CARB with the fuel pathway application, including any new contracts and termination of existing contracts, with any entity engaged in the transfer, purchase, or sale of biomethane and its environmental attributes. Failure to notify CARB of such a change could result in enforcement action and could invalidate this fuel pathway.

Fuel pathway holders must update the list of Bio-CNG dispensing entities and any biomethane end users at the time of Annual Fuel Pathway Report submission. Contractual agreements from the fuel dispensing entities do not need to be submitted in the original fuel pathway application or the Annual Fuel Pathway

- Reports; instead, they must be verified as part of the annual verification of the Quarterly Fuel Transactions Reports.
- 3. The biomethane and its environmental attributes claimed under this pathway shall not be claimed by any entity for any other purpose, nor under any other program notwithstanding the exceptions listed in LCFS Regulation section 95488.8(i)(2). The LCFS places no restriction on the use of any emission reduction credits generated by the project for emission reductions that are demonstrated to be additional to reductions claimed under the LCFS.
- 4. The fuel pathway holder must include the assumptions and calculations used to establish the fraction of solids input to each manure management system in its Annual Fuel Pathway Report submitted to CARB for third-party verification of the operational CI.
- 5. Any quantity of biomethane metered at the inlet to the upgrading facility that cannot be demonstrated by meter records to have been pipeline injected or destroyed, must be calculated by energy balance and accounted for in the CI as a fugitive methane emission if the calculated value exceeds the default 2% fugitive emission.
- 6. Each dairy/swine farm supplying manure to a digester will be subject to third-party verification to support the fraction of volatile solids inputs to the modified Simplified CI Calculator for Biomethane from Anaerobic Digestion of Dairy and Swine Manure for baseline and project modeling (Manure-to-Biogas (LOP Inputs) tab). CARB must be immediately notified through the AFP if any changes to dairy/swine manure suppliers and sources (e.g., additional suppliers or manure from different types of livestock) are made from the certified pathway. Modifications to the dairy/swine manure suppliers and sources may require submission of a new pathway for review, validation, and certification. Failure to notify CARB of such a change may result in the invalidation of the fuel pathway, invalidation of associated LCFS credits, and enforcement action.
- 7. The fuel pathway holder must report total upgrading facility energy use and biogas flow, and the calculations used to allocate these parameters to each digester pathway based on its monthly share of total biogas measured at inlet to upgrading, in its Annual Fuel Pathway Report submitted to CARB and subject to third-party verification of the operational CI.

Staff Analysis and Recommendation

Staff has reviewed the application and has replicated, using the Tier 1 modified version of the Simplified CI Calculator, the CI values calculated by the applicant. SCS Global Services (H3-20-017) submitted a Positive validation statement. Staff recommends this application be certified on a provisional basis after all the comments received during the 10-day comment period are addressed satisfactorily

by the applicant. The certification is subject to the operating conditions set forth in this document. **Comments and Certification** CARB has reviewed the applicant's response to comments received during the 10day comment period, determined that these adequately address factual and methodological errors, and certified the pathways. 7 | Page



400 North Capitol Street, N.W. Suite 450 Washington, D.C. 20001 **Transportproject.org** Sherrie Merrow Director, State Government Affairs smerrow@transportproject.org

307.761.9717



April 21, 2025

The Honorable Dr. Steve Cliff Chair, California Air Resources Board 1001 I Street Sacramento, California 95814

RE: Third Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information: Proposed Low Carbon Fuel Standard Amendments

Dear Dr. Cliff:

054.1

The Transport Project (TTP) respectfully submits the following comments on the California Air Resources Board (CARB) Third Notice on the proposed amendments to the California Low Carbon Fuel Standard (LCFS) program and is in support of the objective: To continue to incentivize the lowest carbon fuels and technologies available to the transportation market. The LCFS amendments proposed by CARB staff represent significant efforts that are appreciated and which TTP continues to support. It is our belief that California should continue to be fuel neutral through the LCFS, using national standards and the Argonne GREET model to determine the best LCFS credit generators.

The Transport Project is a national coalition of fleets, vehicle and engine manufacturers and dealers, servicers and suppliers, and fuel producers and providers dedicated to the decarbonization of North America's transportation sector. By continuing to increase the use of gaseous motor fuels including renewable natural gas (RNG) and hydrogen, California can achieve ambitious climate goals and greatly improve air quality safely, reliably, and effectively without delay and without compromising existing commercial business operations.

In California, the use of low-carbon fuels including renewable diesel and renewable natural gas have produced most of the emissions reductions to date, demonstrating the need to retain these fuels while ZEV technology, charging/fueling and supply reach full operational capacity. There is **no one solution** to the pressing environmental issues facing the transportations sector. The LCFS with the proposed amendments will deploy those technologies and solutions that are readily available, maximize costeffective emission reductions, and provide a real pathway to carbon neutral/negative emissions.

The Transport Project thanks CARB for its work and requests expedient approval of the Third 15-day Package before July 1, 2025, to allow the amendments to be in effect for the first quarter of 2025.

Please contact me with any questions.

Sincerely.

Sherrie Merrow

Shu Merron

The Transport Project Director of State Government Affairs



April 21, 2025

Chair Liane Randolph & Members of the Board California Air Resources Board 1001 I Street, Sacramento, CA 95814

Via Electronic Submission

Re: Third 15-Day Changes to the Proposed LCFS Regulation Order

Dear Chair Randolph and Members of the California Air Resources Board:

The Michigan Soybean Association appreciates the opportunity to comment on the proposed modifications (Third 15-Day Changes) to the Low Carbon Fuel Standard (LCFS) program. Michigan Soybean Association has welcomed engagement with the California Air Resources Board (CARB) and staff throughout this multi-year process to update the LCFS program.

The Michigan Soybean Association (MSA) is a membership organization which represents Michigan soybean producers' interests at the state and national levels by voicing the needs and concerns before governmental agencies and the general public through advocacy and legislation.

CARB's Third 15-Day Changes to revise the LCFS did not address our major concerns with provisions included in the final amendments approved by CARB. In addition to the new proposals in the Third 15-Day Changes package, Michigan Soybean Association remains deeply concerned with the drastic and inequitable pivot CARB has made related to agricultural feedstocks used for biofuels. Michigan Soybean Association continues to encourage that updates to the LCFS program are based on up-to-date and sound science, as required by AB-32. Outlined below are our concerns and proposed solutions that will enable CARB to meet its climate goals, protect the environment and all Californians, while also supporting American soybean farmers and processors who are investing in the future of low-carbon energy.

Serious Feedstock Cap Concerns and Proposed Solutions

Michigan Soybean Association still has significant concerns with the vegetable oil feedstock cap that was included in the initial 15-Day Changes posted in August 2024. The current proposal restricts the amount of soybean oil, canola oil and sunflower seed oil that is allowed to generate credits in the program at an inequitable 20% by company. CARB's

own data demonstrates that vegetable oil feedstocks, including soy, have consistently exceeded the proposed cap since 2021.

Capping these proven, sustainable, and scalable feedstocks would suppress the supply of renewable diesel, increase reliance on fossil fuels, and raise fuel prices for California consumers. Even CARB staff acknowledged in the April 2024 workshop that a cap would reduce air quality benefits and likely increase NOx and PM2.5 emissions. All of this, including the recent tariffs on imported feedstocks greatly increase costs and further substantiate U.S. based feedstocks as the clear-cut choice. Michigan Soybean Association urges CARB to remove the cap on U.S. based vegetable oil feedstocks to provide a more economically feasible, locally produced and sustainable, climate smart option for the people and the planet.

Agricultural feedstocks for biofuel production are already held to a high standard for participation in the U.S. Renewable Fuel Standard (RFS). Rather than adding sustainable U.S. based feedstocks to its arbitrary proposed cap, CARB needs to update carbon intensity analysis and oversight of imported feedstocks, which are not held to the same level of accountability. Recent actions by the European Union in response to fraudulent Chinese biodiesel imports underscore this concern¹. The EU committee recently met at the request of a member state to discuss alleged fraud in biodiesel imports from China. Fraud continues to be an issue with imported feedstocks and needs to be addressed further. Michigan Soybean Association strongly encourages CARB to adopt enforceable traceability and verification standards, including origin disclosures, documentation audits, and physical testing. Without implementing sustainable solutions to the above and not eliminating a cap on U.S. vegetable oil feedstock, CARB is essentially putting the feedstocks from foreign countries (i.e., China) above those of the United States.

Sustainability Guardrails and Traceability Concerns

Michigan Soybean Association remains very concerned about the sustainability guardrails. The sustainability guardrails are more onerous than the specified source requirements used for non-U.S. waste feedstock imports. Palm oil in Southeast Asia has had forced labor concerns², but CARB does not require used cooking oil derived from palm to track social or economic sustainability. Concerningly, petroleum does have to track these criteria. CARB's proposal makes it administratively easier to use non-sustainable petroleum³ in the state than biofuels that have lower carbon intensity (CI) scores and are produced from sustainable feedstocks grown in the United States. Land use change is already captured in the indirect land use change (ILUC) score, which still makes it unclear what actual purpose the guardrails serve.

¹ EU industry demands answers as 'fraudulent' Chinese biofuels continue to flow - Euractiv

 $^{^2 \, \}underline{\text{https://apnews.com/article/virus-outbreak-only-on-ap-indonesia-financial-markets-malaysia-7b634596270cc6aa7578a062a30423bb}$

³ https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.858512/full

If CARB insists on agricultural feedstock traceability, then it should reward sustainable practices beyond what is already assumed in the lifecycle analysis (LCA). The U.S. Department of Agriculture (USDA) has developed a tool to quantify the CI reductions for no-till, cover crops and nitrogen inhibitors. Considering this integral information, the carbon intensity of soy-based biofuels could improve through the mentioned climate smart ag practices on the field where the soybeans were produced. Other farming practices like low-till, nutrient management, enhanced efficiency fertilizers, buffers, wetland and grassland management, tree planting on working lands, planting for higher carbon sequestration, and soil amendments all could and should be accounted to assign a lower CI score to an agricultural feedstock. USDA already tracks all these practices through several of their managed conservation programs. In addition, there are a variety of other practices that scientifically lower the CI score of soybean feedstocks for biofuels, and USDA is actively working to develop mechanisms to account for those. If CARB insists on tracing feedstocks back to the farm, then it should also acknowledge when those feedstocks are produced with lower CI practices.

Moreover, USDA has recognized the CI reduction benefits of certain sustainable or climate-smart practices for the purposes of clean fuel transportation programs and is undertaking a rulemaking process to develop final guidelines for the quantification of these practices. Through planting decisions, soil management, and other practices, soybean farmers can continuously reduce environmental impacts. In addition, some soybeans are double cropped meaning they are grown as a secondary crop following a primary crop within a growing season. They are not displacing other crops or land uses. Double-crop soybeans should be eligible to have the ILUC component of the CI score removed or at least shared with the other crop in the rotation. Michigan Soybean Association proposes the aforementioned issues to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Modernized, Accurate, Climate Smart Carbon Intensity Modeling and Scoring

Michigan Soybean Association remains concerned that without a comprehensive update to the Global Trade Analysis Project model for biofuels (GTAP-BIO) that CARB utilizes, U.S. soy-based feedstocks will be phased out of the LCFS even without the additional limitations included in the Second and Third 15-Day Changes. Current data indicates a much lower CI score for U.S. soybeans, as growers continue to improve soil practices, limit water use, lower on-farm emissions and more. CARB is recommending stringent sustainability guardrails for U.S. soy but is still on track to likely phase-out U.S. soy-based biofuels from credit generation by approximately 2035 or sooner.

As CARB looks to develop a more aggressive auto acceleration mechanism to reach CI reduction benchmarks sooner, using outdated methodologies will only limit the output of

actual improvement over time in terms of emissions reductions. As CARB updates all other major lifecycle emissions models through this rulemaking, Michigan Soybean Association once again urges action to update the GTAP-BIO model so that the most current, climate smart and science-based data may be used to determine carbon intensity reductions. The reasoning and sources indicated in the Third 15-Day Changes do not address this concern and need to be revised to ensure accuracy. Michigan Soybean Association proposes this issue to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Equitable Entities Eligible to Apply for Fuel Pathways

055.1

Michigan Soybean Association is very concerned about CARB's decision to give the Executive Officer authority to stop accepting new pathways for biomass-based diesel starting in January 2031. Michigan Soybean Association does not understand how this benefits the LCFS. Under AB-32, CARB must under statute minimize costs and maximize GHG reductions. It is unclear how this is served by rejecting new pathways. In fact, the LCFS is best served by allowing the most available and equitable pathways. If these pathways cannot achieve cost-effective GHG savings, they will not be utilized by the market in the LCFS. In essence, an increase in pathways can only serve to improve GHG benefits in California. Singling out a single fuel for prejudicial treatment is baffling given the goals of the LCFS and the authority that establishes it. Michigan Soybean Association urges CARB to continue to allow equitable pathways forward with no date of denial.

Recommended Climate Enhancing Solutions for CARB

As CARB finalizes its update to the LCFS, Michigan Soybean Association recommends several actions that will likely prevent an increase in fossil diesel use, improve carbon intensity calculations, and improve market access for sustainable U.S. agricultural feedstock providers.

First, CARB should not apply the vegetable oil feedstock cap proposal to U.S. feedstocks. As noted, these feedstocks are already subject to federal guardrails to ensure production on land not converted since 2008. The RFS was designed specifically to prevent land conversion for biofuel production, and USDA data shows a decrease in farmland over the same period.

Second, CARB should convene an expert working group to consider issues related to the sustainability provisions and indirect land use change (ILUC). Michigan Soybean Association recommends that this expert working group convene before the end of 2025 and provide recommendations by the end of Fall 2026.

Third, Michigan Soybean Association retains strong concerns about the ability of supply chains to comply with the sustainability guardrails. If CARB does move forward with the guardrails, they must reconsider its proposed sustainability requirements to allow soybean growers the opportunity to participate in the California biofuels market through innovative and climate smart agriculture practices. If traceability can be used to show additional

benefits in CI scoring, CARB must look to programs already developed through farmer input and provide improved scoring for feedstocks that employ sustainability practices to minimize the changes in comparative costs (i.e., USDA accredited programs and practices). CARB should work with USDA to develop an aligned scheme to quantify climate-smart agricultural practices for the purposes of biofuel feedstocks. USDA has already engaged with CARB regarding this project, which could be applied to the work that CARB is doing on traceability and carbon quantification of agricultural biofuel feedstocks.

Lastly, CARB must undertake a comprehensive update of the GTAP-BIO model for soybean oil used in biofuel production. Without using the most up-to-date and accurate data, CARB is doing a disservice to the U.S. feedstock producers and California's citizens by calculating carbon intensity scores not rooted in current facts. Through CARB's own analysis we know prejudicial feedstock treatment will lead to more emissions in the California transportation sector, harming the environment.

Concluding Thoughts/Pathway Forward

Michigan Soybean Association is encouraged by the continued successes of programs that support the development of cleaner, low-carbon fuels. However, it is critical that CARB finalizes updates in a way that equitably include U.S. agricultural feedstocks through policies that are science-based aligning with the most up to date information as well as promoting the sustainability of U.S. based products and businesses; including the elimination of capping on U.S. vegetable oil feedstocks and applying sustainability guardrails that are economically feasible for farmers while rewarding their practices that lower CI.

CARB's Third 15-Day Changes did not address any of the fundamental issues raised by Michigan Soybean Association in the First and Second 15-Day Changes and fails to acknowledge the potential unintentional consequences of a feedstock outlined by its own employees in previous discussions. CARB is required under the law to achieve the maximum technically feasible and cost-effective reductions in greenhouse gas emissions. The most recent 15-Day Changes show a lack of willingness to achieve the statutory obligations set forth in AB-32 and neglect modernized, climate smart, science-based solutions, ultimately disregarding the protection of U.S. based feedstocks, the people, and the planet. Michigan Soybean Association also asks that CARB respond in writing to further substantiate their decisions regarding our concerns expressed in this letter. We look forward to your written responses as a state regulatory body, whose responsibility is to protect its' citizens and the environment by providing transparency on decisions made for those of impact.

Michigan Soybean Association is eager to continue working with CARB to support the role of agriculture in diversifying the fuel supply while reducing carbon intensity and increasing clean air in California and beyond. On behalf of U.S. soybean farmers, we appreciate the opportunity to comment and look forward to collaborating with CARB and other relevant

stakeholders on implementation of policies that expand the use of U.S. soy-based biofuels and market opportunities for U.S. soybean farmers.

Sincerely,

Ben Steyer

CEO, Michigan Soybean Association



April 21, 2025

Rajinder Sahota California Air Resources Board (CARB) 1001 I Street Sacramento, California 95814

RE: Electrify America comments on the Third 15-Day Changes to the Low Carbon Fuel Standard (LCFS) Amendments

Dear Ms. Sahota:

Electrify America appreciates the opportunity to comment on this third set of 15-day changes to the Low Carbon Fuel Standard (LCFS) regulation, and we thank CARB staff for moving quickly to refine and finalize this critical rule.

Electrify America operates the largest open network of hyper-fast EV chargers in the United States—offering speeds up to 350 kW—including more than 1,200 chargers across 265+ publicly accessible locations in California. Programs like the LCFS make this kind of infrastructure buildout possible by supporting investment in EV charging and accelerating growth in the broader electric vehicle market. It is critical that these updated program amendments are implemented promptly to send a strong and stabilizing market signal.

Importance of a Timely Implementation

Electrify America supports CARB's overall direction in the proposed changes, which reflect targeted updates responsive to stakeholder input and aligned with concerns raised by the Office of Administrative Law. We continue to strongly support both the 9% carbon intensity (CI) stringency step-down and the creation of the auto acceleration mechanism (AAM), which together are essential to restoring LCFS market stability and sustaining investment in EV infrastructure and other clean fuels.

Timely implementation of these amendments is critical to ensure market confidence and certainty. We are concerned that continued delays in finalizing the regulation could prevent the step-down from applying in Q1 2025, limiting meaningful structural corrections to support credit market stability before the AAM can first take effect in 2028. The step-down is essential to providing interim market direction and ensuring the LCFS continues to drive clean transportation investment. We encourage CARB to finalize these regulations and to work closely with the Office of Administrative Law to ensure the package is finalized as quickly as possible.



056.2



Implementation Considerations and Continued Partnership

We also want to note for staff that the proposed definition of "quality assured data" may lead CARB to require accuracy demonstrations for equipment that is explicitly exempt from metrology requirements under the California Department of Food and Agriculture Division of Measurement Standards (DMS) regulations (CCR Section 4002.11¹). We look forward to working with CARB to ensure implementation remains aligned with DMS requirements and avoids unnecessary market disruption.

Electrify America appreciates CARB staff's thorough public engagement throughout this rulemaking process. We remain committed to partnering with the agency to advance California's clean transportation goals and look forward to continued collaboration as these provisions are implemented.

Sincerely,

/s/

056.3

Rhiannon Davis Director of Government Affairs Electrify America, LLC

¹ https://www.law.cornell.edu/regulations/california/4-CCR-4002.11





April 21, 2025

Ms. Rajinder Sahota Deputy Executive Officer, Climate Change and Research California Air Resources Board 1001 | Street Sacramento, CA 95864

Re: LCFS 15-day Notice Comments

Japan Hydrogen Forum (JH2F) is an organization formed in 2021 to contribute to the goal of decarbonization in the United States, consisting of 35 Japan-affiliated companies with hydrogen related technologies from production, carrier conversion, transportation, storage to utilization, including hydrogen fuel cell providers for heavy-duty (HD) truck and cargo handling equipment OEMs and retail hydrogen refueling station (HRS) providers in California.

JH2F would like to acknowledge California Air Resource Board (CARB) for the Low Carbon Fuel Standard (LCFS) regulation. This program has been incentivizing Japanese corporations to make investments into California and we strongly believe that the continuation of this program is a key element to enhance further investments from Japan.

As for the new regulation language we are encouraged to see some of the proposed language on hydrogen production methods, which leads into affordable hydrogen in California. However, we are still concerned on the HRI provisions with the proposed cap structure. Thus, we would like to submit the following comments for further consideration in response to the LCFS 15-day notice available on April 4, 2025. While acknowledging the continued improvements to the program, we would propose some critical refinements to ensure the success of hydrogen, and its necessary role in meeting California's 2045 carbon neutrality goal.

HRI – Light and Medium Duty (LMD-HRI)

We appreciate your effort to incorporate some of the feedback made in the last comments and are in support of excluding the cap on HRI credit generation of 1.5x of Capex- Grants. However, the newly introduced cap on LDV capacity of public 62.5%, private 31.5% will encourage smaller scale station creation, which we assume is not what the market envisions. The new 2024 changes have included Medium Duty to the Light Duty HRI which should entail more volume requirements than the previous Light-Duty vehicle only regulation. To support the over 18,000 FCV on the road and future work trucks/ fuel cell pick-ups come to the market at the end of the decade, this current regulation would hinder the growth for demand. Thus we encourage CARB to reconsider to *keep the original proposal in the final language submitted to OAL office in January (which has 100% for public station and 50% for private station as a factor)* on LMD-HRI or increase in station capacity threshold to 2,000 kg/d *in case currently proposed factors are maintained*.





We appreciate your consideration and thoughtful feedback to address our concerns. We look forward to contributing to California's goal of zero-emissions transportation.

Sincerely,

Daisuke Yanagisawa 4/21/2025 Daisuke Yanagisawa Chairperson, Japan Hydrogen Forum



April 21, 2025

Matthew Botill
Division Chief, Industrial Strategies Division
California Air Resources Board
1001 | Street
Sacramento, CA 95814

RE: Comments on the Third 15-Day Changes to the Low Carbon Fuel Standard Amendments

Dear Mr. Botill:

I write on behalf of U.S. Venture and our subsidiary U.S. Energy regarding the Third 15-Day Modifications to the Low Carbon Fuel Standard (LCFS) regulation, released April 4, 2025. We appreciate the Board's continued work to refine the rule and ensure its clarity and consistency with the Administrative Procedure Act. We urge CARB to swiftly finalize and implement the rule without further delay.

With more than 500 California employees, U.S. Venture is national provider of transportation energy, automotive tires, lubricants, and data insights that help fleet owners reduce fuel costs and emissions. As a marketer and distributor of renewable natural gas (RNG), U.S. Venture has participated in the LCFS program since 2013.

The current rulemaking has now spanned nearly three years and multiple iterations. While the process has benefited from significant public input and revision, prolonged uncertainty creates real consequences for companies like ours that deliver RNG to California. Continued delays in rule finalization impact both current projects and future development, particularly as LCFS credit markets remain sensitive to regulatory signals. Timely approval of the final amendments will provide developers with the regulatory certainty needed to proceed with confidence.

Therefore, we urge CARB to adopt the proposed final amendments and resubmit the package to the Office of Administrative Law within the statutory deadline.

Sincerely, <u>s/Brian Casey</u>

Brian Casey Head of Government Affairs U.S. Venture / U.S. Energy

058.1



April 21st, 2025

VIA ELECTRONIC FILING

Matthew Botill Branch Chief, Industrial Strategies Division California Air Resources Board 1001 | Street Sacramento, California 95814

RE: Comments on April 4th, 2025, Proposed LCFS Amendments (Third 15-Day Package)

Dear Mr. Botill:

Monarch Bioenergy LLC (Monarch) is pleased to provide comments on the Third Notice of Public Availability of Modified Text to the Proposed Low Carbon Fuel Standard (LCFS) Amendments.

Monarch works in rural farm communities, where we develop, build, own, and operate carbon-negative Renewable Natural Gas (RNG) projects in partnership with the nation's farmers. Monarch has actively participated in the LCFS program for years and considers CARB a highly valued partner in our business. We are grateful for CARB's ongoing effort to refine and advance this rulemaking as soon as practicable.

Although stakeholder input in the rulemaking process has enhanced the final product for all parties involved, the absence of clear guidance has affected the Monarch platform and the rural farming communities where we develop our projects. We have developed projects representing hundreds of millions of dollars in potential private capital deployment and await definitive guidance before making final investment decisions. These projects generate rural construction activity.

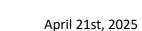
We recognize that energy is an important national conversation, with all participants raising valid concerns, representing differing yet valuable views and priorities. Monarch simply takes waste products from the existing agricultural process and turns these waste streams into usable energy, efficiently using existing natural gas infrastructure. Monarch's biogas heats homes, powers farm equipment, generates electricity, and runs commercial facilities; our biogas can also assist in decarbonizing data centers.

We respectfully urge the Board to approve the amendments and resubmit the package to the Office of Administrative Law within the 120-day window. Monarch is proud to partner with California and the nation's farmers to turn waste into useful, sustainable energy from their standard farming process. Thank you for supporting platforms like Monarch. We look forward to the finalized LCFS framework.

With best regards,

s/Sean Lock

Sean Lock President and Chief Investment Officer Monarch Bioenergy LLC





VIA ELECTRONIC FILING

Matthew Botill Branch Chief, Industrial Strategies Division California Air Resources Board 1001 I Street Sacramento, California 95814

RE: Comments on April 4th, 2025, Proposed LCFS Amendments (Third 15-Day Package)

Dear Mr. Botill:

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Although stakeholder input in the rulemaking process has enhanced the final product for all parties involved, the absence of clear guidance has affected the Monarch platform and the rural farming communities where we develop our projects. We have developed projects representing hundreds of millions of dollars in potential private capital deployment and await definitive guidance before making final investment decisions. These projects generate rural construction activity.

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We respectfully urge the Board to approve the amendments and resubmit the package to the Office of Administrative Law within the 120-day window. Monarch is proud to partner with California and the nation's farmers to turn waste into useful, sustainable energy from their standard farming process.

Thank you for supporting platforms like Monarch. We look forward to the finalized LCFS framework.

With best regards,

s/Sean Lock

Sean Lock President and Chief Investment Officer Monarch Bioenergy LLC





April 21, 2025

Chair Liane Randolph California Air Resources Board 1001 | Street Sacramento, CA 95814

Re: Comments on the 3rd 15-day Package

Submitted via email: https://ww2.arb.ca.gov/lispub/comm/bclist.php

Dear Chair Randolph and members of the California Air Resources Board:

The Clean Fuels Alliance America (Clean Fuels)¹ and California Advanced Biofuels Alliance (CABA)² appreciate the opportunity to provide comments on the third 15-day package (3rd 15-day Notice) that was published on April 4, 2025. Clean Fuels and CABA have been longtime supporters of the state's overall climate and air quality improvement goals and have collaborated frequently with CARB staff toward achieving those goals. We have been strong partners with California in its long-term efforts to decarbonize its transportation sector, with its vast portfolio of policies, regulations and incentives that target high priority zero emission technologies and the hugely successful Low Carbon Fuel Standards (LCFS) - the hallmark policy that champions a market-based approach to decarbonizing transportation fuels by being science-driven, fuel-neutral, technology-agnostic, and performance-based. CARB set out a lofty goal to reduce GHG emissions and the members of Clean Fuels and CABA responded swiftly and overwhelmingly to that call...with innovation and investment throughout the supply chain.

Overview

On April 4, 2025, CARB released a Third Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information (third 15-day package) that addresses the issues raised by the Office of Administrative Law's Decision of Disapproval of Regulatory Action (OAL decision) dated February 25, 2025. Clean Fuels and CABA

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¹ Clean Fuels Alliance America (Clean Fuels) is the U.S. trade association representing the entire biodiesel, renewable diesel, and sustainable aviation fuel supply chains including producers, feedstock suppliers, and fuel distributors serving the on- and off-road applications, rail, marine, and heating oil markets. Made from an increasingly diverse mix of resources such as recycled cooking oil, soybean oil, and animal fats, the clean fuels industry is a proven, integral part of America's clean energy future.

² California Advanced Biofuels Alliance is a not-for-profit trade association promoting the increased use and production of advanced biofuels in California. CABA represents biomass-based diesel (BMBD) feedstock suppliers, producers, distributors, retailers, and fleets on state and federal legislative and regulatory issues.

appreciate CARB's quick response to the OAL decision and its efforts towards ensuring a path towards implementing the rule package for 2025.

Clean Fuels and CABA have been strong supporters of the updated CI targets, the Automatic Acceleration Mechanism, and other provisions that are designed to bolster the low credit prices in the LCFS over the last few years. The clean fuels industry needs the regulatory certainty provided by this rulemaking to ensure continued investment to provide lower carbon liquid fuels into the future. In addition, many believe that recent federal actions will delay the transition to zero emissions technologies provide the biomass-based diesel industry with a greater opportunity to contribute domestically-produced low-cost alternatives that can be deployed immediately.

Past Comments

Clean Fuels and CABA would also like to reiterate our significant concerns that we have previously shared with you throughout the rulemaking (including multiple workshops, the ISOR and both 15-day notices) regarding the new provisions that aim to penalize cropbased biofuels, specifically the limit on credit generation from soy, canola and sunflower oil; the land use change values; and the sustainability provisions. In aggregate, these new requirements will create significant barriers to these affected fuels from participating in the future and continue the attack on the fuel-neutral aspect of the LCFS that it was designed to address. We believe that implementing these provisions will:

- Substantially constrain the supply of feedstocks needed to provide California with lower carbon options, leading to the return of fossil diesel as discussed by CARB staff at their April 10, 2024 workshop.
- Delay decarbonization for every 5 years of delay, 13 times more emissions reductions will be required to have the same climate impact³.
- Work against efforts to promote sustainable and climate smart farming practices under development by the agricultural community.

New Comments

1) In subsection 95488(d), staff proposes to change "may choose not to" to "shall not" in order to clarify that the Executive Officer will not accept new fuel pathway applications for biomass-based diesel if the specified conditions are met. The proposed language is:

"Beginning January 1, 2031, the Executive Officer may choose not to shall not accept new fuel pathway applications for biomass-based diesel, if the number of unique Class 3–8 ZEVs reported or registered in California exceeds 132,000 ZEVs or NZEVs on December 31, 2029. The Executive Officer shall provide a notification on the LCFS website by August 31, 2030 if

³ Joos et al, Carbon dioxide and climate impulse response functions for the computation of greenhouse gas metrics: a multi-model analysis, <u>acp-13-2793-2013.pdf (copernicus.org)</u>.

this condition has been met. The Executive Officer will determine whether the condition has been met based on the following evaluation:

- (1) The number of unique Class 3–8 zero-emission vehicles and near-zero emission vehicles (NZEVs), as defined in title 13, CCR, section 1963, reported or registered:
- (A) In CARB's Truck Regulation Upload, Compliance, and Reporting System;
- (B) Pursuant to the California requirements of the Advanced Clean Trucks regulation, as defined in title 13, CCR, section 1963; and
- (C) With the California Department of Motor Vehicles."

Changing this provision from a "may" to a "shall" is of great concern to Clean Fuels and CABA. We question the perceived connection between Class 3 - 8 (medium-and heavy-duty or MHD) vehicles and biomass-based diesel (BMBD) pathways. While we understand that theoretical connection between the electrification of MHD vehicles and the consumption of biomass-based diesel, it does not reason to have this provision in this regulation. CARB staff have publicly acknowledged the need for low-carbon BMBD even when electrification becomes the primary pathway to decarbonization in the MHD sector in California. And why would CARB not approve even lower-carbon BMBD pathways in the future? That seems to be counter to the continuing effort to decarbonize all of California's transportation fuels. In addition, many of the Class 3 - 6 (medium-duty) vehicles are gasoline-fueled and have no impact on the consumption of diesel fuels. If anything, it would make more sense if this provision were restricted to just diesel-fueled vehicles or just Class 7 - 8 vehicles.

- 2) Given the additional time that it has taken CARB to respond to the OAL decision, Clean Fuels and CABA are seeking clarification regarding the next steps for implementation. Our understanding is that CARB must respond to the comments of this 3rd 15-day notice then re-submit the proposed regulation to OAL. OAL then has 30 working days to approve the submission and establish an effective date.
 - Is it possible that different parts of the regulation may have different effective dates or will there be a single effective date for the entire regulation?
 - If the effective date is after June 30, 2025, then how is the step-down of the 2025 carbon intensity reduction targets going to be implemented?
 - If the effective date is retroactive to January 1, then how will the following be implemented?
 - o the requirements for existing certified pathways in subsection 95488.9(g)(5)(A)
 - the requirements for chain-of-custody evidence, feedstock transfer documents, and feedstock attestation letters in subsection 95488.8(g)(1)

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<u>Summary</u>

Clean Fuels and CABA thank CARB staff for their continued efforts to strengthen the LCFS and provide the vision for the program to meet California's carbon neutrality goals. We look forward to OAL approval of this rulemaking in a timely fashion and collaborating with staff on its implementation. Thank you for your consideration of these comments.

Sincerely,

Cory-Ann Wind

Director of State Regulatory Affairs

Cory-Ann Wind

Clean Fuels Alliance America

Carlos Gutierrez

Executive Director

California Advanced Biofuels Alliance



Texas Soybean Association

4205 N. Interstate 27 | Lubbock, Texas 79403

April 21, 2025

Chair Liane Randolph & Members of the Board California Air Resources Board 1001 | Street, Sacramento, CA 95814

Via Electronic Submission

Re: Third 15-Day Changes to the Proposed LCFS Regulation Order

Dear Chair Randolph and Members of the California Air Resources Board:

The Texas Soybean Association appreciates the opportunity to comment on the proposed modifications (Third 15-Day Changes) to the Low Carbon Fuel Standard (LCFS) program. Texas Soybean Association has welcomed engagement with the California Air Resources Board (CARB) and staff throughout this multi-year process to update the LCFS program.

CARB's Third 15-Day Changes to revise the LCFS did not address our major concerns with provisions included in the final amendments approved by CARB. In addition to the new proposals in the Third 15-Day Changes package, Texas Soybean Association remains deeply concerned with the drastic and inequitable pivot CARB has made related to agricultural feedstocks used for biofuels. Texas Soybean Association continues to encourage that updates to the LCFS program are based on up-to-date and sound science, as required by AB-32. Outlined below are our concerns and proposed solutions that will enable CARB to meet its climate goals, protect the environment and all Californians, while also supporting American soybean farmers and processors who are investing in the future of low-carbon energy.

Serious Feedstock Cap Concerns and Proposed Solutions

Texas Soybean Association still has significant concerns with the vegetable oil feedstock cap that was included in the initial 15-Day Changes posted in August 2024. The current proposal restricts the amount of soybean oil, canola oil and sunflower seed oil that is allowed to

generate credits in the program at an inequitable 20% by company. CARB's own data demonstrates that vegetable oil feedstocks, including soy, have consistently exceeded the proposed cap since 2021.

Capping these proven, sustainable, and scalable feedstocks would suppress the supply of renewable diesel, increase reliance on fossil fuels, and raise fuel prices for California consumers. Even CARB staff acknowledged in the April 2024 workshop that a cap would reduce air quality benefits and likely increase NOx and PM2.5 emissions. All of this, including the recent tariffs on imported feedstocks greatly increase costs and further substantiate U.S. based feedstocks as the clear-cut choice. Texas Soybean Association urges CARB to remove the cap on U.S. based vegetable oil feedstocks to provide a more economically feasible, locally produced and sustainable, climate smart option for the people and the planet.

Agricultural feedstocks for biofuel production are already held to a high standard for participation in the U.S. Renewable Fuel Standard (RFS). Rather than adding sustainable U.S. based feedstocks to its arbitrary proposed cap, CARB needs to update carbon intensity analysis and oversight of imported feedstocks, which are not held to the same level of accountability. Recent actions by the European Union in response to fraudulent Chinese biodiesel imports underscore this concern¹. The EU committee recently met at the request of a member state to discuss alleged fraud in biodiesel imports from China. Fraud continues to be an issue with imported feedstocks and needs to be addressed further. Texas Soybean Association strongly encourages CARB to adopt enforceable traceability and verification standards, including origin disclosures, documentation audits, and physical testing. Without implementing sustainable solutions to the above and not eliminating a cap on U.S. vegetable oil feedstock, CARB is essentially putting the feedstocks from foreign countries (i.e., China) above those of the United States.

Sustainability Guardrails and Traceability Concerns

Texas Soybean Association remains very concerned about the sustainability guardrails. The sustainability guardrails are more onerous than the specified source requirements used for non-U.S. waste feedstock imports. Palm oil in Southeast Asia has had forced labor concerns², but CARB does not require used cooking oil derived from palm to track social or economic sustainability. Concerningly, petroleum does have to track these criteria. CARB's proposal makes it administratively easier to use non-sustainable petroleum³ in the state than biofuels that have lower carbon intensity (CI) scores and are produced from sustainable feedstocks grown in the United States. Land use change is already captured in the indirect land use change (ILUC) score, which still makes it unclear what actual purpose the guardrails serve.

¹ EU industry demands answers as 'fraudulent' Chinese biofuels continue to flow - Euractiv

² https://apnews.com/article/virus-outbreak-only-on-ap-indonesia-financial-markets-malaysia-7b634596270cc6aa7578a062a30423bb

³ https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.858512/full

If CARB insists on agricultural feedstock traceability, then it should reward sustainable practices beyond what is already assumed in the lifecycle analysis (LCA). The U.S. Department of Agriculture (USDA) has developed a tool to quantify the CI reductions for no-till, cover crops and nitrogen inhibitors. Considering this integral information, the carbon intensity of soy-based biofuels could improve through the mentioned climate smart ag practices on the field where the soybeans were produced. Other farming practices like low-till, nutrient management, enhanced efficiency fertilizers, buffers, wetland and grassland management, tree planting on working lands, planting for higher carbon sequestration, and soil amendments all could and should be accounted to assign a lower CI score to an agricultural feedstock. USDA already tracks all these practices through several of their managed conservation programs. In addition, there are a variety of other practices that scientifically lower the CI score of soybean feedstocks for biofuels, and USDA is actively working to develop mechanisms to account for those. If CARB insists on tracing feedstocks back to the farm, then it should also acknowledge when those feedstocks are produced with lower CI practices.

Moreover, USDA has recognized the CI reduction benefits of certain sustainable or climate-smart practices for the purposes of clean fuel transportation programs and is undertaking a rulemaking process to develop final guidelines for the quantification of these practices. Through planting decisions, soil management, and other practices, soybean farmers can continuously reduce environmental impacts. In addition, some soybeans are double cropped meaning they are grown as a secondary crop following a primary crop within a growing season. They are not displacing other crops or land uses. Double-crop soybeans should be eligible to have the ILUC component of the CI score removed or at least shared with the other crop in the rotation. Texas Soybean Association proposes the aforementioned issues to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Modernized, Accurate, Climate Smart Carbon Intensity Modeling and Scoring

Texas Soybean Association remains concerned that without a comprehensive update to the Global Trade Analysis Project model for biofuels (GTAP-BIO) that CARB utilizes, U.S. soy-based feedstocks will be phased out of the LCFS even without the additional limitations included in the Second and Third 15-Day Changes. Current data indicates a much lower CI score for U.S. soybeans, as growers continue to improve soil practices, limit water use, lower on-farm emissions and more. CARB is recommending stringent sustainability guardrails for U.S. soy but is still on track to likely phase-out U.S. soy-based biofuels from credit generation by approximately 2035 or sooner.

As CARB looks to develop a more aggressive auto acceleration mechanism to reach CI reduction benchmarks sooner, using outdated methodologies will only limit the output of actual improvement over time in terms of emissions reductions. As CARB updates all other major lifecycle emissions models through this rulemaking, Texas Soybean Association once again urges action to update the GTAP-BIO model so that the most current, climate smart and

science-based data may be used to determine carbon intensity reductions. The reasoning and sources indicated in the Third 15-Day Changes do not address this concern and need to be revised to ensure accuracy. Texas Soybean Association proposes this issue to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Equitable Entities Eligible to Apply for Fuel Pathways

Texas Soybean Association is very concerned about CARB's decision to give the Executive Officer authority to stop accepting new pathways for biomass-based diesel starting in January 2031. Texas Soybean Association does not understand how this benefits the LCFS. Under AB-32, CARB must under statute minimize costs and maximize GHG reductions. It is unclear how this is served by rejecting new pathways. In fact, the LCFS is best served by allowing the most available and equitable pathways. If these pathways cannot achieve cost-effective GHG savings, they will not be utilized by the market in the LCFS. In essence, an increase in pathways can only serve to improve GHG benefits in California. Singling out a single fuel for prejudicial treatment is baffling given the goals of the LCFS and the authority that establishes it. Texas Soybean Association urges CARB to continue to allow equitable pathways forward with no date of denial.

Recommended Climate Enhancing Solutions for CARB

As CARB finalizes its update to the LCFS, Texas Soybean Association recommends several actions that will likely prevent an increase in fossil diesel use, improve carbon intensity calculations, and improve market access for sustainable U.S. agricultural feedstock providers.

First, CARB should not apply the vegetable oil feedstock cap proposal to U.S. feedstocks. As noted, these feedstocks are already subject to federal guardrails to ensure production on land not converted since 2008. The RFS was designed specifically to prevent land conversion for biofuel production, and USDA data shows a decrease in farmland over the same period.

Second, CARB should convene an expert working group to consider issues related to the sustainability provisions and indirect land use change (ILUC). Texas Soybean Association recommends that this expert working group convene before the end of 2025 and provide recommendations by the end of Fall 2026.

Third, Texas Soybean Association retains strong concerns about the ability of supply chains to comply with the sustainability guardrails. If CARB does move forward with the guardrails, they must reconsider its proposed sustainability requirements to allow soybean growers the opportunity to participate in the California biofuels market through innovative and climate smart agriculture practices. If traceability can be used to show additional benefits in CI scoring, CARB must look to programs already developed through farmer input and provide improved scoring for feedstocks that employ sustainability practices to minimize the changes in comparative costs (i.e., USDA accredited programs and practices). CARB should work with USDA to develop an aligned scheme to quantify climate-smart agricultural practices for the purposes of biofuel feedstocks. USDA has already engaged with CARB regarding this project, which could be applied to the work that CARB is doing on traceability and carbon quantification of agricultural biofuel feedstocks.

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Lastly, CARB must undertake a comprehensive update of the GTAP-BIO model for soybean oil used in biofuel production. Without using the most up-to-date and accurate data, CARB is doing a disservice to the U.S. feedstock producers and California's citizens by calculating carbon intensity scores not rooted in current facts. Through CARB's own analysis we know prejudicial feedstock treatment will lead to more emissions in the California transportation sector, harming the environment.

Concluding Thoughts/Pathway Forward

Texas Soybean Association is encouraged by the continued successes of programs that support the development of cleaner, low-carbon fuels. However, it is critical that CARB finalizes updates in a way that equitably include U.S. agricultural feedstocks through policies that are science-based aligning with the most up to date information as well as promoting the sustainability of U.S. based products and businesses; including the elimination of capping on U.S. vegetable oil feedstocks and applying sustainability guardrails that are economically feasible for farmers while rewarding their practices that lower CI.

CARB's Third 15-Day Changes did not address any of the fundamental issues raised by Texas Soybean Association in the First and Second 15-Day Changes and fails to acknowledge the potential unintentional consequences of a feedstock outlined by its own employees in previous discussions. CARB is required under the law to achieve the maximum technically feasible and cost-effective reductions in greenhouse gas emissions. The most recent 15-Day Changes show a lack of willingness to achieve the statutory obligations set forth in AB-32 and neglect modernized, climate smart, science-based solutions, ultimately disregarding the protection of U.S. based feedstocks, the people, and the planet. Texas Soybean Association also asks that CARB respond in writing to further substantiate their decisions regarding our concerns expressed in this letter. We look forward to your written responses as a state regulatory body, whose responsibility is to protect its' citizens and the environment by providing transparency on decisions made for those of impact.

Texas Soybean Association is eager to continue working with CARB to support the role of agriculture in diversifying the fuel supply while reducing carbon intensity and increasing clean air in California and beyond. On behalf of U.S. soybean farmers, we appreciate the opportunity to comment and look forward to collaborating with CARB and other relevant stakeholders on implementation of policies that expand the use of U.S. soy-based biofuels and market opportunities for U.S. soybean farmers.

Sincerely,

Daniel Berglund President – Texas Soybean Association



1730 South St. | Redding, CA | 96001

Matthew Botill California Air Resources Board 1001 I Street Sacramento, California 95814

April 21, 2025

Re: Maas Energy Works Comments on Low Carbon Fuel Standard Third 15-Day Amendments

Dear Mr. Botill:

Maas Energy Works (MEW) respectfully submits these comments to the California Air Resources Board (CARB) in response to the April 4, 2025, *Third Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information* Proposed Low Carbon Fuel Standard (LCFS) Amendments – the Third 15-Day Package.

MEW is a family-owned business based in Redding, California. We develop, own, and operate onfarm renewable energy facilities. We work with dairy families to create biogas from cow manure and other organic waste. That biogas is then used to generate vehicle fuel - usually compressed natural gas, but we can also produce electricity and hydrogen. Our ~180 employees operate the nation's largest fleet of dairy digesters, with ~50 operational facilities right here in California and more than 20 additional projects in development. We are positioned to continue building if market conditions remain viable.

We support the proposed Third 15-Day Amendments and urge CARB and the Office of Administrative Law (OAL) to finalize and implement the rule without further delay. After several years of regulatory uncertainty and declining credit values, the LCFS market needs stability. Finalizing this rule will restore market confidence and ensure that project developers can continue investing in clean fuel infrastructure.

The new rules are not necessarily favorable to dairy biogas, as they include a reduction in the number of years that dairy biogas projects can remain eligible to claim avoided methane benefits, among other policies that we hope may be later changed. However, the overall state of the LCFS market requires clarity and stability, and so we urge rapid adoption of the new rules.

We thank CARB staff for their tireless work to strengthen the LCFS and we encourage immediate action to implement the updated rule.

Sincerely,

Dallas Spiecker – Public Affairs & Marketing Communications Maas Energy Works

www.maasenergy.com Page 1



April 21, 2025

Mr. Matthew Botill California Air Resources Board 1001 I Street Sacramento, California 95814

Re: Aemetis, Inc. Comments on Low Carbon Fuel Standard Third 15-Day Changes

Dear Mr. Botill:

Aemetis is one of California's largest biofuels producers, with over 60 million gallons per year of renewable fuel ethanol and approximately 500,000 MMBtu of dairy-based renewable natural gas - which will double in the next three years. Aemetis has been an active credit generator in the LCFS program since 2011 and has invested hundreds of millions of dollars in building and operating assets that positively contribute to the state's climate initiatives by reducing GHG and methane emissions.

Aemetis respectfully submits these comments to the California Air Resources Board (CARB) in response to the April 4, 2025, Third Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information Proposed Low Carbon Fuel Standard (LCFS) Amendments (Third 15-Day Package).

Aemetis Strongly Urges CARB to Quickly Restore Investment Certainty for Clean Fuels

Aemetis has been a strong participant advocate of the LCFS program for nearly two decades. The LCFS program is a proven and successful framework, and the availability of clean fuels incented by the LCFS has exceeded expectations. As such, other states and nations have used the LCFS as a model. RNG development is one of the first major low carbon fuel industries built primarily around the LCFS program – with CARB's strong encouragement. We have been successful because of CARB's prior strong rulemaking and commitment to clean fuels, which in turn has encouraged significant private investment across the RNG and other clean fuels sectors.

Transportation remains the largest source of greenhouse gas (GHG) emissions in California, and additional deployment of a variety of low carbon fuel supply is clearly achievable. The only significant barrier blocking the program's continued success is the regulatory delay in enhancing the program's ambition. Given the LCFS credit surplus and low credit price for the past few years, a significant step-down in the Annual Carbon Intensity (CI) Benchmarks cannot be delayed any further. We believe CARB's top priority should be immediate finalization and a

January 1, 2025, effective date for the lower 2025 carbon intensity Benchmark requirements in Section 95484 of the new rule.

All parties received adequate notice throughout this extended rulemaking process and are prepared for implementation the new Benchmark effective at the start of the 2025. Clean fuel credit generators—such as RNG producers—should not be punished with any further administrative delays to the rule, either from CARB or OAL. Obligated parties (deficit generators) are all well informed about the rule changes and further delays are not necessary. This has been a highly transparent multi-year process with ample public hearings and opportunities for all concerned parties to participate and comment. It is time to move forward with implementation.

Conclusion

At current LCFS prices, and in the face of the programmatic uncertainty created by years of discussion on this rulemaking, new RNG projects driven by the LCFS will be extremely limited until this rule is finalized. Additionally, existing funding covenants and future investments are at serious risk due to delays in implementation.

Finalizing and implementing the rule will restore investment certainty, leverage renewable gas production to increase methane destruction, add additional jobs in economically disadvantaged communities, and further decarbonize California's transportation sector. We thank CARB for your continued work and look forward to the swift conclusion of this rulemaking.

Singerely

Andy Foster

President – Advanced Fuels

Aemetis, Inc. (408) 213-0928

andy.foster@aemetis.com





April 21, 2025

Clerk of the Board and Members of Board California Air Resources Board 1001 I Street Sacramento, CA 95814

Via Electronic Submittal

RE: Communities for a Better Environment and Earthjustice Comments on the Low Carbon Fuel Standard Third 15-Day Changes.

Chair Randolph and Members of the California Air Resources Board:

Communities for a Better Environment and Earthjustice submit the following comments on the Third Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information regarding amendments to the Low Carbon Fuel Standard (LCFS).¹

In response to the Office of Administrative Law's (OAL) February 25, 2025 disapproval of the LCFS amendments that the Board approved for adoption at the November 8, 2024 Hearing, staff proposes changes that significantly worsen the program in favor of polluting fuels. While we applaud the proposal to preserve the Clean Fuel Rewards program consistent with Board direction, we urge CARB to (1) reject increased subsidies for fossil-fuel derived hydrogen and to (2) boost support for electric vehicles (EVs) so that California can meet its air quality and climate goals notwithstanding federal rollbacks.

First, the proposed changes to Subsection 95482(h) in title 17 of the California Code of Regulations (CCR) would increase production of fossil hydrogen paired with carbon capture and storage (CCS), resulting in increased emissions of greenhouse gases (GHGs) and other

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¹ CARB, Third Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information, Proposed Low Carbon Fuel Standard Amendments (Apr. 4, 2025) ("Third 15-Day Change"), https://www2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/3rd_15day_notice.pdf.

pollutants. These significant changes are inconsistent with California's climate, air quality, and equity goals, exceed the scope of the OAL decision, and contradict Board Resolution 24-14. They also require CARB to both readopt the regulations under the California Administrative Procedure Act (APA) and to evaluate new impacts under the California Environmental Quality Act (CEQA). The OAL did not require these substantive changes to LCFS hydrogen policy, nor did the Board authorize staff to make them at this juncture. As a result, CARB must either reject the proposed changes to Subsection(h) or readopt the regulation after conducting additional environmental review.

Second, staff fails to propose enhanced crediting for EV charging even though it proposes increased support for hydrogen refueling. At a time when federal support for EVs is highly uncertain, CARB must boost LCFS support for EVs so that California can meet its air quality and climate goals despite Trump administration attacks.²

I. CARB must reject staff's proposed revision of the Board's decision to both end subsidies for fossil hydrogen by 2035 and require 80% "renewable" hydrogen by 2030.

The LCFS amendments that the CARB Board approved in November mandate that (1) starting in 2035, fossil fuel-derived hydrogen can no longer receive LCFS subsidies and that (2) 80% of hydrogen dispensed as a vehicle fuel must be "renewable" by 2030.³ The newly proposed changes would reverse course on both fronts. Specifically, they would exempt fossil hydrogen from the 2035 phase-out so long as that fossil hydrogen is paired with CCS technologies, and they would allow this fossil hydrogen paired with CCS to count toward the 80%-by-2030 requirement.⁴ CARB must reject these changes because they lack evidentiary support and will cause a wide range of environmental harms.

A. CARB staff fails to justify this significant and harmful departure from the policy that the Board adopted at its November 2024 hearing.

The OAL did not identify any issues that would require amendment of Subsection 95482(h) and CARB staff has not identified evidence to support changes that section. In the Final Statements of Reasons (FSOR), responding to comments critical of Subsection 95482(h)'s

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² All cited sources are accessible by hyperlink in the footnotes to these comments. In addition, we have emailed the Clerk of the Board all cited sources that are not already in the record. All sources are thus readily accessible to CARB and thus submitted for inclusion in the record. See Pub. Res. Code § 21167.6(e)(7); *Consolidated Irrig. Dist. v. Superior Court* (2012) 205 Cal.App.4th 697.

³ CARB, Attachment A-1, Final Regulation Order https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/fro_atta-1.pdf at 37 (Section 95482(h)).

⁴ Id. at 36-37 (changes to Section 95482(h)).

limits on fossil hydrogen, CARB states that "timing of this provision in the Proposed Amendments aligns with the current operational timeline for projects funded under the hydrogen hubs grants, which will expand the supply of renewable hydrogen in California starting in the early 2030s and aligns with mandates that 90% of electricity retail sales be renewable or zero carbon by 2035 (SB 1020 (Laird, Chapter 361, Statutes of 2022))." In the changes that CARB staff now proposes, it has not identified any new facts since publication of the FSOR that alter this rationale.

CARB staff states that the proposed modifications to this Subsection "would allow the LCFS to further support growing supplies of low-CI hydrogen in alignment with federal incentives and investment in carbon dioxide removal technology as well as California's 2022 Scoping Plan for Achieving Carbon Neutrality." However, the Scoping Plan cannot justify this weakening of the LCFS. Indeed, the certified Environmental Impact Analysis (EIA) for the amendments explains that excluding fossil-derived hydrogen from the LCFS will align the regulation with the 2022 Scoping Plan Update. In relevant part, it states:

The 2022 Scoping Plan Update identified a need for low-carbon, renewable hydrogen for the transportation sector (among other sectors) to displace fossil fuels in support of achieving the State's greenhouse gas emission reduction goals. The 2022 Scoping Plan Update scenario did not include hydrogen produced from fossil fuels, with or without carbon capture as low-carbon, renewable hydrogen.⁷

It would be illogical to encourage investments in long-lived assets to capture carbon dioxide at fossil hydrogen production facilities when the 2022 Scoping Plan Update does not foresee this equipment operating in a carbon-neutral California in 2045. Thus, the proposal would encourage investment in stranded fossil fuel infrastructure, in direct conflict with the 2022 Scoping Plan Update.

CARB staff's other stated rationales for the proposed changes are equally unpersuasive. Subsection 95482(h) already aligns with federal incentives because it provides a market for renewable hydrogen that the federal government is incentivizing with a generous \$3/kg production tax credit.⁸ Even if the federal government also provides incentives for fossil hydrogen, that federal policy does not justify weakening California's rules to accommodate fossil

https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/3rd 15day notice.pdf.

https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/lcfs final eia.pdf/

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⁵ CARB, Final Statement of Reasons (FSOR) at 358 https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/fsor appa.pdf.

⁶ CARB, Third 15-Day Notice,

⁷ CARB, Final EIA at 19

⁸ 26 U.S.C. § 45V.

fuels that are inconsistent with the State's plan for achieving its climate goals. Also, it is unclear what the proposed change to Subsection 95482(h) has to do with "investment in carbon dioxide removal technology," which are strategies for taking carbon out of the atmosphere—not abating a specific facility's emissions.⁹

B. Expanding California subsidies for fossil-fuel derived hydrogen paired with CCS poses numerous risks to the environment and human health.

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Fossil hydrogen production with CCS creates significant impacts upstream throughout the fossil gas supply chain, harms the communities closest to the production facilities, and imposes downstream risks associated with the transportation and storage of carbon dioxide. CARB does not address any of these risks or impacts in its proposal to weaken Subsection 95482(h). As detailed below in Section III, these impacts are potentially significant and have not been evaluated in the EIA.

Producing hydrogen from fossil gas induces more production of fossil fuels, with concomitant harms to public health and the environment. Adding CCS to the process increases the demand for fossil gas because CCS equipment requires a significant amount of energy to operate. One reason that the hydrogen industry's demand for fossil gas threatens public health is that many kinds of equipment throughout the fossil gas supply chain emit hazardous and carcinogenic air pollution. This upstream activity also destabilizes the climate by emitting methane. Indeed, the high methane emissions observed in the fossil gas supply chain are a key reason why one recent study found that hydrogen produced from fossil gas with CCS is an even more greenhouse gas-intensive source of heat than fossil gas or coal.

In implementing the LCFS, CARB fails to properly account for these upstream methane emissions because they rely on a version of the GREET model that improperly assumes an

⁹ See, e.g., CARB, 2022 Scoping Plan Update at 84, Figure 2-2,

https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf (distinguishing Carbon Capture and Storage "from a facility" from Carbon Dioxide Removal "from ambient air").

¹⁰ Robert W. Howarth & Mark Z. Jacobson, *How green is blue hydrogen?*, at 1681, Energy Sci. & Eng'g (2021) 2021;9:1676–1687 ("Howarth & Jacobson"),

https://onlinelibrary.wiley.com/doi/epdf/10.1002/ese3.956 (estimating that "upstream emissions of unburned methane from the energy used to drive carbon capture are between 9.5 g CO2eq per MJ if only the SMR carbon is captured and 18 g CO2eq per MJ if the flue-gas emissions are also captured").

¹¹ Clean Air Task Force, Fossil Fumes (2022 Update) at 5, https://cdn.catf.us/wp-content/uploads/2016/06/14175846/fossil-fumes-report-2022.pdf.

¹² Howarth and Jacobson at 1679, Table 1 (estimating the contribution of fugitive methane emissions and other emissions sources to the total carbon-intensity of different hydrogen production technologies); *id.* at 1683 (comparing carbon-intensity of hydrogen produced from fossil gas with CCS to that of other fossil fuels).

upstream leakage rate of about 1%. ¹³ This flawed assumption stems from two basic methodological errors: relying on self-reported data from the oil and gas industry and using national data, when California's gas supply comes from shale fields with especially high leakage rates. According to one recent study, on average, fossil gas consumed in California has a production-stage methane leakage rate of 2.8%. ¹⁴ Thus, CARB ignores about two thirds of the significant upstream climate impacts of producing hydrogen from fossil fuels with CCS for use in the LCFS.

Producing hydrogen from fossil gas with CCS is a heavy industrial activity with several potentially significant local environmental impacts. The dominant technology for producing hydrogen from fossil fuels in California and the rest of the United States is steam methane reformation (SMR). As detailed in prior comments and recent studies, SMR facilities release criteria air pollution¹⁵ and hazardous air pollution.¹⁶ Powering energy-hungry CCS equipment could further increase emissions.¹⁷ Also, CCS equipment that uses amine-based solvents could cause additional environmental and public health harms because these solvents are potential carcinogens that adversely affect aquatic life and may contribute to smog formation and contaminate drinking water.¹⁸ After the solvent is used, the degraded amine product becomes

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¹³ CARB, CA-GREET3.0 Model, https://www.arb.ca.gov/fuels/lcfs/ca-greet/ca-greet30-corrected.xlsm?_ga=2.176366309.1181395569.1744834010-466423198.1662166685 (Table 4.3 in the "Inputs" tab lists 1.14% as the total CH4 leakage rate for conventional natural gas production and 1.21% as the leakage rate for shale gas production).

¹⁴ Diana Burns & Emily Grubert, *Attribution of production-stage methane emissions to assess spatial variability in the climate intensity of US natural gas consumption*, at 6, 16 Environmental Research Letters 4 (2021), https://iopscience.iop.org/article/10.1088/1748-9326/abef33.

¹⁵ Sun et al., *Criteria air pollutants and greenhouse gas emissions from hydrogen production in U.S. steam methane reforming facilities*, 53 Env. Sci. Tech. 7103-7113 (2019), https://pubs.acs.org/doi/10.1021/acs.est.8b06197.

¹⁶ An air toxics health risk assessment completed for the Air Liquide El Segundo Hydrogen plant found maximum "offsite" cancer risks of 7.1 per million for a 30-year exposure, with diesel particulate matter from internal combustion engines and hexavalent chromium from the reformer heater identified as the primary cancer risk drivers. Davenport Engineering, Inc., *Health Risk Assessment RY 2016*, prepared for Air Liquide El Segundo Hydrogen Plant, (July 30, 2020) at PDF 10, https://www.aqmd.gov/docs/default-source/planning/risk-assessment/air-liquide/air-liquide-el-segundo-2016-hra-(id148236).pdf.

¹⁷ For instance, the most recent annual reporting for Shell's Quest CCS project at an SMR facility in Alberta Canada states that it incurred an energy penalty of .67 MJ_c/kg from electricity usage to capture, transport and store carbon dioxide and a net energy penalty of 2.02 MJ_{th}/kg, primarily due to the thermal energy required to produce steam for carbon dioxide capture and transport. Shell, Quest GHG and Energy Report for 2023 (Feb. 2024), Table 1, https://open.alberta.ca/dataset/e90a4e6e-2c11-44ee-b198-de244261c585/resource/8c471776-1700-457b-a58b-6c9da68c1962/download/quest-annual-status-report-2023-ghg-energy-report-2023.pdf.

¹⁸ Yukyan Lam et al., Environmental Justice Concerns with Carbon Capture and Hydrogen Co-Firing in the Power Sector, The New Sch. Tishman Env't and Design Ctr. (June 2024), at 16, https://njeja.org/wp-content/uploads/2024/07/CCS-EJ-White-Paper.pdf; see also sources cited as references in Yukyan Lam et al. at 42-61 (citations omitted here and submitted attached to these comments).

hazardous waste. ¹⁹ Producing hydrogen from fossil fuels with CCS could also threaten local water supplies, as SMR of fossil gas with CCS requires more water than electrolytic hydrogen production. ²⁰

Producing hydrogen with CCS also creates downstream impacts from transporting and storing carbon dioxide. Carbon dioxide pipelines pose various environmental and health threats. Carbon dioxide's interaction with impurities, such as water and hydrogen sulfide, can compromise pipe integrity and increase the risk of corrosion and failure, which could lead to the re-release of carbon dioxide into the atmosphere and lead to a public health emergency because carbon dioxide is an asphyxiant. Long-term carbon dioxide sequestration via saline aquifers poses various environmental threats, including potential contamination of shallow aquifer waters and leakage of carbon dioxide back into the atmosphere. The fossil fuel industry may use the carbon dioxide captured at hydrogen production facilities for enhanced oil recovery (EOR). Using carbon dioxide for EOR contravenes California's climate goals by stimulating oil production, yet the LCFS' carbon accounting for hydrogen produced from fossil fuels with CCS does not account for its contributions to the supply of petroleum.

Finally, the proposal to end crediting for fossil hydrogen without CCS in 2035 has the same practical effect as simply deleting Subsection 95482(h)'s requirement to phase out fossil hydrogen and nullifies the intent of the Board in approving the regulation. In 2035, fossil hydrogen will not have a relevant credit generation opportunity, regardless of Subsection 95482(h). Under the amendments the Board approved in November 2024, the benchmark carbon intensity for California transportation fuels would be 47.09 gCO_{2e}/MJ in 2035 unless the Automatic Acceleration Mechanism (AAM) increases the stringency of the standard. The energy efficiency ratios for hydrogen vehicles range from 1.6–2.5. Therefore, in the unlikely scenario that the AAM does not accelerate benchmarks by 2035, the hydrogen industry would

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¹⁹ Id. at 17.

²⁰ International Renewable Energy Agency, Water for hydrogen production (2023), Figure S1, https://www.irena.org/-

[/]media/Files/IRENA/Agency/Publication/2023/Dec/IRENA_Bluerisk_Water_for_hydrogen_production_2023.pdf.

²¹ Richard Kuprewicz, Accufacts' Perspectives on the State of Federal Carbon Dioxide Transmission Pipeline Safety Regulations as it Relates to Carbon Capture, Utilization, and Sequestration within the U.S., prepared for the Pipeline Safety Trust (Mar. 23, 2022), https://pstrust.org/wp-content/uploads/2022/03/3-23-22-Final-Accufacts-CO2-Pipeline-Report2.pdf.

²² Hannah Klaus et al., Uncertainties and Gaps in Research on Carbon Capture and Storage in Louisiana, Ctr. for Progressive Reform (June 2023), https://cpr-assets.s3.amazonaws.com/wp/uploads/2023/06/ccs-in-louisiana-rpt-june2023-final.pdf.

²³ For instance, Air Products and Chemicals supplies the carbon dioxide it captures at an SMR facility in Port Arthur, Texas, for EOR. U.S. Department of Energy, APCI Port Arthur ICCS Project, https://www.energy.gov/fecm/air-products-chemicals-inc.

²⁴ 17 CCR § 95484, Table 1.

²⁵ 17 CCR § 95486.1, Table 5.

need to supply hydrogen with a CI below 117.25 gCO_{2e}/MJ to generate credits in 2035.²⁶ However, the temporary CI for hydrogen produced from fossil gas without CCS is 195 gCO_{2e}/MJ,²⁷ suggesting that a CI of 117.25 gCO_{2e}/MJ is likely out of reach for this fuel. There is no evidence that prohibiting credit generation with hydrogen produced from fossil gas with CCS in 2035 changes the compliance options available to industry. In essence, CARB staff proposes to replace a meaningful limitation on incentives for polluting activity with an inconsequential, ineffectual one.

II. If CARB does not reject the proposed changes to Subsection 95482(h), the California Administrative Procedure Act requires it to readopt the regulation.

Under the APA, if CARB makes new, significant changes to a regulation in response to OAL's disapproval, CARB must readopt the regulation. Cal. Gov. Code § 11349.4 (a). In relevant part, Subsection 11349(a) of the California Government Code provides that "[i]f the regulation has been significantly changed... the agency shall comply with Article 5 (commencing with Section 11346) and readopt the regulation." Id.

First, the proposed changes to Subsection 95482(h) are significant within the meaning of Subsection 11349.4 (a) because they substantially alter the limits placed on fossil fuel-derived hydrogen in the LCFS. As detailed above in Section I, these changes will impact LCFS credit generation for fossil hydrogen paired with CCS and adversely impact the environment and human health in numerous ways.

Second, the proposed changes improperly exceed the scope of the changes that OAL called for in disapproval decision. Pursuant to Government Code Section 11349.1, OAL reviewed the proposed LCFS amendments and found that they failed to comply with the APA's procedural and clarity requirements. ²⁸ OAL provided a detailed discussion of the 26 sections that required revision and identified procedural deficiencies. ²⁹ Nowhere in its discussion did OAL identify concerns with Subsection 95482(h). Indeed, the OAL decision does not so much as mention the word hydrogen. Likewise, in its justification of the proposed Subsection 95482(h), CARB staff does not assert that they were made in response to OAL's decision. Without following the procedure set forth in the APA, CARB may not seize upon the OAL's disapproval of its regulation to substantively change key provisions of the regulation. But for the OAL's

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 $^{^{26}}$ 47.09 x 2.5 = 117.25. It is generous to assume that hydrogen vehicles in 2035 would have an EER of 2.5 because this is the EER listed for light- and medium-duty vehicles, segments where it is especially difficult for hydrogen to compete against battery electric technologies. The EER listed for hydrogen heavy-duty trucks is 1.9. § 95486.1, Table 5.

²⁷ 17 CCR § 95488.9, Table 8.

²⁸ OAL Decision at 2, 22.

²⁹ Id. at 3-22.

disapproval, the LCFS amendments as submitted to OAL for approval would have been adopted and deemed effective when OAL reached its approval decision in February. CARB cannot take another bite at the apple and change LCFS hydrogen policy simply because it submitted a regulation that was rejected by OAL. The APA prohibits such machinations by requiring readoption for any significant changes made after OAL review, Cal. Gov. Code § 11349.4(a), and by setting forth detailed procedures for public participation in the rulemaking process. *See* Cal. Gov. Code § 11346 et seq.

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Third, the issues raised by these proposed changes were not addressed at the November 8, 2024 Board hearing and could not have been anticipated from the existing record. CARB never proposed allowing fossil hydrogen paired with CCS to count toward the 80%-by-2030 goal nor did it suggest that it would exempt such hydrogen from the 2035 phase out deadline. There was no discussion of this possibility at the Board hearing, and the public could not have anticipated CARB's reversal in its hydrogen policy based on the record. As noted above, CARB's statements justifying the Board-approved version of Subsection 95482(h) indicated to the public that CARB thought only renewable hydrogen was consistent with 2022 Scoping Plan update, not hydrogen derived from fossil fuels, as now proposed. In response to myriad comments about Subsection 95482(h)'s consistency with the Scoping Plan, CARB stated in the FSOR that Subsection 95482(h) aligns with the Scoping Plan because "[t]he 2022 Scoping Plan Update scenario did not include hydrogen produced from fossil fuels, with or without carbon capture, as low-carbon, renewable hydrogen."³⁰ CARB also stated in the FSOR that "[t]he proposed amendments do not preclude the use of carbon capture and sequestration on hydrogen production, provided that fossil gas is not the primary feedstock."31 Also, responding to comments critical of Subsection 95482(h)'s limits on fossil hydrogen, CARB asserted that "timing of this provision in the Proposed Amendments aligns with the current operational timeline for projects funded under the hydrogen hubs grants, which will expand the supply of renewable hydrogen in California starting in the early 2030s and aligns with mandates that 90% of electricity retail sales be renewable or zero carbon by 2035 (SB 1020 (Laird, Chapter 361, Statutes of 2022))."32 Thus, none of CARB's statements in the record indicate that it would reverse course on these fossil hydrogen limits. And as noted above, in the changes that CARB staff now proposes, it has not identified any new facts since publication of the FSOR that alter its FSOR rationale.

CARB's EIA also underscores the centrality of the fossil hydrogen limits in Subsection 95482(h) to CARB's regulatory package as approved for adoption by the Board. In the EIA's "Description of the Proposed Amendments to the Low Carbon Fuel Standard," CARB lists "Remove Eligibility of Fossil Fuel-Derived Hydrogen" as one of the major changes to the

³⁰ CARB, FSOR at 512 (emphasis added)

³¹ Id

³² CARB, FSOR at 358

regulation, and again states that "[t]he 2022 Scoping Plan Update scenario did not include hydrogen produced from fossil fuels, with or without carbon capture as low-carbon, renewable hydrogen." Thus, there was no reason for the public to anticipate that CARB would change course and later claim that hydrogen made from fossil fuels and paired with CCS would be deemed consistent with the 2022 Scoping Plan or allowed to generate credits beyond 2035, when the EIA's analysis and findings were based on a Project that ended credits for all fossil hydrogen in 2035. Because the proposed changes were not addressed at the public hearing and could not have been anticipated from the existing record, they must be subject to the appropriate public process under the APA. Cal. Gov. Code §§ 11349.4 (a); 11346.8(c).

Finally, the proposed changes are directly contrary to Board Resolution 24-14. In relevant part, the resolution directs the Executive Officer to "monitor, report back to the Board as part of the next Scoping Plan Update, and propose any adjustments, if any of the following conditions may impede successful expansion of similar GHG reduction policies in other jurisdictions or impede the ability of the State to achieve its air quality and climate goals, and transition to zero emission technology," including "[h]ydrogen fuel availability to meet growing demand and role of state and federal incentives, including alignment with federal hydrogen incentives to increase hydrogen supply;"³⁵ This direction specifically contemplates the possibility of future changes to state and federal hydrogen policy as well as hydrogen supply and mandates the following course of action: (1) the Executive Office must report back to the Board at the next Scoping Plan update (which is required by 2027); (2) based on that reported information, the Board will review and approve of any "adjustments" to the LCFS regulations. The Resolution 24-14 does not authorize any changes to the regulation's hydrogen provisions at this juncture, nor does it authorize the Executive Officer to make changes to the regulations without Board consideration and approval. Thus, CARB must readopt the regulation if it makes the proposed Subsection 35482(h) changes.

III. Additional environmental review, including review of localized impacts, is required if CARB does not reject the proposed changes to Subsection 95482(h).

In addition to requiring readoption under the APA, CARB's proposed changes to Subsection 95482(h) will alter the Project such that new and additional environmental review is required under CEQA. Whenever a public agency must make a further discretionary decision to

³³ CARB, Final EIA at 19.

³⁴ Further, CCS was discussed in a meet that CARB staff had with CARB's Environmental Justice Advisory Committee. staff never suggested to the EJAC that it would propose amendments to the LCFS that would incentivize CCS paired with hydrogen in these amendments. https://ww2.arb.ca.gov/sites/default/files/barcu/board/mt/2024/mt091224.pdf.

³⁵ CARB Board Resolution 24-14 at 7,

https://ww2.arb.ca.gov/sites/default/files/barcu/board/res/2024/res24-14.pdf (emphasis added).

carry out or approve a project for which it has previously issued an approval, the agency must determine whether further environmental review is required due to changes in the project, changes in circumstances, or new information. *Department of Water Resources Environmental Impact Cases* (2022) 79 Cal.App.5th 556, 576. Here, CARB has proposed significant Project changes after the close of public comment and certification of an EIA. As discussed above in Section II, CARB's proposed new, significant changes to the Project require the agency to readopt the regulation to comply with Section 11349.4(a) of the APA. Because readoption is a discretionary decision, CARB must determine whether additional CEQA review is required due to these Project changes. 14 Cal. Code Regs. 15162(a), (c); *see Willow Glen Trestle Conservancy v. City of San Jose* (2020) 49 Cal.App.5th 127, 131. Significant project changes require CEQA review when, as here, the changes will result in new and worsened environmental impacts that have not been analyzed in an environmental review document. Pub. Resources Code § 21166(a); 14 Cal. Code Regs. 15162(a)(1).

The proposed changes to Section 954852(h) are significant because the changes go beyond mere ministerial modifications of the previously analyzed Project. *See Communities for a Better Environment v. South Coast Air Quality Management Dist.* (2010) 48 Cal.4th 310 (finding applicant's proposal to produce ultra-low sulfur diesel at oil refinery was not a mere modification where it would result in significant increased operation of polluting equipment). As explained throughout these comments, the Proposed changes substantially alter the limits placed on fossil hydrogen in the LCFS in ways that would trigger readoption under the APA. *See* Section II.

These significant changes to the LCFS amendments would also result in new and worsened environmental impacts by altering LCFS credit generation for fossil hydrogen paired with CCS, requiring the need for subsequent or supplemental CEQA review. See Citizens Comm. to Complete the Refuge v. City of Newark (2021) 74 Cal.App.5th 460, 475 (concluding that the need for additional environmental review arises when there is a need to evaluate new or more severe significant environmental impacts that will result from changes to a project). As Section I.B. explains, fossil hydrogen production with CCS creates significant impacts throughout the supply chain, harming communities closest to hydrogen production facilities and generating downstream risks because of storage and transportation of carbon dioxide. Additionally, CCS equipment that uses amine-based solvents could cause additional environmental and public health harms, including smog formation, drinking water contamination, and impacts to aquatic life. See Section I.B.

None of these additional and worsened environmental impacts have been discussed or considered in the EIA. The EIA did not analyze both the production and downstream impacts of CCS with SMR facilities and downplayed the likelihood of significant impacts from CCS processes. For example, the EIA incorrectly suggests that CCS at SMR facilities would not use

amine-based solvents because those facilities do not have "low-purity CO2 streams." However, CARB itself has recently recognized that SMR facilities with carbon capture use amine separation. Indeed, among the small handful of projects that have demonstrated SMR with CCS, multiple facilities have used amine-based solvents. Academics are also attempting to refine the process of capturing carbon emissions from SMR facilities with amine-based technologies. The U.S. Department of Energy is funding a CCS project at an SMR facility in Texas that does not plan to use an amine-based solvent to capture carbon dioxide from its syngas, but does intend to rely on an amine-based solvent to capture carbon from the flue gas stack that contributes about 45% of the facility's emissions. An SMR facility could not plausibly operate in a manner that is consistent with California's long-term climate goals if it fails to abate the low-purity carbon dioxide stream in its flue gas emissions. Thus, CARB's environmental analysis cannot deny or ignore the potential environmental consequences of hydrogen producers deploying amine-based CCS technologies.

Because the proposed changes incentivize more fossil hydrogen and additional CCS, which will foreseeably result in new, additional impacts such as those from amine solvents, among others, CARB must analyze the environmental impacts of its proposed changes now in a subsequent or supplemental EIA in order to comply with CEQA. Alternatively, CARB should

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³⁶ CARB, Final EIA at 102.

³⁷ CARB, California Transportation Supply (CATS) Model v.0.2 – Technical Documentation for August 2023 Example Scenario (Aug. 2023) at 18, https://www2.arb.ca.gov/sites/default/files/2023-08/CATS%20Technical_1.pdf ("Older SMR processes typically use an amine separation, which is selective for CO2, resulting in a very high capture efficiency (90 percent or higher). Many modern hydrogen production facilities are likely to use membrane separation to create a higher purity hydrogen stream. If these facilities are also using CCS, they will add amine separation as an additional step to purify the CO2."). CARB relies on the CATS model in the LCFS rulemaking to understand how different regulatory approaches to the transportation sector affect compliance scenarios.

³⁸ Shell's Quest carbon capture and storage project in Alberta, Canada, uses the monoethyldiamine (MDEA) solvent to remove carbon dioxide from the syngas of an SMR facility. Clean Air Task Force, Carbon capture and storage: What can we learn from the project track record?, (July 31, 2024), https://www.catf.us/resource/carbon-capture-storage-what-can-learn-from-project-track-record/. The Tomakomai CCS Demonstration Project in Japan also captured carbon dioxide from an SMR unit using an active amine process. International Energy Agency, Tomakomai CCS Demonstration Project, https://www.iea.org/reports/ccus-around-the-world-in-2021/tomakomai-ccs-demonstration-project; U.S. Department of Energy, Tomakomai Carbon Capture and Storage (CCS) Demonstration Project, https://fossil.energy.gov/archives/cslf/Projects/Tomakomai.html.

³⁹ See, e.g., Muhammad Zubair Shahid and Jim-Kuk Kim, Design and economic evaluation of a novel amine-based CO₂ capture process for SMR-based hydrogen production plants, Journal of Cleaner Production (May 20, 2023), https://www.sciencedirect.com/science/article/abs/pii/S0959652623008624 ("Chemical absorption using amine solvents is the most commercially recognized technology to capture CO₂ from the SMR-based hydrogen production plant.").

⁴⁰ Air Liquide, Combined Carbon Capture Solution on Air Liquide South Texas Steam Methane Reformer, 2024 FECM/NETL Carbon Management Research Project Review Meeting, slides 5–6, https://netl.doe.gov/sites/default/files/netl-file/24CM/24CM_PSCC_6_Odom.pdf.

decertify the LCFS Amendments' EIA, conduct the environmental analysis anew because of these proposed changes, and recirculate the document for public comment and review.

Importantly, any environmental review must address the impacts of fossil hydrogen production and CCS on adjacent communities. The locations of fossil hydrogen producers that sell into the LCFS are known. In its air quality modeling spreadsheet CARB lists "California SMR Hydrogen Facilities," which are located in at least three air districts throughout the State. ⁴¹ CARB knows which existing SMR facilities produce hydrogen that generates LCFS credits, providing a strong indication of which facilities will further ramp up hydrogen production to supply the growing market for hydrogen as a transportation fuel. The Current Fuel Pathways spreadsheet, which contains a list of certified LCFS pathways, also identifies hydrogen producers and their locations. ⁴² Finally, a 2019 study has also listed the locations of all SMR facilities. ⁴³

CARB admits in the EIA that "[s]taff expects proposed amendments will increase the production of low-carbon fuels in California, which will result in increased emissions at the production facilities."44 The addition of the proposed changes to Subjection 95482(h) would only increase such emissions for the reasons described above in this Section and Section I.B. CARB must connect this data and assess the impact of increasing hydrogen production on communities impacted by these hydrogen and CCS facilities. This sort of analysis is not only appropriate but required, even for a programmatic environmental review such as this one. See Cleveland National Forest Foundation v. San Diego Association of Governments (2017) 17 Cal. App.5th 413, 440. As noted in prior comments, submitted before the Board hearing, it is insufficient for CARB to simply conclude, without analysis, that long-term air quality impacts of the Amendments will be significant and unavoidable. CARB must analyze the foreseeable air quality impacts from new or expanding hydrogen production and CCS expansion. CARB's failure to disclose localized impacts and analyze the public health and air quality implications would leave the public and decisionmakers in the dark about the Project's pollution burdens and public health impacts to frontline communities. The programmatic nature of environmental review does not excuse CARB's failure to disclose and assess the magnitude and severity of air quality impacts from the Amendments' impacts on hydrogen production at already existing SMR facilities and expected new facilities, which would likely be located near known freight corridors to reduce the

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⁴¹ CARB, Air Quality Analysis Workbook from 15-day Package, Emissions Factors – Production) tab. https://ww2.arb.ca.gov/sites/default/files/2024-

^{08/2024%20}LCFS Amendments Air Quality Calculations 15Day%20Proposed 1.xlsx.

⁴² CARB, Current Fuel Pathways

https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/fuelpathways/current-pathways all.xlsx.

⁴³ Sun et al., Supporting Information for Criteria Air Pollutants and Greenhouse Gas Emissions from Hydrogen Production in U.S. Steam Methane Reforming Facilities (2019), https://pubs.acs.org/doi/suppl/10.1021/acs.est.8b06197/suppl file/es8b06197 si 001.pdf.

⁴⁴ CARB, SRIA at B-2.

costs of serving the heavy-duty freight vehicles that are most difficult to electrify. Failing to provide this analysis would violate CEQA.

IV. Given the federal threats to EV support, CARB should enhance credit generation for EV charging infrastructure.

CARB's landmark zero-emission vehicle (ZEV) rules—vital pieces of California's strategy to meet air and climate goals—are under unprecedented attack. As the Trump administration takes steps to rescind California's Clean Air Act waivers, ⁴⁵ deny approval of future waivers, ⁴⁶ and slash federal funding, ⁴⁷ CARB must increase support for battery EVs. The need for this support was evident when the Board voted on the LCFS amendments, and it is even more apparent now, given the federal assault on bedrock climate and clean air laws.

Despite the central importance of battery EVs, California's commitment to them, and the growing threats to their deployment, CARB staff fails to propose enhancements to EV fast charging infrastructure (FCI) crediting even though it proposes increased crediting for hydrogen refueling infrastructure (HRI). ⁴⁸ FCI is already disadvantaged in the LCFS program, and this proposal would exacerbate the uneven playing field. CARB must correct this unjustified asymmetry and boost FCI crediting at this critical time.

First, CARB should eliminate the capacity crediting cap (of 1.5x the CapEx) for FCI to provide developers with greater investments certainty. Removing credit limits would signal CARB's commitment to maintaining infrastructure growth and California's commitment to its ZEV goals, especially in a time of regulatory and federal financial uncertainty. CARB staff

⁴⁵ See, e.g., Executive Order 14154, Section 2 (e), https://www.whitehouse.gov/presidential-actions/2025/01/unleashing-american-energy/; Advanced Clean Cars II Notice of Approval in 2024,

https://www.govinfo.gov/content/pkg/FR-2025-01-06/pdf/2024-31128.pdf; Advanced Clean Trucks approval in 2023, https://www.govinfo.gov/content/pkg/FR-2023-04-06/pdf/2023-07184.pdf. 46 In 2019, the first Trump administration withdrew the waiver for Advanced Clean Cars I

https://www.epa.gov/system/files/documents/2025-01/hd-acf-carb-waiver-withdraw-resp-2025-1-14.pdf. The waiver was reinstated under the Biden administration in 2022. In 2025, CARB revoked its waiver request for Advanced Clean Fleets and the In-Use Locomotive Standards, limiting CARB's enforcement of these Board-approved regulations.

⁴⁷ Including Advanced Technology Vehicle Manufacturing Loans, used and new clean vehicle tax credits, charging infrastructure tax credits, the National Electric Vehicle Infrastructure (NEVI) Formula Program.
⁴⁸ CARB, Attachment A-2.1, Proposed Regulation Order

https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/atta2.pdf (compare changes to 95486.3 at 21-22 and 27-28 (increasing credit generation for hydrogen refueling by lowering the derating factors and eliminating the credit cap provision) with changes at 31 and 36 (same derating and credit cap provisions not altered for EV charging infrastructure).

proposes to remove this cap for HRI, and there is no basis for withholding such a change for FCI.⁴⁹

Second, CARB must make the arbitrary derating for FCI at least at parity with the HRI stations, allowing for continued investment even under the significant uncertainty of the Advanced Clean Trucks rule and potential slower EV adoption due to the revocation of the Advanced Clean Fleets waiver request. Staff's current proposal increases the credit generation factors for HRI (from 50% to 62.5% for shared stations and from 25% to 31.5% for private stations) but inexplicably leaves the FCI factors unchanged (i.e. 20% for shared and 10% for private charging). CARB provides no explanation for why the specific increases were chosen, nor any evidence or analysis justifying that HRI needs more support than FCI. CARB claims that "through the public engagement process, stakeholders have confirmed that 6,000 kg/day, derated to 50% of the nameplate capacity, provides sufficient incentive for MHD-HRI stations," whereas no such confirmation was made from FCI stakeholders. In fact, FCI stakeholders noted that the HD FCI provisions help address "utilization risks in the early market phases" even with such regulatory requirements of the Advanced Clean Trucks and Advanced Clean Fleets rules.

CARB's unjustified preference for hydrogen refueling over EV charging is puzzling and troublesome given the overwhelming evidence shows that battery EVs will do almost all of the work cleaning up California's transportation sector. CARB's own estimates show electricity will power 88% of the zero-emission transportation energy demand through 2045, far exceeding the contribution of hydrogen fuel cell vehicles. ⁵³ CARB cut its own hydrogen fuel cell vehicle projections by two-thirds (from 62,600 to 20,500)⁵⁴—even before potential federal rollbacks

⁴⁹ Id.

⁵⁰ Id.

⁵¹ CARB, Appendix E: Purpose and Rationale of Proposed Amendments for the Low Carbon Fuel Standard Requirements (Jan.2, 2024) at 42

https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/lcfs appe.pdf.

⁵² Hall et al., Low Carbon Fuel Standard Amendments (2nd 15-Day Changes) (Oct. 16, 2024) at 1, https://www.arb.ca.gov/lists/com-attach/39-lcfs2024-2nd15day-AG0HaVA1WVUDbFA+.pdf.

⁵³ CARB provided the expected energy demand for fuel types in its LCFS scenario model (https://ww2.arb.ca.gov/sites/default/files/2024-

^{08/}scenario inputs 15Day Proposed 9step 30 final posted 0.xlsx) and explained the rationale for the fuel demand by fuel type in its CATS modeling documentation

⁽https://ww2.arb.ca.gov/sites/default/files/2023-08/CATS%20Technical_1.pdf). From 2025-2045, the electricity demand is estimated as 4.92E12 MJ and the hydrogen demand is estimated as 6.44E11 MJ. Of the total ZEV-related energy (i.e. electricity and hydrogen (not including gas, diesel, cng), 88% of the energy need is from electricity and 12% is from hydrogen.

⁵⁴ CARB, 2024 Annual Evaluation of Fuel Cell Electric Vehicle Deployment and Hydrogen Fuel Station Network Deployment (2024) at 14 https://ww2.arb.ca.gov/sites/default/files/2024-12/AB-126-Report-2024-Final.pdf.

were identified. ⁵⁵ Other experts' most recent economic modeling has also shown that the role of hydrogen in surface transportation is likely to be very limited, as the costs of battery EVs decline more quickly than previously forecasted and hydrogen vehicle costs decline more slowly than anticipated. ⁵⁶ Further, even though EV adoption may be slower than what was expected with full enforcement of CARB's Advanced Clean Cars II, Advanced Clean Trucks, and Advanced Clean Fleets regulations, the data are clear: more consumers are purchasing EVs, ⁵⁷ and more infrastructure is needed. Indeed, the current level of EV infrastructure deployment (i.e. 179, 241 reported EV chargers) is less than 1/6 of what California Energy Commission (CEC) says is needed by 2030 (i.e. 1.01 million chargers). ⁵⁸

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<u>LDV</u> <u>Sales and Shares Last updated 1-31-2025 ada.xlsx</u> (showing light duty ZEVs represent over 25% of new car sales in 2024, and that percentage is increasing);

Medium Heavy Duty Vehicle Population Last updated 04-30-2024 ada.xlsx (showing 95% of the MHD ZEVs registered with DMV in 2023 were battery EVs (as opposed to FCEVs)

⁵⁸ See California Energy Commission (2025). Zero Emission Vehicle and Infrastructure Statistics, EV Chargers (last updated March 6, 2025)

https://www.energy.ca.gov/filebrowser/download/7390?fid=7390#block-symsoft-page-title (showing only 179,241 public or shared private chargers are in operation across California); Davis, Adam et al.,

⁵⁵ This is not the first time that CARB has slashed its projections for the role of hydrogen vehicles in the transportation sector. For instance, when CARB adopted the first ACC rule in 2012, it estimated cumulative sales of light-duty FCEVs to reach 56,844 by 2022. In the 2017 midterm review for the rule, CARB estimated that cumulative sales of light-duty FCEVs would reach 35,083 by 2022. CARB, 2017 ZEV Calculator Tool *available at* https://ww2.arb.ca.gov/sites/default/files/2020-01/zevcalculator_2017_ac.xlsx. However, just 11,897 light-duty FCEVs were on the road in California at the end of 2022. CEC, Light-Duty Vehicle Population in California, https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics/light-duty-vehicle. In its 2022 Advanced Clean Cars II rulemaking, CARB found that California could achieve 100% sales of zero-emission light-duty vehicles with just 2.8% sales of FCEVs. CARB, Final Statement of Reasons for Rulemaking for the Advanced Clean Cars II Regulations, Appendix F at 7 (Aug. 25, 2022), https://www2.arb.ca.gov/sites/default/files/barcu/regact/2022/accii/fsorappf.pdf.

⁵⁶ For instance, a February 2025 report from the U.K. Climate Change Committee included the key message that by 2050, "[T]here will be no hydrogen cars or vans, and very little or potentially even no role for hydrogen in heavier vehicles." UKCCC Seventh Carbon Budget at 146, https://www.theccc.org.uk/wp-content/uploads/2025/02/The-Seventh-Carbon-Budget.pdf. The supporting documents for this report include ERM, ZEV HDV Uptake Trajectories: Modeling Assumptions (2024), https://www.theccc.org.uk/wp-content/uploads/2025/02/ZEV-HDV-uptake-trajectories-ERM.pdf. In addition, independent analysts at DNV estimated in 2024 that hydrogen would provide just 1% of on-road energy demand by 2050—a dramatic downward revision of its projection in 2023 that hydrogen would provide about 3% of on-road energy by midcentury. Leigh Collins, DNV slashes forecast for hydrogen use in road transport amid advances in battery-electric trucks, Hydrogen Insight (Oct. 17, 2024), https://www.hydrogeninsight.com/transport/dnv-slashes-forecast-for-hydrogen-use-in-road-transport-amid-advances-in-battery-electric-trucks/2-1-1725398.

⁵⁷ California Energy Commission (2025). California Energy Commission Zero Emission Vehicle and Infrastructure Statistics (last updated Jan. 31, 2025) https://www.energy.ca.gov/files/zev-and-infrastructure-stats-data;

It is also irresponsible for CARB to favor hydrogen fueling stations with special credit generation opportunities that are unavailable to EV charging stations because hydrogen fueling stations present unique stranded asset risks. In a 2023 fact sheet, CARB and CEC explained that "investments in hydrogen fueling infrastructure may become stranded assets" if several barriers are not addressed. ⁵⁹ The agencies highlighted the need to transition to fully clean and renewable hydrogen production, lower hydrogen fuel prices so that they do not remain far above the costs of equivalent fuel for internal combustion engines (ICE) and battery electric vehicles, and improve the availability of fuel cell electric vehicle (FCEV) models. ⁶⁰ These factors do not pose similar risks to EV charging stations because (1) Senate Bill 100 created a process for transitioning their fuel to renewable energy, (2) fuel costs for EVs are already lower than fuel costs for ICE vehicles, and (3) manufacturers offer a broader range of battery electric models than FCEVs.

Given this robust evidence, CARB should appropriately boost FCI crediting to reflect the critical importance of battery EVs for California's energy transition and to counter federal threats to EV deployment and California's clean air and climate goals. Significant changes will require readoption of the regulation under the APA, and this process will provide CARB with an opportunity to consider additional evidence on the importance of LCFS support for EV deployment given the altered federal landscape.

In sum, we urge CARB to (1) reject staff's unjustified proposal to increase subsidies for polluting fossil hydrogen and to (2) boost support for EV infrastructure in the face of federal attacks and rollbacks. If CARB does not reject staff's proposal to significantly change the regulation in favor of fossil hydrogen, it must readopt the regulation and conduct additional review under CEQA.

Sincerely,

/s/ Nina Robertson Nina Robertson Sara Gersen

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²⁰²³ Assembly Bill 2127 Second Electric Vehicle Charging Infrastructure Assessment: Assessing Charging Needs to Support Zero-Emission Vehicles in 2030 and 2035. California Energy Commission. Publication Number: CEC-600-2024-003, at ii

https://efiling.energy.ca.gov/GetDocument.aspx?tn=254161 (projecting that "California will need 1.01 million chargers (including 39,000 direct-current fast chargers) to support 7.1 million light-duty plug-in electric vehicles in 2030.").

⁵⁹ CARB and CEC, Hydrogen Vehicle Fueling Infrastructure and Fuel Production in California: Frequently Asked Questions (2023), https://calmatters.org/wp-content/uploads/2023/08/AB-118_FactSheet_H2-4.pdf.

⁶⁰ Id.

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April 21, 2025

Clerk of the Board and Members of Board California Air Resources Board 1001 I Street Sacramento, CA 95814

Via Electronic Submittal

RE: Communities for a Better Environment and Earthjustice Comments on the Low Carbon Fuel Standard Third 15-Day Changes.

Chair Randolph and Members of the California Air Resources Board:

Communities for a Better Environment and Earthjustice submit the following comments on the Third Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information regarding amendments to the Low Carbon Fuel Standard (LCFS).¹

In response to the Office of Administrative Law's (OAL) February 25, 2025 disapproval of the LCFS amendments that the Board approved for adoption at the November 8, 2024 Hearing, staff proposes changes that significantly worsen the program in favor of polluting fuels. While we applaud the proposal to preserve the Clean Fuel Rewards program consistent with Board direction, we urge CARB to (1) reject increased subsidies for fossil-fuel derived hydrogen and to (2) boost support for electric vehicles (EVs) so that California can meet its air quality and climate goals notwithstanding federal rollbacks.

First, the proposed changes to Subsection 95482(h) in title 17 of the California Code of Regulations (CCR) would increase production of fossil hydrogen paired with carbon capture and storage (CCS), resulting in increased emissions of greenhouse gases (GHGs) and other

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¹ CARB, Third Notice of Public Availability of Modified Text and Availability of Additional Documents and/or Information, Proposed Low Carbon Fuel Standard Amendments (Apr. 4, 2025) ("Third 15-Day Change"), https://www2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/3rd_15day_notice.pdf.

pollutants. These significant changes are inconsistent with California's climate, air quality, and equity goals, exceed the scope of the OAL decision, and contradict Board Resolution 24-14. They also require CARB to both readopt the regulations under the California Administrative Procedure Act (APA) and to evaluate new impacts under the California Environmental Quality Act (CEQA). The OAL did not require these substantive changes to LCFS hydrogen policy, nor did the Board authorize staff to make them at this juncture. As a result, CARB must either reject the proposed changes to Subsection(h) or readopt the regulation after conducting additional environmental review.

Second, staff fails to propose enhanced crediting for EV charging even though it proposes increased support for hydrogen refueling. At a time when federal support for EVs is highly uncertain, CARB must boost LCFS support for EVs so that California can meet its air quality and climate goals despite Trump administration attacks.²

I. CARB must reject staff's proposed revision of the Board's decision to both end subsidies for fossil hydrogen by 2035 and require 80% "renewable" hydrogen by 2030.

The LCFS amendments that the CARB Board approved in November mandate that (1) starting in 2035, fossil fuel-derived hydrogen can no longer receive LCFS subsidies and that (2) 80% of hydrogen dispensed as a vehicle fuel must be "renewable" by 2030.³ The newly proposed changes would reverse course on both fronts. Specifically, they would exempt fossil hydrogen from the 2035 phase-out so long as that fossil hydrogen is paired with CCS technologies, and they would allow this fossil hydrogen paired with CCS to count toward the 80%-by-2030 requirement.⁴ CARB must reject these changes because they lack evidentiary support and will cause a wide range of environmental harms.

A. CARB staff fails to justify this significant and harmful departure from the policy that the Board adopted at its November 2024 hearing.

The OAL did not identify any issues that would require amendment of Subsection 95482(h) and CARB staff has not identified evidence to support changes that section. In the Final Statements of Reasons (FSOR), responding to comments critical of Subsection 95482(h)'s

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² All cited sources are accessible by hyperlink in the footnotes to these comments. In addition, we have emailed the Clerk of the Board all cited sources that are not already in the record. All sources are thus readily accessible to CARB and thus submitted for inclusion in the record. See Pub. Res. Code § 21167.6(e)(7); *Consolidated Irrig. Dist. v. Superior Court* (2012) 205 Cal.App.4th 697.

³ CARB, Attachment A-1, Final Regulation Order https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/fro_atta-1.pdf at 37 (Section 95482(h)).

⁴ Id. at 36-37 (changes to Section 95482(h)).

limits on fossil hydrogen, CARB states that "timing of this provision in the Proposed Amendments aligns with the current operational timeline for projects funded under the hydrogen hubs grants, which will expand the supply of renewable hydrogen in California starting in the early 2030s and aligns with mandates that 90% of electricity retail sales be renewable or zero carbon by 2035 (SB 1020 (Laird, Chapter 361, Statutes of 2022))." In the changes that CARB staff now proposes, it has not identified any new facts since publication of the FSOR that alter this rationale.

CARB staff states that the proposed modifications to this Subsection "would allow the LCFS to further support growing supplies of low-CI hydrogen in alignment with federal incentives and investment in carbon dioxide removal technology as well as California's 2022 Scoping Plan for Achieving Carbon Neutrality." However, the Scoping Plan cannot justify this weakening of the LCFS. Indeed, the certified Environmental Impact Analysis (EIA) for the amendments explains that excluding fossil-derived hydrogen from the LCFS will align the regulation with the 2022 Scoping Plan Update. In relevant part, it states:

The 2022 Scoping Plan Update identified a need for low-carbon, renewable hydrogen for the transportation sector (among other sectors) to displace fossil fuels in support of achieving the State's greenhouse gas emission reduction goals. The 2022 Scoping Plan Update scenario did not include hydrogen produced from fossil fuels, with or without carbon capture as low-carbon, renewable hydrogen.⁷

It would be illogical to encourage investments in long-lived assets to capture carbon dioxide at fossil hydrogen production facilities when the 2022 Scoping Plan Update does not foresee this equipment operating in a carbon-neutral California in 2045. Thus, the proposal would encourage investment in stranded fossil fuel infrastructure, in direct conflict with the 2022 Scoping Plan Update.

CARB staff's other stated rationales for the proposed changes are equally unpersuasive. Subsection 95482(h) already aligns with federal incentives because it provides a market for renewable hydrogen that the federal government is incentivizing with a generous \$3/kg production tax credit.⁸ Even if the federal government also provides incentives for fossil hydrogen, that federal policy does not justify weakening California's rules to accommodate fossil

https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/3rd 15day notice.pdf.

https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/lcfs final eia.pdf/

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⁵ CARB, Final Statement of Reasons (FSOR) at 358 https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/fsor appa.pdf.

⁶ CARB, Third 15-Day Notice,

⁷ CARB, Final EIA at 19

⁸ 26 U.S.C. § 45V.

fuels that are inconsistent with the State's plan for achieving its climate goals. Also, it is unclear what the proposed change to Subsection 95482(h) has to do with "investment in carbon dioxide removal technology," which are strategies for taking carbon out of the atmosphere—not abating a specific facility's emissions.⁹

B. Expanding California subsidies for fossil-fuel derived hydrogen paired with CCS poses numerous risks to the environment and human health.

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Fossil hydrogen production with CCS creates significant impacts upstream throughout the fossil gas supply chain, harms the communities closest to the production facilities, and imposes downstream risks associated with the transportation and storage of carbon dioxide. CARB does not address any of these risks or impacts in its proposal to weaken Subsection 95482(h). As detailed below in Section III, these impacts are potentially significant and have not been evaluated in the EIA.

Producing hydrogen from fossil gas induces more production of fossil fuels, with concomitant harms to public health and the environment. Adding CCS to the process increases the demand for fossil gas because CCS equipment requires a significant amount of energy to operate. One reason that the hydrogen industry's demand for fossil gas threatens public health is that many kinds of equipment throughout the fossil gas supply chain emit hazardous and carcinogenic air pollution. This upstream activity also destabilizes the climate by emitting methane. Indeed, the high methane emissions observed in the fossil gas supply chain are a key reason why one recent study found that hydrogen produced from fossil gas with CCS is an even more greenhouse gas-intensive source of heat than fossil gas or coal.

In implementing the LCFS, CARB fails to properly account for these upstream methane emissions because they rely on a version of the GREET model that improperly assumes an

⁹ See, e.g., CARB, 2022 Scoping Plan Update at 84, Figure 2-2,

https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf (distinguishing Carbon Capture and Storage "from a facility" from Carbon Dioxide Removal "from ambient air").

¹⁰ Robert W. Howarth & Mark Z. Jacobson, *How green is blue hydrogen?*, at 1681, Energy Sci. & Eng'g (2021) 2021;9:1676–1687 ("Howarth & Jacobson"),

https://onlinelibrary.wiley.com/doi/epdf/10.1002/ese3.956 (estimating that "upstream emissions of unburned methane from the energy used to drive carbon capture are between 9.5 g CO2eq per MJ if only the SMR carbon is captured and 18 g CO2eq per MJ if the flue-gas emissions are also captured").

¹¹ Clean Air Task Force, Fossil Fumes (2022 Update) at 5, https://cdn.catf.us/wp-content/uploads/2016/06/14175846/fossil-fumes-report-2022.pdf.

¹² Howarth and Jacobson at 1679, Table 1 (estimating the contribution of fugitive methane emissions and other emissions sources to the total carbon-intensity of different hydrogen production technologies); *id.* at 1683 (comparing carbon-intensity of hydrogen produced from fossil gas with CCS to that of other fossil fuels).

upstream leakage rate of about 1%. ¹³ This flawed assumption stems from two basic methodological errors: relying on self-reported data from the oil and gas industry and using national data, when California's gas supply comes from shale fields with especially high leakage rates. According to one recent study, on average, fossil gas consumed in California has a production-stage methane leakage rate of 2.8%. ¹⁴ Thus, CARB ignores about two thirds of the significant upstream climate impacts of producing hydrogen from fossil fuels with CCS for use in the LCFS.

Producing hydrogen from fossil gas with CCS is a heavy industrial activity with several potentially significant local environmental impacts. The dominant technology for producing hydrogen from fossil fuels in California and the rest of the United States is steam methane reformation (SMR). As detailed in prior comments and recent studies, SMR facilities release criteria air pollution¹⁵ and hazardous air pollution.¹⁶ Powering energy-hungry CCS equipment could further increase emissions.¹⁷ Also, CCS equipment that uses amine-based solvents could cause additional environmental and public health harms because these solvents are potential carcinogens that adversely affect aquatic life and may contribute to smog formation and contaminate drinking water.¹⁸ After the solvent is used, the degraded amine product becomes

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¹³ CARB, CA-GREET3.0 Model, https://www.arb.ca.gov/fuels/lcfs/ca-greet/ca-greet30-corrected.xlsm?_ga=2.176366309.1181395569.1744834010-466423198.1662166685 (Table 4.3 in the "Inputs" tab lists 1.14% as the total CH4 leakage rate for conventional natural gas production and 1.21% as the leakage rate for shale gas production).

¹⁴ Diana Burns & Emily Grubert, *Attribution of production-stage methane emissions to assess spatial variability in the climate intensity of US natural gas consumption*, at 6, 16 Environmental Research Letters 4 (2021), https://iopscience.iop.org/article/10.1088/1748-9326/abef33.

¹⁵ Sun et al., *Criteria air pollutants and greenhouse gas emissions from hydrogen production in U.S. steam methane reforming facilities*, 53 Env. Sci. Tech. 7103-7113 (2019), https://pubs.acs.org/doi/10.1021/acs.est.8b06197.

¹⁶ An air toxics health risk assessment completed for the Air Liquide El Segundo Hydrogen plant found maximum "offsite" cancer risks of 7.1 per million for a 30-year exposure, with diesel particulate matter from internal combustion engines and hexavalent chromium from the reformer heater identified as the primary cancer risk drivers. Davenport Engineering, Inc., *Health Risk Assessment RY 2016*, prepared for Air Liquide El Segundo Hydrogen Plant, (July 30, 2020) at PDF 10, https://www.aqmd.gov/docs/default-source/planning/risk-assessment/air-liquide/air-liquide-el-segundo-2016-hra-(id148236).pdf.

¹⁷ For instance, the most recent annual reporting for Shell's Quest CCS project at an SMR facility in Alberta Canada states that it incurred an energy penalty of .67 MJ_c/kg from electricity usage to capture, transport and store carbon dioxide and a net energy penalty of 2.02 MJ_{th}/kg, primarily due to the thermal energy required to produce steam for carbon dioxide capture and transport. Shell, Quest GHG and Energy Report for 2023 (Feb. 2024), Table 1, https://open.alberta.ca/dataset/e90a4e6e-2c11-44ee-b198-de244261c585/resource/8c471776-1700-457b-a58b-6c9da68c1962/download/quest-annual-status-report-2023-ghg-energy-report-2023.pdf.

¹⁸ Yukyan Lam et al., Environmental Justice Concerns with Carbon Capture and Hydrogen Co-Firing in the Power Sector, The New Sch. Tishman Env't and Design Ctr. (June 2024), at 16, https://njeja.org/wp-content/uploads/2024/07/CCS-EJ-White-Paper.pdf; see also sources cited as references in Yukyan Lam et al. at 42-61 (citations omitted here and submitted attached to these comments).

hazardous waste. ¹⁹ Producing hydrogen from fossil fuels with CCS could also threaten local water supplies, as SMR of fossil gas with CCS requires more water than electrolytic hydrogen production. ²⁰

Producing hydrogen with CCS also creates downstream impacts from transporting and storing carbon dioxide. Carbon dioxide pipelines pose various environmental and health threats. Carbon dioxide's interaction with impurities, such as water and hydrogen sulfide, can compromise pipe integrity and increase the risk of corrosion and failure, which could lead to the re-release of carbon dioxide into the atmosphere and lead to a public health emergency because carbon dioxide is an asphyxiant. Long-term carbon dioxide sequestration via saline aquifers poses various environmental threats, including potential contamination of shallow aquifer waters and leakage of carbon dioxide back into the atmosphere. The fossil fuel industry may use the carbon dioxide captured at hydrogen production facilities for enhanced oil recovery (EOR). Using carbon dioxide for EOR contravenes California's climate goals by stimulating oil production, yet the LCFS' carbon accounting for hydrogen produced from fossil fuels with CCS does not account for its contributions to the supply of petroleum.

Finally, the proposal to end crediting for fossil hydrogen without CCS in 2035 has the same practical effect as simply deleting Subsection 95482(h)'s requirement to phase out fossil hydrogen and nullifies the intent of the Board in approving the regulation. In 2035, fossil hydrogen will not have a relevant credit generation opportunity, regardless of Subsection 95482(h). Under the amendments the Board approved in November 2024, the benchmark carbon intensity for California transportation fuels would be 47.09 gCO_{2e}/MJ in 2035 unless the Automatic Acceleration Mechanism (AAM) increases the stringency of the standard. The energy efficiency ratios for hydrogen vehicles range from 1.6–2.5. Therefore, in the unlikely scenario that the AAM does not accelerate benchmarks by 2035, the hydrogen industry would

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¹⁹ Id. at 17.

²⁰ International Renewable Energy Agency, Water for hydrogen production (2023), Figure S1, https://www.irena.org/-

[/]media/Files/IRENA/Agency/Publication/2023/Dec/IRENA_Bluerisk_Water_for_hydrogen_production_2023.pdf.

²¹ Richard Kuprewicz, Accufacts' Perspectives on the State of Federal Carbon Dioxide Transmission Pipeline Safety Regulations as it Relates to Carbon Capture, Utilization, and Sequestration within the U.S., prepared for the Pipeline Safety Trust (Mar. 23, 2022), https://pstrust.org/wp-content/uploads/2022/03/3-23-22-Final-Accufacts-CO2-Pipeline-Report2.pdf.

²² Hannah Klaus et al., Uncertainties and Gaps in Research on Carbon Capture and Storage in Louisiana, Ctr. for Progressive Reform (June 2023), https://cpr-assets.s3.amazonaws.com/wp/uploads/2023/06/ccs-in-louisiana-rpt-june2023-final.pdf.

²³ For instance, Air Products and Chemicals supplies the carbon dioxide it captures at an SMR facility in Port Arthur, Texas, for EOR. U.S. Department of Energy, APCI Port Arthur ICCS Project, https://www.energy.gov/fecm/air-products-chemicals-inc.

²⁴ 17 CCR § 95484, Table 1.

²⁵ 17 CCR § 95486.1, Table 5.

need to supply hydrogen with a CI below 117.25 gCO_{2e}/MJ to generate credits in 2035.²⁶ However, the temporary CI for hydrogen produced from fossil gas without CCS is 195 gCO_{2e}/MJ,²⁷ suggesting that a CI of 117.25 gCO_{2e}/MJ is likely out of reach for this fuel. There is no evidence that prohibiting credit generation with hydrogen produced from fossil gas with CCS in 2035 changes the compliance options available to industry. In essence, CARB staff proposes to replace a meaningful limitation on incentives for polluting activity with an inconsequential, ineffectual one.

II. If CARB does not reject the proposed changes to Subsection 95482(h), the California Administrative Procedure Act requires it to readopt the regulation.

Under the APA, if CARB makes new, significant changes to a regulation in response to OAL's disapproval, CARB must readopt the regulation. Cal. Gov. Code § 11349.4 (a). In relevant part, Subsection 11349(a) of the California Government Code provides that "[i]f the regulation has been significantly changed... the agency shall comply with Article 5 (commencing with Section 11346) and readopt the regulation." Id.

First, the proposed changes to Subsection 95482(h) are significant within the meaning of Subsection 11349.4 (a) because they substantially alter the limits placed on fossil fuel-derived hydrogen in the LCFS. As detailed above in Section I, these changes will impact LCFS credit generation for fossil hydrogen paired with CCS and adversely impact the environment and human health in numerous ways.

Second, the proposed changes improperly exceed the scope of the changes that OAL called for in disapproval decision. Pursuant to Government Code Section 11349.1, OAL reviewed the proposed LCFS amendments and found that they failed to comply with the APA's procedural and clarity requirements. ²⁸ OAL provided a detailed discussion of the 26 sections that required revision and identified procedural deficiencies. ²⁹ Nowhere in its discussion did OAL identify concerns with Subsection 95482(h). Indeed, the OAL decision does not so much as mention the word hydrogen. Likewise, in its justification of the proposed Subsection 95482(h), CARB staff does not assert that they were made in response to OAL's decision. Without following the procedure set forth in the APA, CARB may not seize upon the OAL's disapproval of its regulation to substantively change key provisions of the regulation. But for the OAL's

 $^{^{26}}$ 47.09 x 2.5 = 117.25. It is generous to assume that hydrogen vehicles in 2035 would have an EER of 2.5 because this is the EER listed for light- and medium-duty vehicles, segments where it is especially difficult for hydrogen to compete against battery electric technologies. The EER listed for hydrogen heavy-duty trucks is 1.9. § 95486.1, Table 5.

²⁷ 17 CCR § 95488.9, Table 8.

²⁸ OAL Decision at 2, 22.

²⁹ Id. at 3-22.

disapproval, the LCFS amendments as submitted to OAL for approval would have been adopted and deemed effective when OAL reached its approval decision in February. CARB cannot take another bite at the apple and change LCFS hydrogen policy simply because it submitted a regulation that was rejected by OAL. The APA prohibits such machinations by requiring readoption for any significant changes made after OAL review, Cal. Gov. Code § 11349.4(a), and by setting forth detailed procedures for public participation in the rulemaking process. *See* Cal. Gov. Code § 11346 et seq.

Third, the issues raised by these proposed changes were not addressed at the November 8, 2024 Board hearing and could not have been anticipated from the existing record. CARB never proposed allowing fossil hydrogen paired with CCS to count toward the 80%-by-2030 goal nor did it suggest that it would exempt such hydrogen from the 2035 phase out deadline. There was no discussion of this possibility at the Board hearing, and the public could not have anticipated CARB's reversal in its hydrogen policy based on the record. As noted above, CARB's statements justifying the Board-approved version of Subsection 95482(h) indicated to the public that CARB thought only renewable hydrogen was consistent with 2022 Scoping Plan update, not hydrogen derived from fossil fuels, as now proposed. In response to myriad comments about Subsection 95482(h)'s consistency with the Scoping Plan, CARB stated in the FSOR that Subsection 95482(h) aligns with the Scoping Plan because "[t]he 2022 Scoping Plan Update scenario did not include hydrogen produced from fossil fuels, with or without carbon capture, as low-carbon, renewable hydrogen."30 CARB also stated in the FSOR that "[t]he proposed amendments do not preclude the use of carbon capture and sequestration on hydrogen production, provided that fossil gas is not the primary feedstock."31 Also, responding to comments critical of Subsection 95482(h)'s limits on fossil hydrogen, CARB asserted that "timing of this provision in the Proposed Amendments aligns with the current operational timeline for projects funded under the hydrogen hubs grants, which will expand the supply of renewable hydrogen in California starting in the early 2030s and aligns with mandates that 90% of electricity retail sales be renewable or zero carbon by 2035 (SB 1020 (Laird, Chapter 361, Statutes of 2022))."32 Thus, none of CARB's statements in the record indicate that it would reverse course on these fossil hydrogen limits. And as noted above, in the changes that CARB staff now proposes, it has not identified any new facts since publication of the FSOR that alter its FSOR rationale.

CARB's EIA also underscores the centrality of the fossil hydrogen limits in Subsection 95482(h) to CARB's regulatory package as approved for adoption by the Board. In the EIA's "Description of the Proposed Amendments to the Low Carbon Fuel Standard," CARB lists "Remove Eligibility of Fossil Fuel-Derived Hydrogen" as one of the major changes to the

³⁰ CARB, FSOR at 512 (emphasis added)

³¹ Id

³² CARB, FSOR at 358

regulation, and again states that "[t]he 2022 Scoping Plan Update scenario did not include hydrogen produced from fossil fuels, with or without carbon capture as low-carbon, renewable hydrogen."33 Thus, there was no reason for the public to anticipate that CARB would change course and later claim that hydrogen made from fossil fuels and paired with CCS would be deemed consistent with the 2022 Scoping Plan or allowed to generate credits beyond 2035, when the EIA's analysis and findings were based on a Project that ended credits for all fossil hydrogen in 2035.³⁴ Because the proposed changes were not addressed at the public hearing and could not have been anticipated from the existing record, they must be subject to the appropriate public process under the APA. Cal. Gov. Code §§ 11349.4 (a); 11346.8(c).

Finally, the proposed changes are directly contrary to Board Resolution 24-14. In relevant part, the resolution directs the Executive Officer to "monitor, report back to the Board as part of the next Scoping Plan Update, and propose any adjustments, if any of the following conditions may impede successful expansion of similar GHG reduction policies in other jurisdictions or impede the ability of the State to achieve its air quality and climate goals, and transition to zero emission technology," including "[h]ydrogen fuel availability to meet growing demand and role of state and federal incentives, including alignment with federal hydrogen incentives to increase hydrogen supply;"35 This direction specifically contemplates the possibility of future changes to state and federal hydrogen policy as well as hydrogen supply and mandates the following course of action: (1) the Executive Office must report back to the Board at the next Scoping Plan update (which is required by 2027); (2) based on that reported information, the Board will review and approve of any "adjustments" to the LCFS regulations. The Resolution 24-14 does not authorize any changes to the regulation's hydrogen provisions at this juncture, nor does it authorize the Executive Officer to make changes to the regulations without Board consideration and approval. Thus, CARB must readopt the regulation if it makes the proposed Subsection 35482(h) changes.

III. Additional environmental review, including review of localized impacts, is required if CARB does not reject the proposed changes to Subsection 95482(h).

In addition to requiring readoption under the APA, CARB's proposed changes to Subsection 95482(h) will alter the Project such that new and additional environmental review is required under CEQA. Whenever a public agency must make a further discretionary decision to

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https://ww2.arb.ca.gov/sites/default/files/barcu/board/res/2024/res24-14.pdf (emphasis added).

³³ CARB, Final EIA at 19.

³⁴ Further, CCS was discussed in a meet that CARB staff had with CARB's Environmental Justice Advisory Committee. staff never suggested to the EJAC that it would propose amendments to the LCFS that would incentivize CCS paired with hydrogen in these amendments. https://ww2.arb.ca.gov/sites/default/files/barcu/board/mt/2024/mt091224.pdf.

³⁵ CARB Board Resolution 24-14 at 7,

carry out or approve a project for which it has previously issued an approval, the agency must determine whether further environmental review is required due to changes in the project, changes in circumstances, or new information. *Department of Water Resources Environmental Impact Cases* (2022) 79 Cal.App.5th 556, 576. Here, CARB has proposed significant Project changes after the close of public comment and certification of an EIA. As discussed above in Section II, CARB's proposed new, significant changes to the Project require the agency to readopt the regulation to comply with Section 11349.4(a) of the APA. Because readoption is a discretionary decision, CARB must determine whether additional CEQA review is required due to these Project changes. 14 Cal. Code Regs. 15162(a), (c); *see Willow Glen Trestle Conservancy v. City of San Jose* (2020) 49 Cal.App.5th 127, 131. Significant project changes require CEQA review when, as here, the changes will result in new and worsened environmental impacts that have not been analyzed in an environmental review document. Pub. Resources Code § 21166(a); 14 Cal. Code Regs. 15162(a)(1).

The proposed changes to Section 954852(h) are significant because the changes go beyond mere ministerial modifications of the previously analyzed Project. *See Communities for a Better Environment v. South Coast Air Quality Management Dist.* (2010) 48 Cal.4th 310 (finding applicant's proposal to produce ultra-low sulfur diesel at oil refinery was not a mere modification where it would result in significant increased operation of polluting equipment). As explained throughout these comments, the Proposed changes substantially alter the limits placed on fossil hydrogen in the LCFS in ways that would trigger readoption under the APA. *See* Section II.

These significant changes to the LCFS amendments would also result in new and worsened environmental impacts by altering LCFS credit generation for fossil hydrogen paired with CCS, requiring the need for subsequent or supplemental CEQA review. See Citizens Comm. to Complete the Refuge v. City of Newark (2021) 74 Cal.App.5th 460, 475 (concluding that the need for additional environmental review arises when there is a need to evaluate new or more severe significant environmental impacts that will result from changes to a project). As Section I.B. explains, fossil hydrogen production with CCS creates significant impacts throughout the supply chain, harming communities closest to hydrogen production facilities and generating downstream risks because of storage and transportation of carbon dioxide. Additionally, CCS equipment that uses amine-based solvents could cause additional environmental and public health harms, including smog formation, drinking water contamination, and impacts to aquatic life. See Section I.B.

None of these additional and worsened environmental impacts have been discussed or considered in the EIA. The EIA did not analyze both the production and downstream impacts of CCS with SMR facilities and downplayed the likelihood of significant impacts from CCS processes. For example, the EIA incorrectly suggests that CCS at SMR facilities would not use

amine-based solvents because those facilities do not have "low-purity CO2 streams." However, CARB itself has recently recognized that SMR facilities with carbon capture use amine separation. Indeed, among the small handful of projects that have demonstrated SMR with CCS, multiple facilities have used amine-based solvents. Academics are also attempting to refine the process of capturing carbon emissions from SMR facilities with amine-based technologies. The U.S. Department of Energy is funding a CCS project at an SMR facility in Texas that does not plan to use an amine-based solvent to capture carbon dioxide from its syngas, but does intend to rely on an amine-based solvent to capture carbon from the flue gas stack that contributes about 45% of the facility's emissions. An SMR facility could not plausibly operate in a manner that is consistent with California's long-term climate goals if it fails to abate the low-purity carbon dioxide stream in its flue gas emissions. Thus, CARB's environmental analysis cannot deny or ignore the potential environmental consequences of hydrogen producers deploying amine-based CCS technologies.

Because the proposed changes incentivize more fossil hydrogen and additional CCS, which will foreseeably result in new, additional impacts such as those from amine solvents, among others, CARB must analyze the environmental impacts of its proposed changes now in a subsequent or supplemental EIA in order to comply with CEQA. Alternatively, CARB should

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³⁶ CARB, Final EIA at 102.

³⁷ CARB, California Transportation Supply (CATS) Model v.0.2 – Technical Documentation for August 2023 Example Scenario (Aug. 2023) at 18, https://www2.arb.ca.gov/sites/default/files/2023-08/CATS%20Technical_1.pdf ("Older SMR processes typically use an amine separation, which is selective for CO2, resulting in a very high capture efficiency (90 percent or higher). Many modern hydrogen production facilities are likely to use membrane separation to create a higher purity hydrogen stream. If these facilities are also using CCS, they will add amine separation as an additional step to purify the CO2."). CARB relies on the CATS model in the LCFS rulemaking to understand how different regulatory approaches to the transportation sector affect compliance scenarios.

³⁸ Shell's Quest carbon capture and storage project in Alberta, Canada, uses the monoethyldiamine (MDEA) solvent to remove carbon dioxide from the syngas of an SMR facility. Clean Air Task Force, Carbon capture and storage: What can we learn from the project track record?, (July 31, 2024), https://www.catf.us/resource/carbon-capture-storage-what-can-learn-from-project-track-record/. The Tomakomai CCS Demonstration Project in Japan also captured carbon dioxide from an SMR unit using an active amine process. International Energy Agency, Tomakomai CCS Demonstration Project, https://www.iea.org/reports/ccus-around-the-world-in-2021/tomakomai-ccs-demonstration-project; U.S. Department of Energy, Tomakomai Carbon Capture and Storage (CCS) Demonstration Project, https://fossil.energy.gov/archives/cslf/Projects/Tomakomai.html.

³⁹ See, e.g., Muhammad Zubair Shahid and Jim-Kuk Kim, Design and economic evaluation of a novel amine-based CO₂ capture process for SMR-based hydrogen production plants, Journal of Cleaner Production (May 20, 2023), https://www.sciencedirect.com/science/article/abs/pii/S0959652623008624 ("Chemical absorption using amine solvents is the most commercially recognized technology to capture CO₂ from the SMR-based hydrogen production plant.").

⁴⁰ Air Liquide, Combined Carbon Capture Solution on Air Liquide South Texas Steam Methane Reformer, 2024 FECM/NETL Carbon Management Research Project Review Meeting, slides 5–6, https://netl.doe.gov/sites/default/files/netl-file/24CM/24CM_PSCC_6_Odom.pdf.

decertify the LCFS Amendments' EIA, conduct the environmental analysis anew because of these proposed changes, and recirculate the document for public comment and review.

Importantly, any environmental review must address the impacts of fossil hydrogen production and CCS on adjacent communities. The locations of fossil hydrogen producers that sell into the LCFS are known. In its air quality modeling spreadsheet CARB lists "California SMR Hydrogen Facilities," which are located in at least three air districts throughout the State. ⁴¹ CARB knows which existing SMR facilities produce hydrogen that generates LCFS credits, providing a strong indication of which facilities will further ramp up hydrogen production to supply the growing market for hydrogen as a transportation fuel. The Current Fuel Pathways spreadsheet, which contains a list of certified LCFS pathways, also identifies hydrogen producers and their locations. ⁴² Finally, a 2019 study has also listed the locations of all SMR facilities. ⁴³

CARB admits in the EIA that "[s]taff expects proposed amendments will increase the production of low-carbon fuels in California, which will result in increased emissions at the production facilities."44 The addition of the proposed changes to Subjection 95482(h) would only increase such emissions for the reasons described above in this Section and Section I.B. CARB must connect this data and assess the impact of increasing hydrogen production on communities impacted by these hydrogen and CCS facilities. This sort of analysis is not only appropriate but required, even for a programmatic environmental review such as this one. See Cleveland National Forest Foundation v. San Diego Association of Governments (2017) 17 Cal. App. 5th 413, 440. As noted in prior comments, submitted before the Board hearing, it is insufficient for CARB to simply conclude, without analysis, that long-term air quality impacts of the Amendments will be significant and unavoidable. CARB must analyze the foreseeable air quality impacts from new or expanding hydrogen production and CCS expansion. CARB's failure to disclose localized impacts and analyze the public health and air quality implications would leave the public and decisionmakers in the dark about the Project's pollution burdens and public health impacts to frontline communities. The programmatic nature of environmental review does not excuse CARB's failure to disclose and assess the magnitude and severity of air quality impacts from the Amendments' impacts on hydrogen production at already existing SMR facilities and expected new facilities, which would likely be located near known freight corridors to reduce the

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⁴¹ CARB, Air Quality Analysis Workbook from 15-day Package, Emissions Factors – Production) tab. https://ww2.arb.ca.gov/sites/default/files/2024-

^{08/2024%20}LCFS Amendments Air Quality Calculations 15Day%20Proposed 1.xlsx.

⁴² CARB, Current Fuel Pathways

https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/fuelpathways/current-pathways all.xlsx.

⁴³ Sun et al., Supporting Information for Criteria Air Pollutants and Greenhouse Gas Emissions from Hydrogen Production in U.S. Steam Methane Reforming Facilities (2019), https://pubs.acs.org/doi/suppl/10.1021/acs.est.8b06197/suppl file/es8b06197 si 001.pdf.

⁴⁴ CARB, SRIA at B-2.

costs of serving the heavy-duty freight vehicles that are most difficult to electrify. Failing to provide this analysis would violate CEQA.

IV. Given the federal threats to EV support, CARB should enhance credit generation for EV charging infrastructure.

CARB's landmark zero-emission vehicle (ZEV) rules—vital pieces of California's strategy to meet air and climate goals—are under unprecedented attack. As the Trump administration takes steps to rescind California's Clean Air Act waivers, ⁴⁵ deny approval of future waivers, ⁴⁶ and slash federal funding, ⁴⁷ CARB must increase support for battery EVs. The need for this support was evident when the Board voted on the LCFS amendments, and it is even more apparent now, given the federal assault on bedrock climate and clean air laws.

Despite the central importance of battery EVs, California's commitment to them, and the growing threats to their deployment, CARB staff fails to propose enhancements to EV fast charging infrastructure (FCI) crediting even though it proposes increased crediting for hydrogen refueling infrastructure (HRI). ⁴⁸ FCI is already disadvantaged in the LCFS program, and this proposal would exacerbate the uneven playing field. CARB must correct this unjustified asymmetry and boost FCI crediting at this critical time.

First, CARB should eliminate the capacity crediting cap (of 1.5x the CapEx) for FCI to provide developers with greater investments certainty. Removing credit limits would signal CARB's commitment to maintaining infrastructure growth and California's commitment to its ZEV goals, especially in a time of regulatory and federal financial uncertainty. CARB staff

⁴⁵ See, e.g., Executive Order 14154, Section 2 (e), https://www.govinfo.gov/content/pkg/FR-2025-01-06/pdf/2024-31128.pdf; Advanced Clean Trucks approval in 2023, https://www.govinfo.gov/content/pkg/FR-2025-01-06/pdf/2024-31128.pdf; Advanced Clean Trucks approval in 2023, https://www.govinfo.gov/content/pkg/FR-2023-04-06/pdf/2023-07184.pdf.

https://www.epa.gov/system/files/documents/2025-01/hd-acf-carb-waiver-withdraw-resp-2025-1-14.pdf. The waiver was reinstated under the Biden administration in 2022. In 2025, CARB revoked its waiver request for Advanced Clean Fleets and the In-Use Locomotive Standards, limiting CARB's enforcement of these Board-approved regulations.

⁴⁷ Including Advanced Technology Vehicle Manufacturing Loans, used and new clean vehicle tax credits, charging infrastructure tax credits, the National Electric Vehicle Infrastructure (NEVI) Formula Program. ⁴⁸ CARB, Attachment A-2.1, Proposed Regulation Order

https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/atta2.pdf (compare changes to 95486.3 at 21-22 and 27-28 (increasing credit generation for hydrogen refueling by lowering the derating factors and eliminating the credit cap provision) with changes at 31 and 36 (same derating and credit cap provisions not altered for EV charging infrastructure).

proposes to remove this cap for HRI, and there is no basis for withholding such a change for FCL.⁴⁹

Second, CARB must make the arbitrary derating for FCI at least at parity with the HRI stations, allowing for continued investment even under the significant uncertainty of the Advanced Clean Trucks rule and potential slower EV adoption due to the revocation of the Advanced Clean Fleets waiver request. Staff's current proposal increases the credit generation factors for HRI (from 50% to 62.5% for shared stations and from 25% to 31.5% for private stations) but inexplicably leaves the FCI factors unchanged (i.e. 20% for shared and 10% for private charging). CARB provides no explanation for why the specific increases were chosen, nor any evidence or analysis justifying that HRI needs more support than FCI. CARB claims that "through the public engagement process, stakeholders have confirmed that 6,000 kg/day, derated to 50% of the nameplate capacity, provides sufficient incentive for MHD-HRI stations," whereas no such confirmation was made from FCI stakeholders. In fact, FCI stakeholders noted that the HD FCI provisions help address "utilization risks in the early market phases" even with such regulatory requirements of the Advanced Clean Trucks and Advanced Clean Fleets rules.

CARB's unjustified preference for hydrogen refueling over EV charging is puzzling and troublesome given the overwhelming evidence shows that battery EVs will do almost all of the work cleaning up California's transportation sector. CARB's own estimates show electricity will power 88% of the zero-emission transportation energy demand through 2045, far exceeding the contribution of hydrogen fuel cell vehicles. ⁵³ CARB cut its own hydrogen fuel cell vehicle projections by two-thirds (from 62,600 to 20,500)⁵⁴—even before potential federal rollbacks

⁴⁹ Id.

⁵⁰ Id.

⁵¹ CARB, Appendix E: Purpose and Rationale of Proposed Amendments for the Low Carbon Fuel Standard Requirements (Jan.2, 2024) at 42

https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/lcfs appe.pdf.

⁵² Hall et al., Low Carbon Fuel Standard Amendments (2nd 15-Day Changes) (Oct. 16, 2024) at 1, https://www.arb.ca.gov/lists/com-attach/39-lcfs2024-2nd15day-AG0HaVA1WVUDbFA+.pdf.

⁵³ CARB provided the expected energy demand for fuel types in its LCFS scenario model (https://ww2.arb.ca.gov/sites/default/files/2024-

^{08/}scenario_inputs_15Day_Proposed_9step_30_final_posted_0.xlsx) and explained the rationale for the fuel demand by fuel type in its CATS modeling documentation

⁽https://ww2.arb.ca.gov/sites/default/files/2023-08/CATS%20Technical 1.pdf). From 2025-2045, the electricity demand is estimated as 4.92E12 MJ and the hydrogen demand is estimated as 6.44E11 MJ. Of the total ZEV-related energy (i.e. electricity and hydrogen (not including gas, diesel, cng), 88% of the energy need is from electricity and 12% is from hydrogen.

⁵⁴ CARB, 2024 Annual Evaluation of Fuel Cell Electric Vehicle Deployment and Hydrogen Fuel Station Network Deployment (2024) at 14 https://ww2.arb.ca.gov/sites/default/files/2024-12/AB-126-Report-2024-Final.pdf.

were identified.⁵⁵ Other experts' most recent economic modeling has also shown that the role of hydrogen in surface transportation is likely to be very limited, as the costs of battery EVs decline more quickly than previously forecasted and hydrogen vehicle costs decline more slowly than anticipated.⁵⁶ Further, even though EV adoption may be slower than what was expected with full enforcement of CARB's Advanced Clean Cars II, Advanced Clean Trucks, and Advanced Clean Fleets regulations, the data are clear: more consumers are purchasing EVs,⁵⁷ and more infrastructure is needed. Indeed, the current level of EV infrastructure deployment (i.e. 179, 241 reported EV chargers) is less than 1/6 of what California Energy Commission (CEC) says is needed by 2030 (i.e. 1.01 million chargers). ⁵⁸

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<u>LDV</u> <u>Sales and Shares Last updated 1-31-2025 ada.xlsx</u> (showing light duty ZEVs represent over 25% of new car sales in 2024, and that percentage is increasing);

Medium Heavy Duty Vehicle Population Last updated 04-30-2024 ada.xlsx (showing 95% of the MHD ZEVs registered with DMV in 2023 were battery EVs (as opposed to FCEVs)

⁵⁸ See California Energy Commission (2025). Zero Emission Vehicle and Infrastructure Statistics, EV Chargers (last updated March 6, 2025)

https://www.energy.ca.gov/filebrowser/download/7390?fid=7390#block-symsoft-page-title (showing only 179,241 public or shared private chargers are in operation across California); Davis, Adam et al.,

⁵⁵ This is not the first time that CARB has slashed its projections for the role of hydrogen vehicles in the transportation sector. For instance, when CARB adopted the first ACC rule in 2012, it estimated cumulative sales of light-duty FCEVs to reach 56,844 by 2022. In the 2017 midterm review for the rule, CARB estimated that cumulative sales of light-duty FCEVs would reach 35,083 by 2022. CARB, 2017 ZEV Calculator Tool *available at* https://ww2.arb.ca.gov/sites/default/files/2020-01/zevcalculator_2017_ac.xlsx. However, just 11,897 light-duty FCEVs were on the road in California at the end of 2022. CEC, Light-Duty Vehicle Population in California, https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics/light-duty-vehicle. In its 2022 Advanced Clean Cars II rulemaking, CARB found that California could achieve 100% sales of zero-emission light-duty vehicles with just 2.8% sales of FCEVs. CARB, Final Statement of Reasons for Rulemaking for the Advanced Clean Cars II Regulations, Appendix F at 7 (Aug. 25, 2022), https://www.arb.ca.gov/sites/default/files/barcu/regact/2022/accii/fsorappf.pdf.

⁵⁶ For instance, a February 2025 report from the U.K. Climate Change Committee included the key message that by 2050, "[T]here will be no hydrogen cars or vans, and very little or potentially even no role for hydrogen in heavier vehicles." UKCCC Seventh Carbon Budget at 146, https://www.theccc.org.uk/wp-content/uploads/2025/02/The-Seventh-Carbon-Budget.pdf. The supporting documents for this report include ERM, ZEV HDV Uptake Trajectories: Modeling Assumptions (2024), https://www.theccc.org.uk/wp-content/uploads/2025/02/ZEV-HDV-uptake-trajectories-ERM.pdf. In addition, independent analysts at DNV estimated in 2024 that hydrogen would provide just 1% of on-road energy demand by 2050—a dramatic downward revision of its projection in 2023 that hydrogen would provide about 3% of on-road energy by midcentury. Leigh Collins, DNV slashes forecast for hydrogen use in road transport amid advances in battery-electric trucks, Hydrogen Insight (Oct. 17, 2024), https://www.hydrogeninsight.com/transport/dnv-slashes-forecast-for-hydrogen-use-in-road-transport-amid-advances-in-battery-electric-trucks/2-1-1725398.

⁵⁷ California Energy Commission (2025). California Energy Commission Zero Emission Vehicle and Infrastructure Statistics (last updated Jan. 31, 2025) https://www.energy.ca.gov/files/zev-and-infrastructure-stats-data;

In Diversity and Shares Last and state 1, 21, 2025, adapting light data. The proposent events are stated as a state of the proposent events.

It is also irresponsible for CARB to favor hydrogen fueling stations with special credit generation opportunities that are unavailable to EV charging stations because hydrogen fueling stations present unique stranded asset risks. In a 2023 fact sheet, CARB and CEC explained that "investments in hydrogen fueling infrastructure may become stranded assets" if several barriers are not addressed. ⁵⁹ The agencies highlighted the need to transition to fully clean and renewable hydrogen production, lower hydrogen fuel prices so that they do not remain far above the costs of equivalent fuel for internal combustion engines (ICE) and battery electric vehicles, and improve the availability of fuel cell electric vehicle (FCEV) models. ⁶⁰ These factors do not pose similar risks to EV charging stations because (1) Senate Bill 100 created a process for transitioning their fuel to renewable energy, (2) fuel costs for EVs are already lower than fuel costs for ICE vehicles, and (3) manufacturers offer a broader range of battery electric models than FCEVs.

Given this robust evidence, CARB should appropriately boost FCI crediting to reflect the critical importance of battery EVs for California's energy transition and to counter federal threats to EV deployment and California's clean air and climate goals. Significant changes will require readoption of the regulation under the APA, and this process will provide CARB with an opportunity to consider additional evidence on the importance of LCFS support for EV deployment given the altered federal landscape.

In sum, we urge CARB to (1) reject staff's unjustified proposal to increase subsidies for polluting fossil hydrogen and to (2) boost support for EV infrastructure in the face of federal attacks and rollbacks. If CARB does not reject staff's proposal to significantly change the regulation in favor of fossil hydrogen, it must readopt the regulation and conduct additional review under CEQA.

Sincerely,

/s/ Nina Robertson Nina Robertson Sara Gersen

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²⁰²³ Assembly Bill 2127 Second Electric Vehicle Charging Infrastructure Assessment: Assessing Charging Needs to Support Zero-Emission Vehicles in 2030 and 2035. California Energy Commission. Publication Number: CEC-600-2024-003, at ii

https://efiling.energy.ca.gov/GetDocument.aspx?tn=254161 (projecting that "California will need 1.01 million chargers (including 39,000 direct-current fast chargers) to support 7.1 million light-duty plug-in electric vehicles in 2030.").

⁵⁹ CARB and CEC, Hydrogen Vehicle Fueling Infrastructure and Fuel Production in California: Frequently Asked Questions (2023), https://calmatters.org/wp-content/uploads/2023/08/AB-118_FactSheet_H2-4.pdf.

⁶⁰ Id.

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April 18, 2025

Submitted electronically via ww2.arb.ca.gov/lispub/comm/bclist.php

The Honorable Dr. Steven Cliff Executive Officer c/o Clerk's Office, California Air Resources Board 1001 I Street Sacramento, CA 95814

RE: Comments to April 4, 2025, CARB Low Carbon Fuel Standard Proposed Third 15-Day Modifications to Proposed Regulation Order

Dear Dr. Cliff:

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California Resources Corporation (CRC) appreciates the opportunity to provide comments on the California Air Resources Board's (CARB) Proposed Third 15-Day Modifications to Proposed Regulation Order released April 4, 2025 (Third 15-Day Changes).¹

CRC supports CARB's proposed amendment to Section 95482(h) of the Low Carbon Fuel Standard Regulation (LCFS Regulation). The availability of LCFS credits for hydrogen produced with accompanying carbon capture and sequestration (CCS) technology is critical to the advancement of California's climate, economic, and energy goals; as it will enable the production of hydrogen that meets both criteria critical to the successful transition to renewable fuels at scale: (i) the ability to produce volumes necessary to meet statewide demand and (ii) consumer affordability. Existing incentives have proven insufficient to attract the capital investments required to develop hydrogen infrastructure in California, without which development at scale is unlikely to occur in the state.

Specifically, if adopted, the proposed amendment to Section 95482(h) will provide an economic rationale for investors to underwrite hydrogen projects, releasing the financing required for project development. The availability of LCFS credits for hydrogen produced with accompanying CCS technology has the potential to drive billions of dollars of private investment in hydrogen production in the state. Additionally, the adoption of the proposed amendment to Section 94582(h) could lead to the creation of high-quality construction jobs and long-term operations jobs, many of which will be paid in accordance with the prevailing wage requirements under Sections 45Q and 45V of the U.S. Internal Revenue Code of 1986, as amended.

If adopted, the proposed amendment to Section 95482(h) will advance the development of projects that aim to contribute to California's hydrogen supply to meet the state's growing needs. For example, through its Carbon TerrraVault (CTV) line of business, CRC is advancing multiple clean energy initiatives in California. These include the previously announced proposed Yosemite Hydrogen Facility projects in collaboration with Yosemite Clean Energy, LLC, which once operational are expected to produce in the aggregate approximately 24,000 Kg of hydrogen per day and sequester approximately 120,000 MT of carbon dioxide per annum. Additionally, the Elk Hills Hydrogen

¹ California Air Resources Board, Proposed 15-Day Changes, https://ww2.arb.ca.gov/rulemaking/2024/lcfs2024.

Project, a collaboration between CTV and Lone Cypress Energy Services, is expected to sequester 205,000 MT of CO₂ annually and produce approximately 65 tons of hydrogen per day. Together these two projects alone are anticipated to bring almost \$1 billion of investment to California, create over 3,000 construction, and over 300 permanent, high-paying jobs, and generate over \$40 million in state and local annual tax revenue.

Beyond economic impact, the production of hydrogen accompanied by CCS technology is expected to support a broader ecosystem of skilled trades, STEM innovation, and workforce training opportunities in traditionally underserved areas. Safety and environmental stewardship remain central to project design and execution, with robust community engagement and regulatory compliance at every stage.

These projects are just a portion of the clean energy portfolio contemplated by CRC. With the adoption of the proposed amendment to Section 95482(h) of the LCFS Regulation, we anticipate greater investment momentum will drive the development of hydrogen production projects in the state, helping California meet its growing energy demand in a technology-neutral manner.

Conclusion

CARB's 2022 Scoping Plan for Achieving Carbon Neutrality calls for a broad and inclusive definition of low carbon hydrogen projects to enable the scale-up of hydrogen production to the level required to meet California's long-term decarbonization goals. California energy companies—including CRC, CTV and its partners—are prepared to make significant investments in low carbon hydrogen projects that incorporate CCS. LCFS credit eligibility is a critical factor of return on investment and a critical driver of final investment decisions and securing financing. The proposed amendment to Section 95482(h) of the LCFS Regulation affirms CARB's continued commitment to supporting CCS-accompanied hydrogen production, providing the requisite regulatory certainty necessary for the advancement of projects that reduce emissions, strengthen energy resilience, and create economic opportunities across the state.

CRC appreciates the opportunity to comment on the Third 15-Day Changes. We support and look forward to the adoption of the proposed amendment to Section 95482(h) and commend CARB for its leadership.

Respectfully submitted,

JMLM

Jason Marshall

Vice President, Regulatory Affairs

California Resources Corporation





April 21, 2025

Chair Liane Randolph & Members of the Board California Air Resources Board 1001 I Street, Sacramento, CA 95814

Via Electronic Submission

Re: Third 15-Day Changes to the Proposed LCFS Regulation Order

Dear Chair Randolph and Members of the California Air Resources Board:

The North Dakota Soybean Growers Association (NDSGA) appreciates the opportunity to comment on the proposed modifications (Third 15-Day Changes) to the Low Carbon Fuel Standard (LCFS) program. NDSGA has welcomed engagement with the California Air Resources Board (CARB) and staff throughout this multi-year process to update the LCFS program.

Members of the NDSGA plant soybeans in a rotation that usually includes a number of crops, including other oil seed crops such as canola and sunflower. The rotation for many farmers changes based on market opportunities. As soybean markets have opened up and profitability for crops like barley have changed, farmers have modified their crop rotation.

CARB's Third 15-Day Changes to revise the LCFS did not address our major concerns with provisions included in the final amendments approved by CARB. In addition to the new proposals in the Third 15-Day Changes package, NDSGA remains deeply concerned with the drastic and inequitable pivot CARB has made related to agricultural feedstocks used for biofuels. NDSGA continues to encourage that updates to the LCFS program are based on up-to-date and sound science, as required by AB-32. Outlined below are our concerns and proposed solutions that will enable CARB to meet its climate goals, protect the environment and all Californians, while also supporting American soybean farmers and processors who are investing in the future of low-carbon energy.

Serious Feedstock Cap Concerns and Proposed Solutions

NDSGA still has significant concerns with the vegetable oil feedstock cap that was included in the initial 15-Day Changes posted in August 2024. The current proposal restricts the amount of soybean oil, canola oil and sunflower seed oil that is allowed to generate credits in the program at an inequitable 20% by company. CARB's own data demonstrates that vegetable oil feedstocks, including soy, have consistently exceeded the proposed cap since 2021.

Capping these proven, sustainable, and scalable feedstocks would suppress the supply of renewable diesel, increase reliance on fossil fuels, and raise fuel prices for California consumers. Even CARB staff acknowledged in the April 2024 workshop that a cap would reduce air quality

benefits and likely increase NOx and PM2.5 emissions. All of this, including the recent tariffs on imported feedstocks greatly increase costs and further substantiate U.S. based feedstocks as the clear-cut choice. NDSGA urges CARB to remove the cap on U.S. based vegetable oil feedstocks to provide a more economically feasible, locally produced and sustainable, climate smart option for the people and the planet.

Agricultural feedstocks for biofuel production are already held to a high standard for participation in the U.S. Renewable Fuel Standard (RFS). Rather than adding sustainable U.S. based feedstocks to its arbitrary proposed cap, CARB needs to update carbon intensity analysis and oversight of imported feedstocks, which are not held to the same level of accountability. Recent actions by the European Union in response to fraudulent Chinese biodiesel imports underscore this concern¹. The EU committee recently met at the request of a member state to discuss alleged fraud in biodiesel imports from China. Fraud continues to be an issue with imported feedstocks and needs to be addressed further. NDSGA strongly encourages CARB to adopt enforceable traceability and verification standards, including origin disclosures, documentation audits, and physical testing. Without implementing sustainable solutions to the above and not eliminating a cap on U.S. vegetable oil feedstock, CARB is essentially putting the feedstocks from foreign countries (i.e., China) above those of the United States.

Sustainability Guardrails and Traceability Concerns

NDSGA remains very concerned about the sustainability guardrails. The sustainability guardrails are more onerous than the specified source requirements used for non-U.S. waste feedstock imports. Palm oil in Southeast Asia has had forced labor concerns², but CARB does not require used cooking oil derived from palm to track social or economic sustainability. Concerningly, petroleum does have to track these criteria. CARB's proposal makes it administratively easier to use non-sustainable petroleum³ in the state than biofuels that have lower carbon intensity (CI) scores and are produced from sustainable feedstocks grown in the United States. Land use change is already captured in the indirect land use change (ILUC) score, which still makes it unclear what actual purpose the guardrails serve.

If CARB insists on agricultural feedstock traceability, then it should reward sustainable practices beyond what is already assumed in the lifecycle analysis (LCA). The U.S. Department of Agriculture (USDA) has developed a tool to quantify the CI reductions for no-till, cover crops and nitrogen inhibitors. Considering this integral information, the carbon intensity of soy-based biofuels could improve through the mentioned climate smart ag practices on the field where the soybeans were produced. Other farming practices like low-till, nutrient management, enhanced efficiency fertilizers, buffers, wetland and grassland management, tree planting on working lands, planting for higher carbon sequestration, and soil amendments all could and should be accounted to assign a lower CI score to an agricultural feedstock. USDA already tracks all these practices through several of their managed conservation programs. In addition, there are a variety of other practices that scientifically lower the CI score of soybean feedstocks for biofuels, and USDA is actively working to develop mechanisms to account for those. If CARB insists

¹ EU industry demands answers as 'fraudulent' Chinese biofuels continue to flow - Euractiv

² https://apnews.com/article/virus-outbreak-only-on-ap-indonesia-financial-markets-malaysia-7b634596270cc6aa7578a062a30423bb

³ https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.858512/full

on tracing feedstocks back to the farm, then it should also acknowledge when those feedstocks are produced with lower CI practices.

Moreover, USDA has recognized the CI reduction benefits of certain sustainable or climate-smart practices for the purposes of clean fuel transportation programs and is undertaking a rulemaking process to develop final guidelines for the quantification of these practices. Through planting decisions, soil management, and other practices, soybean farmers can continuously reduce environmental impacts. NDSGA proposes the aforementioned issues to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Modernized, Accurate, Climate Smart Carbon Intensity Modeling and Scoring

NDSGA remains concerned that without a comprehensive update to the Global Trade Analysis Project model for biofuels (GTAP-BIO) that CARB utilizes, U.S. soy-based feedstocks will be phased out of the LCFS even without the additional limitations included in the Second and Third 15-Day Changes. Current data indicates a much lower CI score for U.S. soybeans, as growers continue to improve soil practices, limit water use, lower on-farm emissions and more. CARB is recommending stringent sustainability guardrails for U.S. soy but is still on track to likely phase-out U.S. soy-based biofuels from credit generation by approximately 2035 or sooner.

As CARB looks to develop a more aggressive auto acceleration mechanism to reach CI reduction benchmarks sooner, using outdated methodologies will only limit the output of actual improvement over time in terms of emissions reductions. As CARB updates all other major lifecycle emissions models through this rulemaking, NDSGA once again urges action to update the GTAP-BIO model so that the most current, climate smart and science-based data may be used to determine carbon intensity reductions. The reasoning and sources indicated in the Third 15-Day Changes do not address this concern and need to be revised to ensure accuracy. NDSGA proposes this issue to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Equitable Entities Eligible to Apply for Fuel Pathways

NDSGA is very concerned about CARB's decision to give the Executive Officer authority to stop accepting new pathways for biomass-based diesel starting in January 2031. NDSGA does not understand how this benefits the LCFS. Under AB-32, CARB must under statute minimize costs and maximize GHG reductions. It is unclear how this is served by rejecting new pathways. In fact, the LCFS is best served by allowing the most available and equitable pathways. If these pathways cannot achieve cost-effective GHG savings, they will not be utilized by the market in the LCFS. In essence, an increase in pathways can only serve to improve GHG benefits in California. Singling out a single fuel for prejudicial treatment is baffling given the goals of the LCFS and the authority that establishes it. NDSGA urges CARB to continue to allow equitable pathways forward with no date of denial.

Recommended Climate Enhancing Solutions for CARB

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As CARB finalizes its update to the LCFS, NDSGA recommends several actions that will likely prevent an increase in fossil diesel use, improve carbon intensity calculations, and improve market access for sustainable U.S. agricultural feedstock providers.

First, CARB should not apply the vegetable oil feedstock cap proposal to U.S. feedstocks. As noted, these feedstocks are already subject to federal guardrails to ensure production on land not converted since 2008. The RFS was designed specifically to prevent land conversion for biofuel production, and USDA data shows a decrease in farmland over the same period.

Second, CARB should convene an expert working group to consider issues related to the sustainability provisions and indirect land use change (ILUC). NDSGA recommends that this expert working group convene before the end of 2025 and provide recommendations by the end of Fall 2026.

Third, NDSGA retains strong concerns about the ability of supply chains to comply with the sustainability guardrails. If CARB does move forward with the guardrails, they must reconsider its proposed sustainability requirements to allow soybean growers the opportunity to participate in the California biofuels market through innovative and climate smart agriculture practices. If traceability can be used to show additional benefits in CI scoring, CARB must look to programs already developed through farmer input and provide improved scoring for feedstocks that employ sustainability practices to minimize the changes in comparative costs (i.e., USDA accredited programs and practices). CARB should work with USDA to develop an aligned scheme to quantify climate-smart agricultural practices for the purposes of biofuel feedstocks. USDA has already engaged with CARB regarding this project, which could be applied to the work that CARB is doing on traceability and carbon quantification of agricultural biofuel feedstocks.

Lastly, CARB must undertake a comprehensive update of the GTAP-BIO model for soybean oil used in biofuel production. Without using the most up-to-date and accurate data, CARB is doing a disservice to the U.S. feedstock producers and California's citizens by calculating carbon intensity scores not rooted in current facts. Through CARB's own analysis we know prejudicial feedstock treatment will lead to more emissions in the California transportation sector, harming the environment.

Concluding Thoughts/Pathway Forward

NDSGA is encouraged by the continued successes of programs that support the development of cleaner, low-carbon fuels. However, it is critical that CARB finalizes updates in a way that equitably include U.S. agricultural feedstocks through policies that are science-based aligning with the most up to date information as well as promoting the sustainability of U.S. based products and businesses; including the elimination of capping on U.S. vegetable oil feedstocks and applying sustainability guardrails that are economically feasible for farmers while rewarding their practices that lower CI.

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CARB's Third 15-Day Changes did not address any of the fundamental issues raised by NDSGA in the First and Second 15-Day Changes and fails to acknowledge the potential unintentional consequences of a feedstock outlined by its own employees in previous discussions. CARB is required under the law to achieve the maximum technically feasible and cost-effective reductions in greenhouse gas emissions. The most recent 15-Day Changes show a lack of

066.2 cont. willingness to achieve the statutory obligations set forth in AB-32 and neglect modernized, climate smart, science-based solutions, ultimately disregarding the protection of U.S. based feedstocks, the people, and the planet. NDSGA also asks that CARB respond in writing to further substantiate their decisions regarding our concerns expressed in this letter. We look forward to your written responses as a state regulatory body, whose responsibility is to protect its' citizens and the environment by providing transparency on decisions made for those of impact.

NDSGA is eager to continue working with CARB to support the role of agriculture in diversifying the fuel supply while reducing carbon intensity and increasing clean air in California and beyond. On behalf of U.S. soybean farmers, we appreciate the opportunity to comment and look forward to collaborating with CARB and other relevant stakeholders on implementation of policies that expand the use of U.S. soy-based biofuels and market opportunities for U.S. soybean farmers.

Sincerely,

Justin Sherlock, President

Justin Sheelood

North Dakota Soybean Growers Association

April 21, 2025

Clerks' Office, California Air Resources Board 1001 I Street, Sacramento, California 95814

Via Electronic submittal: https://ww2.arb.ca.gov/lispub/comm/bclist.php

Re: Proposed Amendment to Title 17, California Code of Regulations Section 95482(h)

The Center for Biological Diversity and Food & Water Watch submit the following comments on the portion of the proposed amendment to the Low Carbon Fuel Standard ("LCFS") creating post-2035 LCFS credits for production of fossil methane-based hydrogen accompanied by carbon capture and sequestration ("CCS"), found at ATTACHMENT A-1, Proposed Regulation Order – Proposed Amendments to the Low Carbon Fuel Standard Regulation (LCFS credit for fossil-fuel derived hydrogen after 2035) ("Amendment"). The Amendment would expand the ways that fossil-fuel derived hydrogen can generate LCFS credits after 2035, and in so doing will incentivize the production of more fossil methane, a dangerous greenhouse gas. The Amendment adds use of CCS in the production of hydrogen from fossil methane as a mechanism to create LCFS credits. In this proposal, fossil fuel-derived hydrogen phases out of the LCFS by 2035 unless it is paired with factory farm gas credits or 100% produced with CCS. The CCS part of this is new.²

The new provision of Title 17, California Code of Regulations Section 95482(h) that these comments address is:

Effective January 1, 2035, hydrogen produced using fossil gas as a feedstock is ineligible for LCFS credit generation unless biomethane attributes are matched to 100 percent of the hydrogen production as described in Section 95488.8(i)(2) or 100 percent of the hydrogen is produced with accompanying carbon capture and sequestration technology [emphasis added].

We oppose the Amendment for four reasons: 1) CCS is an unproven, potentially dangerous technology that should not be a part of California's hydrogen policy; 2) hydrogen does not fit within the LCFS CCS Protocol; 3) enhancing fossil methane production is counter to California's greenhouse gas ("GHG") policies and will lead to additional methane emissions from production and transportation; and 4) because of the items above, if CARB is to proceed with this amendment, a supplemental EIR is required.

Alaska . Arizona · California · Colorado · Florida · Hawaii · N. Carolina · New Mexico · New York · Oregon · Washington, D.C. · La Paz, Mexico

¹ Available at https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/atta1.pdf), specifically Section 95482(h) at internal pages 36-37.

² The CARB Carbon Capture and Sequestration Protocol under the Low Carbon Fuel Standard appears at https://ww2.arb.ca.gov/sites/default/files/2020-03/CCS Protocol Under LCFS 8-13-18 ada.pdf.

1. CCS Should Not Be Part of California's Hydrogen Policy

CCS is a risky, unproven technology that should not be part of California's hydrogen policy. The Center for Biological Diversity's February 20, 2024 letter to CARB on the proposed LCFS amendments pointed out the dangers of CCS. As the Center explained in that letter:

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[T]he only form of hydrogen that should be considered under any provision in the LCFS is "green hydrogen," or hydrogen made by splitting water into hydrogen and oxygen using 100% solar or wind energy, while adhering to the three pillars . . . CARB should not be incentivizing and prolonging the use of fossil fuels in any manner. This includes fossil fuels plus CCS. Facilities using CCS do not capture 100% of their climate-harming emissions, they incur a high energy penalty (meaning more energy use and emissions), and fossil fuel production is rife with environmental and health harms. Phasing out fossil fuels should be a fundamental tenant [sic] of any climate-focused policy, but CARB insists on carving out ways for fossil fuels to continue . . . These carve outs must end.

2. Hydrogen Does Not Fit Within the LCFS CCS Protocol

Green hydrogen produced by electrolysis does not produce CO₂ or any GHGs as a byproduct. But hydrogen made from methane steam reforming does, to the tune of roughly 7 kg of CO₂ produced for each kg of hydrogen created.³ The "Applicability" section of the Protocol states: "The Carbon Capture and Sequestration (CCS) Protocol applies to CCS projects that capture carbon dioxide (CO₂) and sequester it onshore, in either saline or depleted oil and gas reservoirs, or oil and gas reservoirs used for CO₂-enhanced oil recovery (CO₂-EOR)." The Protocol, however, was designed to allow transportation fuels whose lifecycle emissions have been reduced through CCS to become eligible for LCFS credits. Hydrogen has many potential uses in addition to fuel cells used for transportation, including possibly decarbonizing hard-to-electrify industries such as steel and cement making, so it does not fit squarely within the purpose of the Protocol. To be consistent, if the proposed Amendment is adopted, the Protocol should be amended to include all uses of hydrogen produced in association with CCS, and that amendment should be analyzed under CEQA.

3. Production And Distribution of Fossil Methane Should Not Be Encouraged

Methane is a powerful greenhouse gas. The Amendment would provide a new market for fossil methane in California: supporting LCFS credits for hydrogen created by methane steam reformation. This is not consistent with California's policy of reducing reliance on fossil fuels. In addition, the production and distribution of methane itself are plagued by leaks. As U.S. EPA explains for natural gas systems:⁴

Methane emissions occur in all segments of the natural gas industry, from production, through processing and transmission, to distribution. They primarily result from normal operations, routine maintenance, fugitive leaks, and system upsets.

³ https://www.sciencedirect.com/topics/engineering/methane-steam-reforming.

⁴ https://www.epa.gov/natural-gas-star-program/primary-sources-methane-emissions.

067.1 cont. As gas moves through the system, emissions occur through intentional venting and unintentional leaks. Venting can occur through equipment design or operational practices, such as the continuous bleed of gas from pneumatic devices (that control gas flows, levels, temperatures, and pressures in the equipment), or venting from well completions during production. In addition to vented emissions, methane losses can occur from leaks (also referred to as fugitive emissions) in all parts of the infrastructure, from connections between pipes and vessels, to valves and equipment.

And as the MIT Technology Review reports:5

The US Environmental Protection Agency estimates that roughly 1% of oil and gas produced winds up leaking into the atmosphere as methane pollution. But survey after survey has suggested that the official numbers underestimate the true extent of the methane problem.

As California is experiencing more and more damage from climate change, including increasingly severe wildfires, this is not the time to put more methane into the atmosphere.

4. A Supplemental EIR Is Required for This Amendment

Under CEQA Guidelines Section 15162(a), a supplemental EIR should be prepared when:

(1) Substantial changes are proposed in the project which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects;

. . .

(3) New information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was certified as complete or the negative declaration was adopted, shows any of the following:

- (A) The project will have one or more significant effects not discussed in the previous EIR or negative declaration;
- (B) Significant effects previously examined will be substantially more severe than shown in the previous EIR;
- (C) Mitigation measures or alternatives previously found not to be feasible would in fact be feasible and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative; or
- (D) Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more

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⁵ https://www.technologyreview.com/2024/03/13/1089725/methane-leaks-oil-gas/.

significant effects on the environment, but the project proponents decline to adopt the mitigation measure or alternative.

CARB has the discretion to approve or reject the Amendment and so may prepare a supplemental EIR. In these circumstances it must, under subsections (1) and (3) above.

First, there will be new significant environmental effects due to the volume of methane that will be lost to the atmosphere in the production and distribution of methane for use in methane steam reforming to create hydrogen. That volume should be analyzed and mitigation measures developed under CEQA.

Second, the project will have a significant effect not discussed in the prior EIR: methane emissions in connection with hydrogen production due to methane leakage.

Accordingly, CARB should prepare a supplemental EIR before enacting the Amendment.

Thank you for your consideration of this letter.

Yours truly,

Tyler Lobdell Staff Attorney Food & Water Watch

David Pettit Senior Attorney Center for Biological Diversity Date



April 21, 2025

The Honorable Liane M. Randolph, Chair California Air Resources Board 1001 I Street Sacramento, CA 95814

RE: Comments on Modified Text for the Proposed LCFS Amendments in Response to OAL Disapproval

The Low Carbon Fuels Coalition (LCFC) and members signatories to these comments are writing in support of the Modified Text for the Proposed Low Carbon Fuel Standard (LCFS) Amendments. While the LCFC previously expressed concerns for specific provisions on the record during the rulemaking process, specifically those that move further away from the technology neutrality that has been a hallmark of the LCFS program's success, the modified amendments strike a balance to accelerate progress toward California's ambitious climate goals and restore investor confidence, while minimizing LCFS program cost and potential impact on California drivers.

The extended rulemaking process has stalled the momentum of the LCFS program by failing to send the long-term market signal and credit value needed to generate investments.

The LCFS had *significantly outpaced its targets as of April 2024*, achieving carbon intensity reductions *3 years ahead of schedule*¹ and at lower cost than anticipated. Prospective estimates by the California Air Resources Board (CARB) and various others had projected up to \$1.80/gallon in conjunction with previous rulemakings. The actual current estimate is 8-10 cents/gallon.² Nonetheless, an unsubstantiated barrage of claims on the cost of the LCFS program and the price that consumers pay have obscured fundamental realities relating to the performance of the LCFS program:

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¹ CARB Data Dashboard at https://ww2.arb.ca.gov/resources/documents/lcfs-data-dashboard

² California Energy Commission published data at https://www.energy.ca.gov/data-reports/energyalmanac/californias-petroleum-market/california-oil-refinery-cost-disclosure



- A definitive study on consumer price impacts by Bates White showed that there is *no correlation between LCFS program credits prices and retail gas prices*³. An FAQ from CARB updated this analysis to show that this lack of correlation has continued.⁴
- The primary drivers of gas prices are the cost of petroleum, followed by fuel taxes and fees added directly to price of a gallon at the pump.
- Compliance costs have remained consistent over time, increasing carbon reductions for the same cost.⁵
- The LCFS has diversified the fuel market, which has created price competition to ease the burden on drivers. For example, renewable diesel is regularly cheaper at the pump than petroleum diesel and can be used in existing vehicles, which has resulted in replacing almost 3/4. of the diesel in California with renewable and waste sources; ethanol has been up to \$2.50/gallon cheaper than gasoline for flex-fuel vehicles that can use E85; home charging for EVs is significantly cheaper per mile.
- The overall compliance cost of the LCFS is minimized by a more flexible and fuel technology-neutral approach to decarbonization.
- As presented in CARB's April 10 workshop, a more restrictive program that reduces opportunities for credit generation by limiting viable and a_ordable low-carbon fuels achieves fewer carbon reductions, raises health eJects and associated costs, relies more heavily on petroleum-based fuels, and raises the cost of the program overall.⁷
- In turn, a more restrictive and costly LCFS program increases both the likelihood and potential magnitude of consumer price impacts.

California is at a pivotal moment in the fight against the increasing effects of climate change. The LCFS program is a lynchpin to decarbonize transportation and achieve the

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³ Study at https://www.lcfcoalition.com/s/Bates-White-LCFC-Report-Updated-20220421.pdf

CARB FAQ at https://ww2.arb.ca.gov/sites/default/files/2024-10/LCFS Fuel FAQ.pdf

⁵ See Environmental Defense Fund graph based on California Energy Commission data at https://blogs.edf.org/climate411/2024/10/31/growing-costs-of-climate-emergency-demand-ambitiouspolicy-not-business-as-usual/

⁶ See Bates White report

⁷ Slides 23, 29 and 31 at https://ww2.arb.ca.gov/sites/default/files/2024-04/LCFS%20April%20Workshop%20Slides.pdf



068.1 goals established under AB32. The program has significantly exceeded expectations cont. for greenhouse gas reductions, and done so at far less than anticipated cost.

> To continue and build on this success, the Low Carbon Fuels Coalition and members below support the technical revisions reflected within the Modified Text for the Proposed LCFS Amendments.























April 21, 2025

Dr. Cheryl Laskowski
Branch Chief, Transportation Fuels
California Air Resources Board
P.O. Box 2815
Sacramento, CA 95812
Via electronic submission

RE: Growth Energy Comments on Third 15-Day Changes

Growth Energy appreciates the opportunity to provide comments to CARB regarding the Third 15-Day Changes to the Low Carbon Fuel Standard (LCFS) Amendments approved by CARB on November 8, 2024. Growth Energy is the world's largest association of biofuel producers, representing 97 U.S. plants that each year produce 9 billion gallons of renewable fuel; 131 businesses associated with the production process; and tens of thousands of biofuel supporters around the country. Together, we are working to bring better and more affordable choices at the fuel pump to consumers, improve air quality, and protect the environment for future generations. We remain committed to helping our country diversify its energy portfolio to grow more energy jobs, decarbonize the nation's energy mix, sustain family farms, and drive down the costs of transportation fuels for consumers.

Growth Energy has previously submitted extensive comments elaborating the vital role low carbon biofuels and higher biofuel blends can play in meeting California's ambitious climate goals. As we have previously noted, the Amendments impose new, costly, and unnecessary burdens on ethanol producers in the form of vague and undefined crop requirements (the "Crop Requirements"). These requirements risk substantially reducing the availability of credit-generating biofuels within the LCFS Program, resulting in significant disruptions to the LCFS market and increased consumer costs. They also will cause widespread structural changes to the nation's agricultural markets, including how crops are grown, sold, marketed and transported.

The Office of Administrative Law (OAL) correctly recognized that these Crop Requirements "fail[] to comply with the clarity standard of Government Code section 11349.1, subdivision (a)(3)."

Unfortunately, the mere cosmetic changes CARB has proposed in this Third 15-Day Changes fall far short of addressing the pervasive lack of clarity throughout this section of the Amendments. As such, we encourage CARB to meaningfully address the Crop Requirements' problematic scope and clarity. Absent

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¹ OAL Decision of Disapproval of Regulatory Action, OAL Matter No. 2025-0103-01S at 2, https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/disapproval_decision.pdf

ont. much needed reconsideration and clarification, we urge OAL to again disapprove of the Amendments, including because CARB has not adequately evaluated and disclosed the sweeping changes to agricultural production and substantial costs the Amendments engender.

Moreover, OAL's initial disapproval has already delayed the regulatory process by months. We urge CARB to account for this unexpected delay and adjust the compliance deadlines to provide regulated parties adequate time to respond to the costs and complexities of the new rules and their impacts on agricultural markets and biofuels production. Relatedly, CARB's assessment of compliance costs released to the public for the first time after the Board voted to approve the Amendments lacks foundation and misstates by orders of magnitude potential compliance costs. A more realistic assessment, which should have been disclosed to the public and offered for comment, would highlight the substantial challenges for regulated parties and their supply chains in complying with the Crop Requirements, particularly on the expedited timeframe provided in the Amendments. As such, we urge CARB to thoroughly consider the economic consequences of the Amendments on both regulated parties and California consumers, along with the impacts of this regulatory delay, as it would be arbitrary and capricious for the agency to maintain its initial timeline in these circumstances.

Growth Energy encourages CARB to reconsider these aspects of the Amendments to ensure the real and significant GHG emissions reductions benefits of biofuels are realized under the LCFS.

I. CARB's Third 15-Day Changes Fail to Cure the Amendments' Lack of Clarity.

Regulations must have sufficient clarity to be "easily understood by those persons directly affected by them." Cal. Gov't Code § 11349(c); see also Sims v. Dep't of Corr. & Rehab., 216 Cal. App. 4th 1059, 1076 (2013). A regulation is not presumed to comply with the clarity standard if it "can, on its face, be reasonably and logically interpreted to have more than one meaning," 1 C.C.R. § 16(a)(1), or "uses terms which do not have meanings generally familiar to those 'directly affected' by the regulation, and those terms are defined neither in the regulation nor in the governing statute" Id., subd. (a)(3); see also Sims, 216 Cal. App. 4th at 1080.

The Crop Requirements are replete with provisions that are not easily understood, are susceptible to multiple meanings, and are not defined in regulation or statute. OAL's disapproval notice cites five separate provisions within the Crop Requirements at § 95488.9(g) that fail to meet regulatory standards for clarity. OAL's concerns with these specific provisions are well-founded, but they are the tip of the iceberg. In particular, there are three key areas where the Amendments' lack of clarity renders the Crop Requirements arbitrary and capricious and unconstitutionally vague: (1) the best environmental management practices ("BEMPs") in § 95488.9(g)(3), (2) the

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third-party certification system criteria in § 95488.9(g)(8), and (3) sweeping compliancewith-all-laws obligations that would require producers to monitor and attest to farmers' actions' consistency with "all local, State, and federal rules and permits" in § 95488.9(q)(1-2).

First, the BEMPs requirements in Section 95488.9(q)(3) consist of vague goals disconnected from any actionable targets or approaches producers could implement. For example, the Amendments state that cropland on which biofuels used in the LCFS program are grown, whether in Iowa or Kansas or Brazil, must "[m]aintain or enhance biodiversity habitat on agricultural or forested lands," "[e]nhance soil fertility and avoid erosion or compaction," and "reduce unsustainable water use. . . . " 17 C.C.R. § 95488.9(g)(3). None of these terms are explained, defined, or otherwise expressed in a way that can be "easily understood" for producers to implement. It is impossible for producers to know what farming practices CARB will determine "enhance biodiversity." how one can demonstrate that their farms "avoid erosion," or what types of water use CARB will deem "unsustainable." Yet failure to comply with the BEMPs will result in ineligibility of feedstock for use in biofuel production separate and apart from whether the feedstock meets a third-party certifier's requirements. *Id.* § 95488.9(g)(4).

069.3 cont.

> **Second**, the third-party certification system criteria are so nebulous that CARB preserves unfettered discretion over what certification systems will be approved or denied. Other than European certification systems, which CARB has bound itself to approve irrespective of consistency with U.S. or California law, ² CARB has set such vague criteria that it is impossible for regulated parties to anticipate what certification systems will be approved or denied, and regulated parties have no voice in the approval process. For example, certification systems must "consider environmental, social, and economic criteria"—a category so broad that it is difficult to imagine anything that CARB would *not* be able to use as a basis for declining to approve a certification system. § 95488.9(g)(8)(A)(2). The Amendments also require "sanction mechanisms" for farmers without any indication of what types of sanctions are appropriate, and mandate "an effective grievance mechanism" without any description of how CARB will determine effectiveness. § 95488.9(g)(8)(A)(11-12).

In the context of this pervasive lack of clarity, CARB's cosmetic changes to the regulations in this 15-Day proposal are legally insufficient. OAL correctly rejected §§ 95488.9(g)(6)(C)(2), 95488.9(g)(7)(C)(1), and 95488.9(g)(8)(A) on the grounds that it was "unclear when the Executive Officer will choose not to approve a certification system."³ In the 15-Day proposal, CARB adjusts these provisions to state that CARB "shall" rather than "may" adopt certification systems that satisfy the criteria listed in § 95488.9(g). But, despite numerous requests from Growth Energy and others to

² See 17 C.C.R. § 95488.9(g)(6)(C). Growth Energy notes its significant concern with CARB's delegation of its rulemaking authority to European regulators, where U.S. ethanol producers have no legal right to participate in the EU rulemaking process, whether through notice, comment, or democratic election.

elaborate this critical aspect of the Crop Requirements, CARB has done nothing to add clarity to the criteria. Regulated parties remain in the dark as to what practices the BEMPs require and which "social" criteria farmers in Iowa or elsewhere must adhere to in order to sell crops to biofuels producers.

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Similarly, OAL correctly rejected § 95488.9(g)(8)(H) because, among other reasons, it was "unclear when the Executive Officer will remove, suspend, or otherwise modify approval of an approved certification system." The language at issue included that "the Executive Officer may also remove, suspend or modify approval of an approved certification system if appropriate for consistency with a modification, removal, or suspension of the certification system standard in an analogous GHG program." § 95488.9(g)(8)(I). CARB's changes in the 15-Day proposal change the term "may...if appropriate" to "shall...if appropriate." *Id.* Any clarity provided by the use of "shall" in this provision is undermined by the retention of the qualifier "if appropriate." CARB retains full discretion to determine whether it is "appropriate" to remove, suspend, or modify approval of the certification system. As such, CARB's use of "shall" fails to improve the clarity of the rejected regulatory provision.

Third, the Amendments require biofuels producers to ensure farmers' consistency with—and attest under penalty of perjury to—sweeping compliance-with-all-laws statements despite not having first-hand knowledge of the information to which they are attesting. Of particular concern, the Amendments require biofuel producers to testify under penalty of perjury that crops were harvested "in accordance with all local, State, and federal rules and permits." § 95488.9(g)(1)(B)(1)(e)(emphasis added); § 95488.9(g)(2). The sheer breadth of this language makes it unclear how a biofuel producer could ever ensure compliance. It is unclear how biofuels producers should go about identifying all local, State, and federal rules and permits applicable to a particular farmer, let alone determining whether the farmer has complied with such rules and permits. Nor is it reasonable for a biofuel producer to ask farmers to make such sweeping and unqualified statements of compliance.⁵

To give one example of the unworkable breadth and lack of clarity of this aspect of the regulations, assume in the normal course of a farmer's operations a diesel tank used to refill farm tractors releases diesel in a manner inconsistent with state law. Although the farmer takes all appropriate steps to remediate the spill and even notifies and works collaboratively with relevant state authorities, is the farmer foreclosed from selling his grain to biofuels producers? If the release was not consistent with state law, would CARB view grain produced on that farm as ineligible for sale as feedstock in California biofuels? Would CARB retroactively invalidate credits for biofuels grown

⁴ *Id.* at 11

⁵ CARB's attempt to draw analogy to pre-existing requirements that biofuel producers ensure *their own* compliance with *California* laws is inapt. *See* FSOR Appx. B at 440. CARB's new requirement that fuel producers attest to farmers' compliance with out-of-state laws and permits is far broader than the LCFS' current requirements to comply with California and federal law themselves.

using crops from that farm? Growth Energy's view is that such results would be absurd, and implores CARB to carefully consider the practical implications of such sweeping statements.

Moreover, the compliance-with-all-laws requirement and related attestation are not limited to environmental rules and permits: "all" rules and permits could implicate federal, state, and local rules on immigration, labor, zoning, or a host of other areas. It is unreasonable to require crop-based biofuels producers to audit farmers' employee records on immigration status and payroll, or delve through local road use permits to ensure tractors and other farming equipment is compliant. Critically, there is no nexus whatsoever between compliance with these laws and regulations and the carbon intensity of biofuel sold in California.

We understand that CARB *may* choose not to interpret these regulatory requirements to cover issues like immigration, labor, zoning, or even the diesel spill example. But there is nothing in the regulatory text that prevents CARB from doing so or otherwise provides a reasonable limiting principle. Requirements this vague result in a patently unclear process where CARB has complete discretion over whether to accept a producers' attestations, giving rise to fair notice and due process concerns. Simply put, if sweeping compliance-with-all-laws provisions and attestations are intended to go no farther than existing requirements (as CARB claims⁶) there is no point including them in the regulation. If, however, they are meant to be meaningful requirements shaping how biofuels producers procure crops, CARB must elaborate and clarify their scope and justify their inclusion under authority rooted in AB-32.

II. Given Gross Underestimation of the Costs of Compliance, CARB Must Reconsider the Crop Requirements.

For the first time in the Final Statement of Reasons (FSOR) released *after* the Board's approval of the Amendments, and *after* the close of multiple comment periods of the regulatory package, CARB shared with the public and regulated parties its estimate of implementation cost of the Crop Requirements. Without explanation or citation, CARB ballparks cost at "\$4.7 million per year for the industry, an average of roughly \$39,000 per company." Relying on this unsupported calculation, CARB states that "staff do not expect the addition of sustainability requirements to reduce or limit the availability of biomass-based feedstocks in the program to a level that would significantly increase the costs of low carbon fuels and stifle investment in new low carbon feedstocks and technologies." CARB further claims that the "main cost to fuel producers" are mitigated by the implementation timeline's *end date* of 2031, ignoring that the costs of establishing supply chain traceability will be borne *immediately* upon the Amendments' effective date for new pathway applicants and for existing pathway

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⁶ See FSOR Appx. B at 440.

⁷ *Id.* at 441.

⁸ *Id*.

holders that must restructure all crop procurement (to the extent even feasible) in less than 8 months. CARB's assessment of both the magnitude of the expense burden and the relevant timing of such impacts necessitates reconsideration.

First, as a threshold matter, CARB's presentation of these compliance cost estimates is inconsistent with California procedural requirements. California agencies "shall include" in the Initial Statement of Reasons "[a]n identification of each technical, theoretical, and empirical study, report, or similar document, if any, upon which the agency relies in proposing the adoption, amendment, or repeal of a regulation." Cal. Gov. Code 11346.2(b)(3). Yet CARB withheld its \$39,000 per company compliance cost estimate until after the comment period had concluded, finally releasing the figure in an appendix to the FSOR. And even the FSOR provides no explanation of the estimate's origin. CARB's procedural errors here deprived the public of any opportunity to provide technical information to refute this estimate. Indeed, the California notice and comment procedural protections exist for this very purpose—to allow the public to present information to correct flawed agency assumptions before those assumptions become codified into flawed regulations. As such, we urge CARB to correct its error by disclosing and accepting comment on whatever technical basis CARB relied upon in this rulemaking to support its compliance cost estimates and assumptions.

Second, with respect to estimated costs, \$39,000/company per year is a gross underestimate which underscores CARB's lack of understanding of the impacts of the Amendments on biofuels producers. Had CARB presented this estimate to regulated parties during the rulemaking process and explained how it was derived, the Board could have considered in its vote on the package a more realistic picture of the changes wrought by the Crop Requirements and their burden on industry as compared against the illusory benefits.

As explained further in the attached letter by environmental economists at Optima Analytics, regulated parties are likely to incur at least the following categories of costs to come into compliance with the Crop Requirements, each of which is likely to independently exceed \$39,000 per company:

- Audit costs to verify farmers' compliance with all federal, state, and local laws.
- Additional personnel necessary at biofuels producers to ensure that feedstock is sourced from verified farmers and that all local, state, and federal regulations are being followed.

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⁹ Id. at 440-41.

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¹⁰ See, e.g. <u>POET, LLC v. State Air Res. Bd.</u>, 218 Cal. App. 4th 681, 744, 160 Cal. Rptr. 3d 69, 113 (2013), as modified on denial of reh'g (Aug. 8, 2013) ("The benefits of public participation in the regulatory process include (1) the agency being informed by interested parties about possible unintended consequences of a proposed regulation and (2) directing the attention of agency policymakers to the public they serve, thus providing some protection against bureaucratic tyranny.").

- Additional personnel necessary at grain elevators to oversee deliveries, track grain, and ensure that feedstock separation is maintained.
- Biofuel producers' direct costs in contracting with third-party certifiers to achieve third-party certification for every farm providing feedstock for the California market.
- Capital expenditures and operational costs for new equipment including silos, bins, and storage buildings at grain elevators to allow physical separation of certified and non-certified feedstock.
- Capital expenditures and operational costs for new equipment including fermentation tanks, stills, heat exchangers, storage bins and buildings, and process control panels and software at biorefineries to allow physical separation of California-destined and other-destination fuels.
- Capital and annual compliance costs incurred by farmers to achieve and maintain certification.
- Increased transportation costs to ensure certified and non-certified feedstocks and fuels are not commingled in trucks or trains.

Some of these costs may be so significant, and may require structural operational changes so fundamental, as to render compliance impossible for certain categories of producers and/or entities in the supply chain. Indeed, costs are also not limited to farmers and biorefineries. As researchers from Iowa State University recently concluded, "current corn and soybean handling, storage, and transportation systems are well suited for commodity management, but are not designed for the segregation and isolation of specialized products. The systems need physical and procedural modifications to effectively handle two grain streams."11 For certain grain elevators and other suppliers of biomass the Crop Requirements are not simply a matter of compliance costs, but rather are likely to extinguish their business models. Grain elevators are not physically designed or technologically equipped to comply with requirements of identifying, segregating, and tracking fungible kernels of corn. Grain elevators may be forced out of market entirely unless they completely change physical layout, basic operations, and contracting practices. And even if a grain elevator had the capital available to make such substantial changes, the additional cost/bushel to keep grains separated would likely reduce already-slim margins by approximately one-third. 12 As a result, the Amendments will dramatically reshape how biofuels producers procure

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¹¹ Pizarro, et al. Cost Estimation Model for isolation and Segregation of Non-Genetically Modified Corn and Soybeans at Country Elevators (March 2024) at 2.

¹² Id.

grain today, to the detriment of wholly out-of-state actors as well as California consumers forced to pay more for the same fuel. 13

There is no evidence that CARB considered any of these compliance costs or structural changes to the interstate commodities market in promulgating this rule. Without adequate consideration of compliance costs, CARB's assumption that the Crop Requirements will not "reduce or limit the availability of biomass-based feedstocks in the program" is faulty. As detailed in Growth Energy's previous comments, this faulty, unsupported assumption risks extreme adverse impacts to the California transportation fuel market. If significant volumes of credit-generating ethanol are unable to comply and become assigned the carbon intensity of gasoline, Californians can expect the resulting shortage of available LCFS credits to result in a corresponding price increase that will predominately be felt by consumers at the pump. 16

Finally, CARB greatly overstates the extent to which its implementation timeline defers compliance costs. Biofuels producers must immediately commence work to establish supply chain traceability in order to accurately submit spatial data and attest to the source of feedstock by the fast-approaching deadlines. As detailed above and in the attached expert report, this will require substantial investment to separate currently commingled grain handling, storage, and transportation systems, including but not limited to grain elevators. To be sure, the additional certification requirements arising in 2028 and 2031 will ratchet up compliance costs further. But CARB's extension of the "fully compliant" deadline to 2031 does not alleviate the significant immediate costs necessary to renovate complex agricultural supply chains before CARB's "first milestone" of sourcing and attestation requirements.

In sum, CARB should reconsider the economic implications of the Crop Requirements and provide an updated disclosure for public comment of estimated costs.

III. OAL Should Also Disapprove The Crop Requirements as Applicable to U.S. Ethanol Producers For Failing to Satisfy the Necessity Standard.

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¹³ For example, research by Informa Economics into the cost implications of similar feedstock requirements considered (and rejected) by EPA for the Renewable Fuel Standard (RFS) Program estimated compliance costs at \$420 million/year in 2009 dollars across the industry, equivalent to over \$621 million/year today. Of course, the RFS is a national program, but California consumes approximately 10% of the nation's biofuel putting costs on the \$60 million/year range, nowhere in the ballpark of CARB's unexplained estimate. We strongly encourage CARB to conduct a study into the costs of its proposal to develop an updated and accurate estimate of compliance costs specific to the LCFS Amendments. Informa Economics, *Compliance Costs Associated with the Proposed Rulemaking for RFS2* (Sep. 2009).

¹⁴ FSOR Appx. B at 441.

¹⁵ Growth Energy Comments on Proposed LCFS Amendments (Feb 20, 2024) at 2.

¹⁶ *Id*.

069.9 cont. In addition to needing sufficient clarity, California regulations must be shown to be "reasonably necessary to carry out the purpose and address the problem for which it is proposed." Cal. Gov. Code § 11346.2(b). This necessity standard requires both a "statement of the specific purpose of each adoption, amendment, or repeal;" and "information explaining why each provision of the adopted regulation is required to carry out the described purpose of the provision." 1 C.C.R. § 10.

CARB has failed to demonstrate that the Crop Requirements on ethanol producers are reasonably necessary. CARB claims that the Crop Requirements are intended to address increased crop demand from a "rapid expansion of biofuel production and biofuel demand." Yet CARB does not project any "rapid expansion" in ethanol demand; and instead notes the opposite, that "ethanol volumes are expected to *decrease* over the course of the Proposed Amendments." The only feedstock crops for which CARB has asserted that an increase in crop demand may occur are oil crops, used to produce biodiesel or renewable diesel. As Growth Energy and others have previously explained, oil crops are not used to produce ethanol.

CARB's response to comments on this issue is inapposite. It states:

By targeting or singling out specific biomass types, the risk increases for biomass not subject to sustainability requirements, as fuel producers shift to less stringent sources. All biomass-based fuels. . . are subject to the same sustainability criteria to minimize any incentive to shift to biomass sources with less stringent requirements.¹⁹

This reasoning misses fundamental realities of the fuels market: ethanol is blended into gasoline, not diesel, and gasoline and diesel are not substitutes. As documented in the record, gasoline demand and diesel demand are on two different trajectories in California given different engine mixes.²⁰ CARB is incorrect to assert that placing constraints on feedstocks for biodiesel and renewable diesel would spur demand for corn used for ethanol when the fuels are not interchangeable.

Moreover, CARB already disproportionately disincentivizes the use of ethanol through an "indirect land use change" penalty that is roughly four times higher than recent values published by the U.S. Department of Energy.²¹ Additional disincentives for ethanol are unreasonable and unnecessary, especially where CARB has not identified any current or expected increase to ethanol demand in California. OAL should therefore disapprove of the Crop Requirements as applied to ethanol producers.

¹⁷ Initial Statement of Reasons ("ISOR") at 32.

¹⁸ Final Environmental Impact Analysis ("FEIA") at 51.

¹⁹ FSOR Appx B at 443-44.

²⁰ 2022 Scoping Plan at 185-86.

²¹ See 45ZCF-GREET Model (January 2025), https://www.energy.gov/eere/greet

1. CARB Must Prepare a Supplemental Environmental Impact Analysis or an Addendum to the Final Environmental Impact Analysis.

A supplemental EIR is required if significant new information or substantial changes in the project or surrounding circumstances necessitate major revisions to the EIR. See Moss v. County of Humboldt, 162 Cal.App.4th 1041, 1057 (2008); see also Guidelines, § 15164, subd. (a). That is the case here. Major revisions to the EIA are needed to address environmental impacts that were ignored or downplayed in the EIA due to CARB's reliance on a deeply flawed cost estimate as well as recent developments in global trade policy.

Public Resources Code section 21166 requires the preparation of a supplemental environmental impact report in certain circumstances, including, as pertinent here, where "[s]ubstantial changes occur with respect to the circumstances under which the project is being undertaken which will require major revisions in the environmental impact report" or where "[n]ew information, which was not known and could not have been known at the time the environmental impact report was certified as complete becomes available." As explained below, both of these conditions are applicable here. Accordingly, CEQA requires that CARB prepare a supplemental EIA.²²

"Section 21166 is intended to provide a balance against the burdens created by the environmental review process and to accord a reasonable measure of finality and certainty to the results achieved." <u>Bowman v. City of Petaluma</u>, 185 Cal.App.3d 1065, 1074 (1986). It "comes into play precisely because in-depth review has already occurred" and requires consideration of "whether circumstances have changed enough to justify repeating a substantial portion of the process." <u>Martis Camp Cmty. Ass'n v. County of Placer</u>, 53 Cal.App.5th 569, 604 (2020) (internal quotations omitted); <u>Citizens for a Sustainable Treasure Island v. City and Cnty. of S.F.</u>, 227 Cal.App.4th 1036, 1051 (2014). Thus, "[i]f one of the conditions described in section 21166 applies, the lead agency *must* prepare either a subsequent EIR or a supplemental EIR." <u>Martis Camp</u> Cmty. Ass'n v. County of Placer, 53 Cal.App.5th 569, 604 (2020) (emphasis added).

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²² Although CARB prepared the EIA pursuant to its certified regulatory program, it remains subject section 21166 of CEQA. "A certified regulatory program remains subject to the provisions of CEQA outside the scope of the exemption provided by subdivision (c) of section 21080.5." <u>POET, LLC v. State Air Res. Bd.</u> 218 Cal.App.4th 681, 714 (2013). Section 21080.5, subdivision (c) exempts certified regulatory programs from "Chapter 3 (commencing with Section 21100), Chapter 4 (commencing with Section 21150), and Section 21167." Section 21166 is located in Chapter 6 of CEQA. Accordingly, CARB's certified regulatory program is not exempt from section 21166 and a supplemental EIA must be prepared if any of the conditions set forth in that provision are satisfied.

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Significant new information and substantial changes in the circumstances under which the Amendments will be undertaken necessitates major revisions to the EIA. As shown above, CARB's \$39,000 per company compliance cost estimate grossly underestimates the cost of complying with the Amendments. However, an accurate estimate of compliance costs is essential to evaluate the Amendments' secondary effects and whether they will result in significant environmental impacts. Because CARB's estimate of compliance costs so drastically underestimates the economic consequences of the Crop Requirements, the EIA ignores or downplays environmental impacts associated with the Amendments' reasonably foreseeable secondary effects, including changes to supply chain dynamics, changes to feedstock demand and availability, and environmental impacts resulting from changes to the mix of fuels consumed in California. For example, the EIA categorically fails to consider the likelihood that the Crop Requirements will strain feedstock availability and disrupt supply chains such that biofuel producers will reduce the volume of biofuel in the California transportation fuel market, resulting in a reasonably foreseeable increase in fossil fuel consumption.

Had CARB disclosed its cost estimate and its basis during the CEQA comment period, such errors could have been identified and corrected before the CARB board approved the Amendments. But this did not occur. Instead, CARB not only deprived the public of the opportunity to review and comment on staff's flawed cost estimate and its effect on the EIA, but also deprived the CARB board of the opportunity to consider public input on these issues before deciding whether to approve the Amendments. See Californians for Alts. to Toxics v. Department of Food & Agric., 136 Cal.App.4th 1, 13 (2005) (analysis must "provide[] sufficient information and analysis to allow the public to discern the basis for the agency's impact findings" and "should set forth specific data, as needed to meaningfully assess whether the proposed activities would result in significant impacts"); Guidelines, § 15151 (environmental analysis is intended "to provide decisionmakers with information which enables them to make a decision which intelligently takes account of environmental consequences.").

Recent global trade developments only increase the likelihood that the Amendments will cause new and more severe environmental impacts than those analyzed in the EIA. According to recent media reports, recent U.S. tariff policy "will severely disrupt global supply chains critical to renewable energy and electric vehicles."

In addition, retaliatory tariffs against U.S. crops may reduce global demand for U.S.-grown corn, soy, and other biofuel feedstocks.

This combination of disruptions to both the electric vehicle and biofuels supply chains may result in substantial changes to the mix of transportation fuels incentivized by the LCFS program.

²³ https://www.winssolutions.org/impact-2025-us-tariffs-on-sustainability/

²⁴ https://www.reuters.com/markets/commodities/us-agricultural-exportsimports-threatened-by-trump-trade-actions-2025-04-01/

At a minimum, the extreme economic uncertainty posed by these recent events warrants supplemental analysis.

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In light of the above, new information and substantial changes to the circumstances in which the project will be undertaken necessitate major revisions to the EIA. The EIA acknowledges that reasonably foreseeable compliance responses resulting from CARB's adoption of the Amendments could result in significant impacts to the existing physical environment due to "modifications to cultivation volume and transport of feedstock," "changes to location and types of feedstock," "construction of new facilities to produce renewable [fuels]," "construction of solar and wind electricity generation projects," "modification to existing or new industrial facilities," "construction of new infrastructure," "modifications to electricity distribution and transmission infrastructure," "land use changes," and "changes to fuel-associated shipment patterns," among many other things. Final EIA, p. 43. Nevertheless, CARB's deeply flawed cost estimate conceals the true scope and extent of environmental impacts resulting from these compliance responses—impacts that the current global trade environment will amplify significantly.

CARB cannot simply ignore the obvious potential for new or different environmental impacts due to its flawed estimate of compliance costs and recent developments in global trade policy. These developments will substantially alter the number and extent of the Amendments' environmental impacts and therefore major revisions to the EIA are required to ensure that the public and the CARB board have sufficient information to consider meaningfully the project's environmental impacts before the project is approved. At a minimum, CARB must prepare an addendum to the EIA to document its determination that a supplemental EIA is not required." Martis Camp Cmty. Ass'n v. County of Placer, 53 Cal.App.5th 569, 604 (2020); see Friends of San Mateo Gardens v. San Mateo Cnty. Cmty. Coll. Dist., 1 Cal.5th 937, 946 (2016); Guidelines, § 15164, subd. (a).

2. By Including Additional Responses to Environmental Comments in an Addendum to the FSOR, CARB is Engaging in Impermissible *Post Hoc* Environmental Review

As the Supreme Court explained in <u>Laurel Heights Improvement Assn. v.</u> Regents of University of California, 47 Cal.3d 376 (1988) "[a] fundamental purpose of an EIR is to provide decision makers with information they can use in deciding whether to approve a proposed project, not to inform them of the environmental effects of projects that they have already approved. If post-approval environmental review were allowed, EIR's would likely become nothing more than *post hoc* rationalizations to support action already taken." *Id.* at 394; see No Oil, Inc. v. City of Los Angeles, 13 Cal.3d 68, 79 (1974); Guidelines, § 15004, subd. (a) ("Before granting any approval of a project subject to CEQA, every lead agency . . . shall consider a final EIR"). The timing requirement set forth in Section 15004 of the CEQA Guidelines "applies to the

environmental review documents prepared by [C]ARB . . . in lieu of an EIR." <u>POET, LLC v. Calif. Air Res. Bd.</u>, 218 Cal.App.4th 681, 716 (2013).

CARB approved the Amendments, and certified the Final EIA on November 8, 2024 with the adoption of Resolution 24-14. However, CARB did not publicize compliance cost estimates and further analysis of environmental impacts until an addendum to the Final Statement of Reasons was released in January. This violates CEQA because the FSOR addendum raises new and significant environmental issues that must be evaluated *before* the project is approved under CEQA. Such issues cannot be addressed in an addendum to the FSOR *after* the Amendments and the Final EIA have been approved by the CARB board for purposes of CEQA without reopening the CEQA record. By declining to reopen the CEQA record and instead responding to significant environmental issues in an addendum to the FSOR, CARB is engaging in impermissible *post hoc* environmental review and depriving the CARB board of important information needed to evaluate whether to approve the Amendments in the manner required by CEQA. To comply with CEQA, CARB must reopen the CEQA record and present all environmental comments and all agency responses to those comments to the CARB board for approval.²⁵

3. Resolution 24-14 Authorizes Piecemeal Environmental Review, Improper Delegation of Decision Making Authority, and *Post Hoc* Environmental Review

Resolution 24-14 purports to authorize CARB's Executive Officer to determine whether sufficiently related changes are needed to the regulatory package approved by the CARB board and to determine whether any further environmental review is required by such changes. But it does not require the Executive Officer to present the complete rulemaking package and all environmental analyses to the CARB board for final approval. Resolution 24-14 thus impermissibly piecemeals environmental review, improperly delegates decision making authority, and expressly authorizes *post hoc* environmental review—all in violation of CEQA. To satisfy its obligations under CEQA, CARB must present the complete rulemaking package and all environmental analyses to the CARB board before the "project" is approved for purposes of CEQA.

Resolution 24-14 states:

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[T]he Board directs the Executive Officer to determine if additional sufficiently related modifications to the regulations are appropriate, and that if no additional modifications are appropriate, the Executive Officer shall take CARB's final step for final approval of such amendments through submittal of the Board-approved

²⁵ To the extent the Third 15-Day Changes and response to comments also engage in further environmental review, this would also violate CEQA for the same reasons.

rulemaking package to the Office of Administrative Law. . . . The Board delegates to the Executive Officer the authority to both (1) either approve or disapprove proposed [sufficiently related] changes in regulatory language under Government Code section 11346.8(c), and (2) conduct any appropriate further environmental review associated with such changes, consistent with the Board's Certified Regulatory Program regulations, at California Code of Regulations, title 17, sections 60000-60008, for those sufficiently related substantial modifications.

As explained above, further environmental review is necessary because significant new information and substantial changes in the circumstances under which the Amendments will be undertaken necessitates major revisions to the EIA. However, as explained below, the procedure set forth in Resolution 24-14 for review of 15-day modifications cannot be reconciled with well-established principles of CEQA or the Fifth District's decision in POET, supra, 218 Cal.App.4th 681. The Amendments and all 15-day modifications are part of the same CEQA "project" and all environmental impacts associated with that "project" must be analyzed and considered by the CARB board before the "project" is approved for purposes of CEQA.

First, Resolution 24-14 impermissibly piecemeals environmental review. "CEQA forbids 'piecemeal' review" of a project, Berkeley Keep Jets Over the Bay Comm. v. Board of Port Comm'rs, 91 Cal.App.4th 1344, 1358 (2001), which occurs when a lead agency "attempt[s] to avoid a full environmental review by splitting a project into several smaller projects which appear more innocuous than the total planned project." East Sacramento P'ships for a Livable City v. City of Sacramento, 5 Cal.App.5th 281, 293 (2016). By authorizing two distinct phases of environmental review—one conducted by the CARB board upon approving the Amendments and certifying the EIA and one conducted by the Executive Officer upon approving the proposed 15-day modifications and any further environmental review—Resolution 24-14 proceeds as if the sufficiently related modifications were a separate "project" for purposes of CEQA.

But that is not the case. "'Project' means 'the whole of the action'" that otherwise qualifies as a "project" under CEQA. Concerned McCloud Citizens v. McCloud Comty. Servs. Dist., 147 Cal.App.4th 181, 192 (2007) (quoting Guidelines, § 15378(a)). It "'does not mean each separate governmental approval." Id. (quoting Guidelines, § 15378(c)). To the extent the Executive Officer makes a change to the regulatory text of the Amendments that is "sufficiently related to the original text that the public was adequately placed on notice that the change could result from the originally proposed regulatory action," (Govt. Code § 11346.8, subd. (c)), the change is "a reasonably foreseeable consequence of the initial project." Laurel Heights, supra, 47 Cal.3d at 396. Similarly, because the 15-day modifications to the Amendments would have no purpose but-for the Amendments, the two activities are "integral part[s]" of each other and thus both are "within the scope of the same CEQA project." Tuolumne Cty., supra, 155

069.7 cont.

Cal.App.4th at 1229. Consequently, the Amendments and all 15-day modifications must be analyzed and considered by the CARB board before the "project" is approved for purposes of CEQA. Laurel Heights, supra, 47 Cal.3d at 396.

Second, Resolution 24-14 improperly delegates decision making authority to the Executive Officer for the second phase of environmental review. As <u>POET</u> explains:

069.7 cont. CEQA is violated when the authority to approve or disapprove the project is separated from the responsibility to complete the environmental review. [Citations.] This conclusion is based on a fundamental policy of CEQA. For an environmental review document to serve CEQA's basic purpose of informing governmental decision makers about environmental issues, that document must be reviewed and considered by the same person or group of persons who make the decision to approve or disapprove the project at issue. In other words, the separation of the approval function from the review and consideration of the environmental assessment is inconsistent with the purpose served by an environmental assessment as it insulates the person or group approving the project "from public awareness and the possible reaction to the individual members' environmental and economic values.

<u>POET, supra, 218 Cal.App.4th at 731 (quoting Kleist v. City of Glendale, 56 Cal.App.3d 770, 779 (1976)).</u>

By transferring decision making authority to the Executive Officer in the second phase, the Resolution 24-14 impermissibly separates the responsibility for approving the "project" (*i.e.*, the original proposal and all 15-day modifications) from the responsibility for completing environmental review, contrary to <u>POET</u>, *supra*, 218 Cal.App.4th 681.

Third, Resolution 24-14 authorizes results in *post hoc* environmental review. Because the initial regulatory proposal and any subsequent 15-day modifications are part of the same "project" under CEQA, authorizing the Executive Officer to perform "further environmental review" after the state board has already approved the "project" for purposes of CEQA, Resolution 24-14 expressly authorizes *post hoc* environmental review in violation of CEQA. (17 Cal. Code Regs., § 60004, subd. (e).). Moreover, CARB's voluminous response to comments appendix to the FSOR contains new and significantly amplified analysis of environmental and cost issues which were not before the Board when the project was approved in November.

Accordingly, to comply with its obligations under CEQA, CARB must present the Amendments, all 15-day modifications, and all environmental analyses to the CARB board before the "project" is approved.

V. At a Minimum, CARB Must Adjust the Effective Date of the Crop Requirements to Account for the Delay in OAL Approval.

The Crop Requirements become applicable as early as the effective date of the Amendments for some producers and, at the latest, 2026 for others. This timeline was already highly burdensome to the regulated community as the requirements place substantial new requirements on feedstock and biofuels producers, which will take significant time to implement (if they can feasibly be implemented at all). Now, OAL's disapproval and CARB's resubmission of the Amendments has further abbreviated the period between finalization of the requirements and their effective date. It would be arbitrary and capricious for CARB to maintain the original compliance deadlines in light of the regulatory delay and the substantial changes that biofuels producers would need to make to come into compliance with these new requirements, including purchasing and installing new equipment, negotiating contracts with new suppliers, and for some biomass suppliers altering (or rendering obsolete) the fundamental structure of their business models. At a minimum, CARB must delay the effective date and "first milestone" requirements until January 1, 2027, and the later stages currently set for 2028 and 2031 should be delayed accordingly.

VI. Conclusion

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Thank you for the opportunity to provide input on the Amendments including the Third 15-Day Changes. The LCFS Program is a critical tool to addressing climate change, and we look forward to working with CARB to ensure the role of biofuels in making California's fuel mix more sustainable.

Sincerely,

Christopher P. Bliley

Senior Vice President of Regulatory Affairs

Growth Energy

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Optima Analytics, Inc.

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APRIL 21, 2025

California Air Resources Board

1001 | Street Sacramento, CA 95814

RE: Comments on 15-Day Changes to the Low Carbon Fuel Standard

Dear California Air Resources Board,

Optima Analytics (Optima) appreciates the opportunity to comment on the modifications to the proposed modifications to the Low Carbon Fuel Standard (LCFS) amendments released on April 4, 2025. As the owner and managing principal of Optima, I have over 35 years of professional experience in environmental consulting and strategic business services for various industries. My expertise includes conducting economic analyses of proposed environmental regulations and evaluating the potential economic impacts of climate change on assets such as water storage and fisheries.

The focus of these comments are the economic consequences of the LCFS amendments' sustainability chain of custody traceability requirements. The comments cover two main areas:

- Implementation Costs of Sustainability Requirements
- Economic Impact on the California Market

Implementation Costs of Sustainability Requirements

The primary participants in the crop-based biofuels production supply chain include farms, grain elevators, biorefineries and the trucks and/or trains used for transportation of feedstock between the primary participants. The LCFS amendments impose new requirements on each of the many participants within the production supply chain. In addition, the timing and cost of compliance differs regarding each participant, assuming that the participants are able to comply with the requirements at all.

Regarding timing, the *Final Statement of Reasons for Rulemaking Appendix B Summary Comments and Agency Response* (RTC) includes the following statement: "In response to concerns around costs and timeline with respect to the complexity of supply chains, staff have added an implementation timeline to section 95488.9(g) that specifies a period of more than 5 years for fuel producers to become fully compliant with the gradually phased-in sustainability requirements." RTC at 440. However, the RTC further states that "The first milestone is that beginning with 2026 data year fuel producers will be required to provide geographic data on farm boundaries (shapefiles, coordinates) where feedstocks are being sourced." RTC at 440. In addition, section 95488.9(g)(2) of the LCFS indicates that "biomass used in fuel pathways must only be sourced on land that was cleared or cultivated prior to January 1, 2008, and actively managed or fallow since January 1, 2008. Biomass must be cultivated and harvested in accordance with all local, State, and federal rules and permits."

Meeting the 2026 sustainability requirements will be a significant challenge for biofuel producers. Biofuel producers purchase grain from hundreds if not thousands of farms. A portion of the corn is sourced via direct contract with individual farmers. However, there are also many cases where sourced corn will pass through one or more grain elevators on the way to biorefineries. To comply with the 2026 requirements each farm, and corn elevator, supplying corn to biofuel producers will have to establish feedstock source tracking. Subsequently, feedstock sourcing must undergo third party verification beginning in 2028. The third-party verification process represents another daunting challenge as there may not be enough accredited third-party verifiers to complete the process by the time supply contracts are being negotiated for 2028 biofuel production.

Regarding cost of compliance, RTC includes the following statement "Staff estimates that annual implementation costs for the full sustainability requirements will be \$4.7 million per year for the industry, an average of roughly \$39,000 per company based on the number of biofuel producers in 2023." However, details regarding the basis for the \$4.7 million dollar estimate are not provided.

The cost of meeting just the 2026 sustainability requirements will be substantial. Biofuel producers will need to employ personnel to ensure that feedstock is sourced from verified farmers and that all local, state, and federal regulations are being followed. This assurance will likely require the biofuel producers to hire new personnel focused on this task. In addition, there is likely to be investments in software upgrades for tracking this information. It is difficult to estimate the costs of software, but a rough estimate of personnel costs can be obtained. There are currently 192 unique facility IDs in the U.S. with ethanol or biodiesel pathways, per CARB data (LCFS Pathway Certified Carbon Intensities, 2025). For a conservative estimate, it is assumed that one full-time employee (FTE) could be responsible for two facilities (i.e. 0.5 FTE per facility) and that the work could be done by entry level employees with a college degree at an annual salary of 70,000 per year (College graduate salaries: 2025 projections, 2025). The total and annual cost of these additional employees is calculated at \$6.7 million per year.

Then, substantial additional costs will accrue from third-party verification of farms and elevators in the supply chain process. Although the cost of validation could be negotiated between the parties, it is reasonable to assume that the biofuel producers will cover the costs of certification of farms and potentially grain elevators. If the costs of third-party validation, software, and additional training is accounted for, it is likely that the annual cost of compliance could exceed \$12 million from employee, software, and verification costs alone.

Additionally, because the regulations do not allow a mass-balance approach to feedstock traceability, substantial additional costs will be incurred across the supply chain to implement physical separation of grain—assuming market participants are even able to comply with those requirements.

To achieve chain of custody traceability biofuel producers and grain elevators would be required to install and operate equipment that will allow for the separation of feedstock from LCFS certified farms from feedstock obtained from non-certified farms. In addition, biofuel producers would be required to add and operate equipment that will allow for the isolation of fuel produced for the California market from fuel produced from non-certified feedstock destined for consumption in other States and/or export for international consumption.

The estimated \$4.7 million per year annual cost to industry contained in the RTC (page 441) seems to account only for from small portion of operational expenses incurred by producers and does not include capital and operating costs incurred by grain elevators that would allow for isolation of feedstock traceable to certified farms from feedstock from obtained from uncertified farms. The same is true regarding capital costs required by biofuel producers to isolate and load for transport biofuel produced from certified feedstock.

Significant capital costs for biofuels producers include additional items such as:

- **Process Vessels and Equipment:** Including fermentation tanks, stills and heat exchangers to allow for separate production of biofuels destined for the California market
- **Grain Storage Bins and/or Buildings:** To maintain separation of LCFS certified feedstock used in the production of ethanol for the California market.
- **Storage Tanks:** To isolate product prior to loadout for transport to the California market.
- **Process Control Panels and Software:** For operating equipment dedicated to ethanol the California production line.

Significant operating costs for biofuels producers include:

- Additional Personnel: For operating equipment dedicated to biofuels destined to the California market.
- **Costs to Assure Verification of Feedstock:** See previous discussion regarding the 2026 requirements as these costs will extend indefinitely and may be substantially larger once

third-party verification including auditing for compliance with a wide range of laws, plus as-yet unknown environmental practices.

Significant capital and operating costs for grain elevators include additional items such as:

- **Additional Personnel:** To oversee deliveries, track grain, and ensure that feedstock separation is maintained.
- Additional Storage Bins and Related Equipment: For maintaining separation of certified feedstock from non-certified feedstock

On top of all these categories of expenses are costs to farmers with grown grain that meets LCFS standards. Since the regulations do not specifically prescribe what those practices are, it is impossible to accurately assess such costs.

In sum, estimating the full cost of supply chain traceability requires estimating the capital and operational expenditures incurred by all participants in the supply chain. In 2009 Informa Economics performed a study focused on understanding the economic impact of traceability standards like those included in the LCFS amendments that were being considered for the Renewable Fuel Standard (RFS) (Voegele, 2009). As part of this study, Informa conducted a survey that included a survey of 12 companies that represented 20% of the ethanol production capacity at the time and 12 grain elevators that represented a wide array of operations in different regions of the country to gauge their opinions of the expected cost of the new requirements. The study ultimately found that upfront capital expenditures would be nearly \$30 million and the annual recurring compliance cost \$420 million (Voegele, 2009). This study was produced 16 years ago, assuming a conservate inflation rate of 2.5%, these capital and annual recurring cost estimates in present value dollars are calculated at \$44 million and \$621 million.¹

Although there are likely differences between the traceability requirements considered by the RFS and those in the LCFS amendments, coupled with a more complete estimate of the costs throughout the supply chain, it appears that the \$4.7 million annual operating cost provided in the RTC is a gross underestimate. A survey, such as the one performed by Informa (including farms), would be required to obtain a more representative estimate of the cost impact of the LCFS traceability requirements. In the absence of such a survey and given the information contained in the Informa study, it is reasonable to conclude that capital expenditures to achieve compliance with the LCFS traceability requirements will be on the order of tens of millions of dollars and that annual operating expenditures will be on the order of hundreds of millions of dollars.

 $^{^{1}}$ It should also be noted that the Informa study did not include the capital and annual compliance costs incurred by farmers to achieve and maintain certification.

Economic Impact on the California Market

The likely impact to the California market associated with the LCFS traceability requirements is that the volume of ethanol available to this market that meet the LCFS requirements will be substantially reduced unless all supply chain participants are able to recover a significant premium to offset these costs (likely in the form of higher fuel prices for consumers). Estimating the actual impact requires partial equilibrium analysis to estimate the interactions of supply and demand within the ethanol market or possibly general equilibrium analysis to understand how changes in the ethanol market interconnect with other markets simultaneously (e.g., the domestic and international market for animal feed. Without such an analysis, it is not possible to quantify with confidence the impact of the LCFS requirements on the volume of ethanol available to the California market and the associated price point. However, it is possible that volume reduction or price increases will be substantial.

Sincerely,

MANAGING PRINCIPAL

Timothy J. Harranch

References

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- Voegele, E. (2009, September 24). Study Finds RFS2 Will Result in High Compliance Costs for Producers. Retrieved from Ethanol Producer Magazine: https://ethanolproducer.com/articles/study-finds-rfs2-will-result-high-compliance-costs-for-producers-60



Optima Analytics Inc. telephone: 412.216.3500 Timothy.Havranek@optacorp.com



Timothy J. Havranek, MBA, PMP Managing Principal

PROFESSIONAL PROFILE

Mr. Timothy Havranek has 35 years of professional experience in environmental economics and strategic business services

industry. He has extensive experience in the application of multi-criteria decision analysis and probabilistic modeling for a wide range of environmental and capital projects, including sediment dredging, mine closures, remediation, restoration, decommissioning, and alternative energy projects. He is skilled at the application of economic principles to environmental issues and finding ways to efficiently allocate resources while protecting the environment and improving business operations. Mr. Havranek has managed numerous large-scale environmental projects, working with multiple site owners, regulatory agencies, and environmental remediation firms to develop strategic and sustainable business liability and asset management solutions that minimize environmental and social risk.

Mr. Havranek is the author of two books. His most recent book, coauthored with Doug MacNair, PhD is *Multicriteria Decision Making – Systems Modeling, Risk Assessment and Financial Analysis for Technical Projects* published in 2023 by De Gruyter. His previous book is *Modern Project Management Techniques for the Environmental Remediation Industry*, published in 1999 by CRC Press.

CREDENTIALS AND PROFESSIONAL HONORS

M.B.A., Concentrations in Strategy and Finance, Carnegie Mellon University, Pittsburgh, Pennsylvania, 2006

B.S., Petroleum Engineering, Marietta College, Marietta, Ohio, 1982

Certified Project Management Professional (PMP) No. 981

RELEVANT EXPERIENCE

Economic Analysis / Modeling / Strategic Business Consulting Experience

Economic Analysis EPA Proposed Rule on Financial Responsibility Under CERCLA - Four industry associations involved in the Chemical Manufacturing industry required a technical review/critique of EPA's Proposed Rule on Financial Responsibility Requirements Under CERCLA Section 108(b) for Facilities in the Chemical Manufacturing Industry (85 FR 10128 February 21, 2020. As lead economist Mr. Havranek performed a detailed economic analysis of the effect of proposed ruling on the chemical manufacturing industry.

This analysis demonstrated the extent to which financial assurance requirements under the Resource Conservation and Recovery Act (RCRA), and financial disclosure requirements imposed by Securities and Exchange Commission (SEC) regulations and Generally Accepted Accounting Principles (GAAP), already effectively require companies within the chemical industry to provide financial assurance for potential cleanup obligations. The proposed rule was not implemented, and the report was referenced in the decision not to do so.

Non-Traditional Assets Impact Analysis – Performed a high-level review and economic analysis on behalf of a fortune 500 oil and gas company regarding the impact SEC-Climate Disclosures and new USEPA regulations. The non-traditional assets included fresh water, water storge, fisheries and aquaculture, and timber. The oil and gas company utilized the results of the analysis as part of their strategic planning and overall management of external risks.

Economic Analysis EPA's Proposed Renewable Fuel Standard (RFS) 2023- 2025 - In the role of lead economist working while working as an employee of Ramboll USA on behalf of an Industry Association of Biofuel Manufacturers, Mr. Havranek performed a review and summary of available research regarding the economic impact of proposed rule and the accompanying Draft Regulatory Impact Analysis (DRIA) along with many of the cited articles. His work included the development of analytical models with the purpose of confirming and/or refuting information in the DRIA and work performed by other researchers. His work helped demonstrate that that the RFS program has limited to no minimal to now effect on corn prices or LUC in the United States. Timothy assisted in the drafting of Ramboll's summary report regarding this project and later presentation of the results to the EPA. His work also included subsequent review of economic documents related to the EPA Biological Evaluation (BE) and a presentation to the EPA completed in March of 2024.

Multi-criteria Decision Analysis in Support of Sediment Early Action, —Created a model to select the optimum remedial alternative in terms or evaluation criteria and project uncertainties for a large port on the western seaboard. Included short- and long-term costs, revenue generation, agency and community acceptance, human health risks, and site disruption costs in the evaluation criteria. Used model results to convince upper-level management, regulatory agencies, and various project stakeholders that the best, most cost effective and protective alternative was selected.

Multi-criteria Decision Analysis for Plant Closure and Redevelopment — Assisted in the process of planning the decommissioning of a large automotive manufacturing plant. Presented the client with a decision model that had to account for the typical short-term decommissioning and environmental costs, but also the long-term socioeconomic and "reputational-risk" costs because of the interests and influence of stakeholders outside the client firm. Included decommissioning and environmental costs, revenue from property sale, financial risks, socioeconomic impacts, regulatory acceptance, and media reaction in the evaluation criteria. Helped to identify the most favorable alternative, considering all criteria, using transparent systematic processes through the multi-criteria decision analysis process. This recommended alternative has an expected value savings of approximately \$20 million when compared to the alternative that was under consideration prior to the decision analysis.

Mine Restoration Multi-criteria Decision Analysis, —Used multi-criteria decision analysis to evaluate mine operations and environmental remediation alternatives for a large copper mine. Analyzed three alternatives, including closure in 1 year, continued operations for the next 20 years, and then closing and expanding mine operations. Included community acceptance, cleanup standards achieved (residential/industrial), net present value, cash flow, and time frame for site resolution in the evaluation criteria. Indicated through the model that continued operations until 2017 is the preferred alternative, and that it represents an expected net present value savings of in excess of \$50 million over the next best alternative (closure in 1 year).

Net Environmental and Community Benefit Analysis (NECBA) for Mining Reclamation Project, Confidential—Developing a tool that integrates the NECBA approach into the EPA Green Remediation Initiative and the CERCLA remediation nine criteria analysis to help a client analyze alternative mining reclamation strategies. The goal is to provide state and federal regulators with a rigorous, defensible analysis of alternatives that accurately captures the environmental, social, and economic impact of the strategies.

NECBA for Solar Project, Confidential—Working with an energy company to assess the potential value of a demonstration solar facility at desert mining site. The analysis is assessing potential financial, environmental, and community impacts of alternative sizes for the project and developing a strategy for addressing regulatory approvals. The NECBA Model is a form of multi-criteria decision analysis and provides a systematic, transparent method to quantify the impacts of alternate strategies.

Airport Deicing System Multi-criteria Decision Analysis, Confidential—Developed a multi-criteria decision analysis model to evaluate different deicing alternatives at a West Coast airport terminal. Evaluated six alternatives in terms of cost, risk, and stakeholder criteria, including compliance, cost effectiveness, effect on operations, and stakeholder acceptability (regulatory, community, airlines), within a Monte Carlo uncertainty analysis framework. Evaluated results using criteria weights associated with three stakeholder groups. Identified an alternative acceptable to all three stakeholder groups. Although the alternative represented an increased expected value cost of nearly \$2.5 million over the least cost alternative, the stakeholders were willing to invest the additional funds to better satisfy identified criteria and objectives.

Portfolio Probabilistic Modeling, Oil and Gas Company, Confidential—Developed a probabilistic model to estimate remediation costs for approximately 2,100 active sites and 900 future sites. This model built upon work performed by the client and other consultants. Used linear regression techniques to develop mathematical functions to represent the potential range of costs at each site in the portfolio. Compiled these mathematical functions into a cost model, and ran a simulation to generate cost versus probability curves and descriptive statistics for each group of sites and the portfolio.

Portfolio Probabilistic Modeling, Regional Utility Company, Pittsburgh, Pennsylvania—Utilized a combination of decision trees and spreadsheet Monte Carlo simulation to estimate environmental liabilities at 12 former manufactured gas plants. This modeling identified the opportunity to reduce environmental reserves by more than \$10 million, and provided the client with a ranking of sites to better focus efforts on those sites involving the highest degree of risks and costs.

Environmental Remediation Experience

CERCLA Feasibility Study, Paoli, Pennsylvania—Served as project manager for a CERCLA remedial investigation and feasibility study, primarily required because of PCB contamination, of a 28-acre active railyard facility. The study addressed elements of RCRA and TSCA regulations as well. Project consisted of technology screening, six treatability studies, and the development/evaluation of remedial alternatives for soil, sediment, groundwater, and surface water. The findings of the feasibility study led EPA to approve stabilization/solidification as the remedial technology of choice to address soil impacts. Approval of this technology saved the customer more than \$15 million over EPA's originally most-favored technology, dechlorination by potassium polyethylene glycol.

RCRA Facility Investigation, Gainesville, Virginia—Served as project manager for a site investigation, interim measures, risk assessment, and a corrective measures study of a 420-acre defense facility contaminated with volatile and semivolatile organic compounds and metals. Saved approximately \$250,000 on investigation cost with a subsequent \$1 million savings on total project costs due to the investigative techniques researched and recommended. Successfully and cost effectively addressed governmental and social concerns regarding deep groundwater contamination.

RCRA Interim Measures, Sharon, Pennsylvania—Served as project manager for the design, installation, and operation of an *in situ* soil venting system for a 6-acre facility that required immediate intervention due to chlorinated impacts in soil and groundwater. Although prior theoretical calculations had estimated volatile organic compound removal at a rate of 10 pounds per day, the installed system achieved volatile organic compound removal at three times that rate. The project approach led to \$400,000 in savings on an estimated \$700,000 project.

Pennsylvania Department of Environmental Protection (PADEP) Project, Pittsburgh, Pennsylvania—Served as project manager for the required investigation and the determination of remedial action due to numerous site contaminants including petroleum hydrocarbons, chlorinated solvents, lead, and arsenic at a 12-acre grease manufacturing plant. Project consisted of strategic planning, site investigation, a feasibility study, groundwater monitoring, and interim measures. Saved an estimated \$300,000 in project cleanup costs due to the identification of asphalt incorporation for impacted soil remediation. Also developed a 3-year remedial plan that stayed within 2 percent of original annual budget through the identification of asphalt incorporation for impacted soil remediation.

CERCLA Project, Union City, Indiana—Served as project manager for the site investigation, technology evaluation, feasibility study, pilot testing, and remediation of a 14-acre electric motor manufacturing plant. Addressed regulatory concerns that required the accelerated installation of an interim remediation system. Completed the project within budget and a tight deadline using a concurrent engineering approach, as well as selection and implementation of high-vacuum dual-phase extraction technology.

PUBLICATIONS

Havranek T., MacNair, D. 2023. *Multicriteria Decision Making, Systems Modeling, Risk Assessment, and Financial Analysis for Technical Projects*. Walter De Gruyter Gmbh, Berlin/Boston

Abrams, S., McGregor, R., Burns, S., Galasso, J., Havranek, T., Hesemann, J., McDonough, J., & Mora, R., 2022, PFAS Experts Symposium 2: Statements on available in situ remediation technologies. Remediation Journal 1-9

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Havranek, T.J., L.B. Fournier, and M.B. Hanish. 1992. Project management for cost-effective environmental remediation. Paper presented at the Project Management Institute 1992 Annual Seminar/Symposium, Pittsburgh, PA.

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PRESENTATIONS/POSTERS

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Havranek, T.J. and L. Hostetter 2016. Forecasting Portfolio Environmental Liabilities. Presented at the Palisades Decision Tool Conference, New Orleans, LA.

Havranek, T.J, and L. Hostetter 2012 Cost Schedule Risk Analysis Using @Risk 6.0, Presented at the Palisade Decision Tools Conference, Las Vegas, NV

Crabtree, W., and T.J. Havranek. 2011. Implementing cost engineering for the management of remediation and decommissioning liabilities. Presented at the Chevron 2011 CPDEP Forum, Woodlands, TX.

Havranek, T.J. 2011. Using the Palisade Decision Tools Suite to identify sustainable environmental alternatives. Presented at the Palisade Decision Tools Conference, Boston, MA.

Havranek, T.J., and L. Hostetter. 2006. Value optimization in a world of choices. Presented at the Palisade Decision Tools Conference, Miami, FL.

Havranek, T.J., and D.J. MacNair, Ph.D. 2009. A multi-criteria approach for evaluating sediment remediation alternatives. Presented at the AEHS Foundation 25th International Conference on Soils, Sediment, Water and Energy, University of Massachusetts, Amherst. Havranek, T.J., and D.J. MacNair, Ph.D. 2009. Integrating net environmental and community benefits analysis and CERCLA nine criteria. Presented at the Sustainable Remediation Forum (SURF) 10, Chicago, IL.

Havranek, T., and P. Ung. 2007. Environmental impaired property transaction analysis. Presented at the Palisade Decision Tools Conference, Miami, FL.

Kubitz, J., T. Havranek, and L. Musikanski. 2008. Using multi-criteria decision analysis to identify sustainable sediment management solutions in a multi-stakeholder environment. Presented at the Fifth International Conference on Remediation of Contaminated Sediments, Battelle, Jacksonville, FL.

Toline, A., and T. Havranek. 2008. Multi-criteria decision analysis in estuary restoration planning. Presented at the Gulf Coast Hurricane Preparedness, Response, Recovery and Rebuilding Conference, PIANC, Mobile, AL.

PROFESSIONAL AFFILIATIONS

Project Management Institute AACE International Society of Decision Professionals April 21, 2025

Chair Liane Randolph and Board Members California Air Resources Board 1001 I Street Sacramento, California 95814

RE: SUPPORT of Proposed Changes to California's Low Carbon Fuel Standard (LCFS): Third 15-Day Changes

Dear Chair Randolph and Board Members,

We are writing to you today as a broad coalition of companies in the medium- and heavy- duty zeroemission transportation sector in support of the Low Carbon Fuel Standard (LCFS) program. We believe that the Third 15-day Changes address the concerns raised by the Office of Administrative Law (OAL). These amendments also appropriately incorporate direction from California Air Resources Board Resolution 24-14 following the November 8, 2024 meeting and vote on adoption of the LCFS program amendments.

The undersigned companies: EV Realty, Forum Mobility, Greenlane, Highland Electric, Prologis Mobility, Terawatt Infrastructure, Voltera Power, WattEV, and Zeem Solutions are providers of electric vehicle charging infrastructure for medium- and heavy-duty trucks, including shared depots that serve multiple fleets at a single location. As noted in our prior comments, we believe the LCFS program supports transportation electrification by facilitating infrastructure deployment, lowering fueling costs, and incentivizing the purchase of zero-emission vehicles.

The amendments adopted in November of 2024 and further clarified in this latest 15-Day Notice strengthen an already powerful program. The HD-FCI provision addresses utilization risks in the early market phases, helping solve the "chicken or egg" dilemma that currently hinders infrastructure deployment, and the 15-Day Changes appropriately clear up lingering uncertainty highlighted by OAL around geographic restrictions for this provision. Additionally, we support the clarification that "base credits" issued to electric distribution utilities are to be allocated to a statewide Clean Fuel Reward program for medium- and heavy-duty vehicles. This clarification addresses OAL questions and accurately reflects direction from Board Members as detailed in Resolution 24-14.

We appreciate the opportunity to provide comments on this vitally important program. We are at a pivotal moment for a variety of climate and clean air goals that depend in part on a strong and well-designed LCFS program. Timely adoption and implementation are needed to provide clear market signals for the nascent fleet electrification industry.

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Yours,

Jamie Hall Director, Policy EV Realty

Andrea Pratt

VP, Government and Utility Relations

Greenlane Infrastructure

Alexis Moch

VP, Government Affairs

Prologis

Tom Ashley

VP, Government and Utility Relations

Voltera Power LLC (Voltera)

Margaret Boelter

Policy & Government Relations

Zeem Solutions

Adam Browning

EVP Policy and Communications

Forum Mobility

Jane Israel

Sr. Western Regional Manager, Market

Development

Highland Electric Fleets

Sam Vercellotti Director, Policy

Terawatt Infrastructure

Salim Youssefzadeh Chief Executive Officer

WattEV



April 21, 2025

Rajinder Sahota Deputy Executive Officer, Climate Change and Research California Air Resources Board 1001 | Street Sacramento, CA 95814

Re: Comments on the Proposed Third 15-Day Changes to the Low Carbon Fuel Standard (LCFS) Proposed Regulation Order

Dear Ms. Sahota:

We appreciate the opportunity to comment on the Proposed Third 15-Day Changes to the Proposed Regulation Order. We strongly support California's LCFS, which is critical to supporting the transition to zero emission vehicles (ZEVs) in California. We support the proposed Third 15-Day Changes and clarifications, including those around hydrogen refueling infrastructure (HRI) crediting, and we urge CARB to quickly finalize this regulatory package, and the Office of Administrative Law to approve it, so that the amendments can take effect as soon as possible and investments can follow to support California's clean transportation goals.

About Prologis, Inc.

Headquartered in San Francisco, CA, Prologis, is the global leader in logistics real estate, with a portfolio of over 1.3 billion square feet across four continents and approximately 2.8% of global GDP flowing through our properties each year. Prologis leases modern warehousing and distribution facilities to customers, which include manufacturers, retailers, transportation companies, third-party logistics providers, and other enterprises. Our large, flat rooftops have enabled us to build out commercial solar installations to serve onsite and offsite load with clean energy and battery storage, helping our customers reduce their emissions and placing us second in the U.S. for corporate on-site solar.

Prologis' Mobility business is helping transform the fleet and logistics industry and enabling our customers to transition to zero-emissions through industry-leading electric vehicle (EV) charging technology and solutions. With roughly 180 million square feet of industrial real estate across our California portfolio, the opportunity for us to help our customers with this transition is significant, and we are developing dedicated charging infrastructure at Prologis sites to support their medium- and heavy-duty (MHD) fleets across last mile, drayage, and other applications. In addition to providing charging solutions at our own properties, we offer electrification services at non-Prologis buildings and are developing multi-fleet charging hubs serving areas with dense concentrations of warehouses.

Expanding Access to Book-and-Claim Accounting for Biomethane-to-Electricity Pathways will Further Support California's ZEV Market

071.1 cont. We support finalizing the regulation and implementing the current set of amendments, along with the proposed 3rd 15-Day Changes, as soon as possible. Moving forward, we look forward to continuing to work with CARB to further strengthen the regulation and support the transition to ZEV fleets, including by

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expanding book-and-claim eligibility to biomethane used in linear generators to charge EVs and green hydrogen-to-electricity pathways, per our previous comments.¹ To be clear, we are not requesting additional changes to the proposed program amendments in this rulemaking process.

Thank you for the opportunity to comment on the 3rd 15-Day Change package and your work to quickly finalize the rulemaking and implement the LCFS amendments. We look forward to continuing to work with CARB on these provisions and ongoing implementation of the regulation, and continuing to invest in deployment of resilient charging infrastructure to support ZEV truck fleets.

Respectfully submitted,

Alexis Moch

Vice President, Government Affairs Prologis

¹ https://www.arb.ca.gov/lists/com-attach/6-lcfs2024-2nd15day-UjFVPABgVWoLZFcj.pdf



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April 21, 2025

Chair Liane Randolph & Members of the Board California Air Resources Board 1001 I Street, Sacramento, CA 95814

Via Electronic Submission

Re: Third 15-Day Changes to the Proposed LCFS Regulation Order

Dear Chair Randolph and Members of the California Air Resources Board:

The IL Soybean Association (ISA) appreciates the opportunity to comment on the proposed modifications (Third 15-Day Changes) to the Low Carbon Fuel Standard (LCFS) program. ISA has welcomed engagement with the California Air Resources Board (CARB) and staff throughout this multi-year process to update the LCFS program.

CARB's Third 15-Day Changes to revise the LCFS did not address our major concerns with provisions included in the final amendments approved by CARB. In addition to the new proposals in the Third 15-Day Changes package, ISA remains deeply concerned with the drastic and inequitable pivot CARB has made related to agricultural feedstocks used for biofuels. ISA continues to encourage that updates to the LCFS program are based on upto-date and sound science, as required by AB-32. Outlined below are our concerns and proposed solutions that will enable CARB to meet its climate goals, protect the environment and all Californians, while also supporting American soybean farmers and processors who are investing in the future of low-carbon energy.

Serious Feedstock Cap Concerns and Proposed Solutions

ISA still has significant concerns with the vegetable oil feedstock cap that was included in the initial 15-Day Changes posted in August 2024. The current proposal restricts the amount of soybean oil, canola oil and sunflower seed oil that is allowed to generate credits in the program at an inequitable 20% by company. CARB's own data demonstrates that vegetable oil feedstocks, including soy, have consistently exceeded the proposed cap since 2021.

Capping these proven, sustainable, and scalable feedstocks would suppress the supply of renewable diesel, increase reliance on fossil fuels, and raise fuel prices for California consumers. Even CARB staff acknowledged in the April 2024 workshop that a cap would reduce air quality benefits and likely increase NOx and PM2.5 emissions. The cap would send a market signal to continue to import feedstocks that come from questionable sources. ISA urges CARB to remove the cap on U.S. based vegetable oil feedstocks to



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provide a more economically feasible, locally produced and sustainable, climate smart option for the people and the planet.

Agricultural feedstocks for biofuel production are already held to a high standard for participation in the U.S. Renewable Fuel Standard (RFS). Rather than adding sustainable U.S. based feedstocks to its arbitrary proposed cap, CARB needs to update carbon intensity analysis and oversight of imported feedstocks, which are not held to the same level of accountability. Recent actions by the European Union in response to fraudulent Chinese biodiesel imports underscore this concern¹. The EU committee recently met at the request of a member state to discuss alleged fraud in biodiesel imports from China. Fraud continues to be an issue with imported feedstocks and needs to be addressed further. ISA strongly encourages CARB to adopt enforceable traceability and verification standards, including origin disclosures, documentation audits, and physical testing. Without implementing sustainable solutions to the above and not eliminating a cap on U.S. vegetable oil feedstock, CARB is essentially putting the feedstocks from foreign countries (i.e., China) above those of the United States.

Sustainability Guardrails and Traceability Concerns

ISA remains very concerned about the sustainability guardrails. The sustainability guardrails are more onerous than the specified source requirements used for non-U.S. waste feedstock imports. Palm oil in Southeast Asia has had forced labor concerns², but CARB does not require used cooking oil derived from palm to track social or economic sustainability. Concerningly, petroleum does have to track these criteria. CARB's proposal makes it administratively easier to use non-sustainable petroleum³ in the state than biofuels that have lower carbon intensity (CI) scores and are produced from sustainable feedstocks grown in the United States. Land use change is already captured in the indirect land use change (ILUC) score, which still makes it unclear what actual purpose the guardrails serve.

¹ EU industry demands answers as 'fraudulent' Chinese biofuels continue to flow - Euractiv

²https://apnews.com/article/virus-outbreak-only-on-ap-indonesia-financial-markets-malaysia-7b634596270cc6aa7578a062a30423bb

³ https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.858512/full



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Equitable Entities Eligible to Apply for Fuel Pathways

ISA is very concerned about CARB's decision to give the Executive Officer authority to stop accepting new pathways for biomass-based diesel starting in January 2031. ISA does not understand how this benefits the LCFS. Under AB-32, CARB must under statute minimize costs and maximize GHG reductions. It is unclear how this is served by rejecting new pathways. In fact, the LCFS is best served by allowing the most available and equitable pathways. If these pathways cannot achieve cost-effective GHG savings, they will not be utilized by the market in the LCFS. In essence, an increase in pathways can only serve to improve GHG benefits in California. Singling out a single fuel for prejudicial treatment is baffling given the goals of the LCFS and the authority that establishes it. ISA urges CARB to continue to allow equitable pathways forward with no date of denial.

Recommended Climate Enhancing Solutions for CARB

As CARB finalizes its update to the LCFS, ISA recommends several actions that will likely prevent an increase in fossil diesel use, improve carbon intensity calculations, and improve market access for sustainable U.S. agricultural feedstock providers.

First, CARB should not apply the vegetable oil feedstock cap proposal to U.S. feedstocks. As noted, these feedstocks are already subject to federal guardrails to ensure production on land not converted since 2008. The RFS was designed specifically to prevent land conversion for biofuel production, and USDA data shows a decrease in farmland over the same period.

Second, CARB should convene an expert working group to consider issues related to the sustainability provisions and indirect land use change (ILUC). ISA recommends that this expert working group convene before the end of 2025 and provide recommendations by the end of Fall 2026.

Third, ISA retains strong concerns about the ability of supply chains to comply with the sustainability guardrails. If CARB does move forward with the guardrails, they must reconsider its proposed sustainability requirements to allow soybean growers the opportunity to participate in the California biofuels market through innovative and climate smart agriculture practices. If traceability can be used to show additional benefits in CI scoring, CARB must look to programs already developed through farmer input and provide improved scoring for feedstocks that employ sustainability practices to minimize the changes in comparative costs (i.e., USDA accredited programs and practices). CARB should work with USDA to develop an aligned scheme to quantify climate-smart agricultural practices for the purposes of biofuel feedstocks. USDA has already engaged with CARB regarding this project, which could be applied to the work that CARB is doing on traceability and carbon quantification of agricultural biofuel feedstocks.



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Lastly, CARB must undertake a comprehensive update of the GTAP-BIO model for soybean oil used in biofuel production. Without using the most up-to-date and accurate data, CARB is doing a disservice to the U.S. feedstock producers and California's citizens by calculating carbon intensity scores not rooted in current facts. Through CARB's own analysis we know prejudicial feedstock treatment will lead to more emissions in the California transportation sector, harming the environment.

Concluding Thoughts/Pathway Forward

ISA is encouraged by the continued successes of programs that support the development of cleaner, low-carbon fuels. However, it is critical that CARB finalizes updates in a way that equitably include U.S. agricultural feedstocks through policies that are science-based aligning with the most up to date information as well as promoting the sustainability of U.S. based products and businesses; including the elimination of capping on U.S. vegetable oil feedstocks and applying sustainability guardrails that are economically feasible for farmers while rewarding their practices that lower CI.

CARB's Third 15-Day Changes did not address any of the fundamental issues raised by ISA in the First and Second 15-Day Changes and fails to acknowledge the potential unintentional consequences of a feedstock outlined by its own employees in previous discussions. CARB is required under the law to achieve the maximum technically feasible and cost-effective reductions in greenhouse gas emissions. The most recent 15-Day Changes show a lack of willingness to achieve the statutory obligations set forth in AB-32 and neglect modernized, climate smart, science-based solutions, ultimately disregarding the protection of U.S. based feedstocks, the people, and the planet. ISA asks that CARB respond in writing to further substantiate their decisions regarding our concerns expressed in this letter. We look forward to your written responses as a state regulatory body, whose responsibility is to protect its' citizens and the environment by providing transparency on decisions made for those of impact.

ISA is eager to continue working with CARB to support the role of agriculture in diversifying the fuel supply while reducing carbon intensity and increasing clean air in California and beyond. On behalf of U.S. soybean farmers, we appreciate the opportunity to comment and look forward to collaborating with CARB and other relevant stakeholders on implementation of policies that expand the use of U.S. soy-based biofuels and market opportunities for U.S. soybean farmers.

Sincerely,

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ISA Chairman Ron Kindred

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April 21, 2025

The Honorable Liane Randolph Chair, California Air Resources Board

Dr. Steven Cliff Executive Officer, California Air Resources Board

California Air Resources Board 1001 I Street Sacramento, CA 95814

Re: Third 15-Day Changes

Dear Chair Randolph and Executive Officer Cliff,

The country of Brazil is the largest beef exporter in the world, exporting more than twice as much as the US. Minerva Foods, the second largest beef exporter in Brazil and one of the world's 10 largest, operates slaughtering and rendering facilities in various states of the country. Our company, Minerva Biodiesel, is the biodiesel production subsidiary of Minerva Foods.

Minerva Biodiesel was created to turn what would otherwise be waste tallow resulting from the slaughtering and rendering operations into a productive use to combat climate change. The company, which commenced operations in 2011, was the first Brazilian company to produce biodiesel exclusively from tallow.

We appreciate the opportunity to provide our comment on the Third 15-Day Changes in connection with the proposed LCFS amendment, as follows:

The California Office of Administrative Law (OAL)'s February disapproval of the LCFS amendment as adopted by the CARB Board and CARB's subsequent submittal of the Third 15-Day Changes to address the disapproval raise questions about the effective date of the amendment, should OAL approve the revisions.

CARB submitted the Third 15-Day Changes on April 4, 2025. If OAL approves the amendment with the 15-Day Changes with 30 working days, as required, i.e., by no later than May 16, 2025, that would leave sufficient time for the final regulation to be filed by May 31, 2025. According to the OAL website, a final regulation filed by May 31st would "generally ...become effective on ... July 1." The OAL site goes on to say that "effective dates may vary, however, ... if the adopting agency requests a later effective date, or if the agency demonstrates good cause for an earlier effective date."

We write this comment letter as a stakeholder in the amendment process. We request that the amendment become effective on the date specified according to the general rule on the OAL website, i.e., July 1, 2025. Doing so will eliminate confusion among stakeholders.



Sincerely,

Marcelo Alcantara Queiroz Director, Minerva Biodiesel

Marcelo Querro Ah



April 21, 2025

Ms. Rajinder Sahota
Deputy Executive Officer
Climate Change and Research
California Air Resources Board
1001 I St
Sacramento, CA 95814

Re: Comments on Modifications to the Proposed Low Carbon Fuel Standard Amendments Issued April 4, 2025

Dear Ms. Sahota:

The Renewable Fuels Association (RFA) appreciates the opportunity to comment on the modifications to the proposed Low Carbon Fuels Standard (LCFS) amendments released on April 4, 2025, as the Third 15-day Changes to Proposed Regulation Order. The RFA is the leading trade association for America's ethanol industry. Our mission is to drive growth in sustainable renewable fuels and bioproducts for a better future.

RFA has provided extensive comments over the last three years during the California Air Resources Board's (CARB) process of modifying and updating the LCFS program, including comments on the First and Second 15-day Changes, and we incorporate those comments by reference and ask that they be considered in conjunction with this letter.¹

RFA Supports CARB's Clarification of How Land Use Change (LUC) Emissions Will Be Calculated, but Caution Needs to Be Exercised in Using Satellite Data

Officer will calculate a conservative LUC value only if an entity's fuel pathway application does not exactly match the biomass/region/fuel combination in Table 6, and if no Table 6 value is appropriate." In our comments submitted on August 27 and October 16, 2024, RFA had addressed the previous language in 95488.3(d) Accounting for Land Use Change, and we appreciate the State's responsiveness to the concerns of RFA and other stakeholders.

¹ See RFA Comments in response to 15-1 (Aug. 27, 2024), https://www.arb.ca.gov/lists/com-attach/7442-lcfs2024-AXMCYgZmBAhVMFQ7.pdf; and RFA Comments in response to 15-2 (Oct. 16, 2024), https://www.arb.ca.gov/lists/com-attach/77-lcfs2024-2nd15day-UiBWNgdnV1sFYAlm.pdf.

https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/3rd_15day_notice.pdf

Still, CARB made a subtle, but substantive change to its approach to determining LUC values in subsection 95488.3(d)(2). Previously, Attachment A-1 in the Second 15-day Changes stated, "Such determination must be based on the best available empirical data, including but not limited to satellite-based remote sensing data for land cover monitoring, crop yields, and emission factors from the AEZ-EF model or carbon stock datasets." In the Third 15-day Changes, this subsection has been modified to say that "the Executive Officer shall calculate a conservative LUC value based on...the best available empirical data. The Executive Officer shall use satellite-based, empirical estimates of land cover change attributed to biomass feedstock expansion in a region, along with emissions factors from the AEZ-EF model and empirical data on biomass feedstock yields." That is, satellite-based estimates appear to have been given primacy over any other datasets.

LUC values for the main U.S.-produced biofuels (i.e., corn ethanol and soy biomass-based diesel) are already provided in Table 6 and would not be subject to this approach. Otherwise, for biofuels produced in countries where adequate datasets are not available from the government, the proposed approach might be appropriate. However, for countries with robust statistical reporting systems on agriculture and land use, CARB should consider such data alongside satellite-based data when developing its estimates. It has been shown that satellite imagery is not well-suited to differentiating between certain types of vegetation (e.g., grassland) and that it can have varying accuracy; additionally, quality has evolved over time, making older imagery less suitable for comparison to more recent imagery. CARB should keep these limitations in mind when using satellite-based data.

Separately, it is RFA's understanding that over the next year CARB intends to initiate a review of its indirect land use change (ILUC) estimates, which are a decade old. RFA agrees that the estimates need to be updated, given the consensus among researchers that potential ILUC is significantly lower than was estimated in the early years of the LCFS, and RFA looks forward to engaging with CARB staff during this process.

The Sustainability Requirements in Section 95488.9(g) are Unnecessary for U.S.-Produced Ethanol and Are Unworkable

CARB's stated rationale for including sustainability requirements in the LCFS amendments was concern about a "rapid expansion of biofuel production and biofuel feedstock demand [that] could result in deforestation or adverse land use change..." However, RFA has repeatedly substantiated in our comments that U.S. corn ethanol is not undergoing rapid expansion and, therefore, the sustainability requirements in section 95488.9(g) should not apply to it. Additionally, RFA has detailed in its previous comments that the sustainability requirements are burdensome and potentially unworkable. Yet, CARB continues to be completely unresponsive to this logic and evidence. To date, CARB has still not substantiated the need for, or demonstrated the benefit of, the sustainability requirements that it finalized in Section 95488.9.

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We would urge CARB to review and carefully consider RFA's comments submitted in response to the workshop held on April 10, 2024, in addition to the comments noted above on the First and Second 15-day Changes.³

In addition, RFA is attaching an analysis showing that the amount of cropland used to produce ethanol consumed in California has *fallen* more than 20 percent since 2011. The analysis shows that the number corn acres needed to meet California ethanol demand has *decreased* by more than 700,000 acres since the LCFS program began. The empirical data presented in the analysis clearly invalidate CARB's rationale for implementing the additional sustainability provisions at Section 95488.9(g).

Approval of E15 Facilitates Meeting More-Stringent LCFS Targets at the Lowest Practical Cost to California Consumers

RFA is encouraged by the recent posting on the CARB website of the Tier II results for the Multi-Media Evaluation (MME) of E15 blends, as well as CARB's fiscal year 2025-26 budget request for funds to conduct a rulemaking process for E15 approval over the next year.

E15 offers a unique opportunity to lower the cost of gasoline while cutting emissions of greenhouse gases and criteria pollutants. The Tier II MME results clearly demonstrate the significant emission benefits of E15 compared to E10.

The expeditious approval of E15 in California supports the more-stringent compliance curve of the amended LCFS regulation and provides additional consumer choice and lower-cost options in LCFS compliance. RFA looks forward to engaging with CARB and other stakeholders in advancing the use of E15 in California.

Thank you for the opportunity to submit these comments.

Sincerely,

Scott Richman Chief Economist

³ See RFA comments in response to the Low Carbon Fuel Standard Workshop, April 10, 2024 (May 10, 2024) https://ww2.arb.ca.gov/system/files/webform/public_comments/11386/RFA%20Comments%20on%20CARB%20LCF_S%20Workshop%204-10-24_0.pdf



CARB's New LCFS Sustainably Requirements for Biomass: A Solution in Search of a Problem

April 2025

As part of its 2024 amendments to the California Low Carbon Fuel Standard (LCFS), the California Air Resources Board (CARB) is planning to implement broad-sweeping "Sustainability Requirements for Biomass." In the case of grain-based ethanol produced in the United States, CARB's new requirements appear to be a blundering "solution" to a "problem" that does not actually exist.

What do the New Sustainability Requirements Mean for Ethanol Producers?

Under the new sustainability provisions, producers of ethanol and other biofuels would be required to submit attestations confirming that the feedstock (like corn or sorghum) they use came from land that was cleared or cultivated prior to January 1, 2008, along with "geographical shapefiles or coordinates" of field boundaries. In addition, the regulation would also require fuel producers to maintain detailed "chain-of-custody" delivery and shipment records for all crop-based feedstocks processed.

Ethanol producers would also be required to secure "continuous third-party sustainability certification" to demonstrate that crop-based feedstocks were "produced according to best environmental management practices that reduce GHG emissions or increase GHG sequestration...." The regulation includes some general examples of activities that CARB believes are consistent with "best environmental management practices." However, no technical guidelines, definitions, specific details, or reference protocols are included, making the new feedstock sustainability requirements highly ambiguous and confusing.

Further, CARB's new regulations would delegate authority to third-party certifiers, potentially including foreign entities, to determine whether biomass feedstock used to make biofuel meets the regulation's new sustainability requirements—even though those requirements remain ill-defined.

¹ CARB. Proposed Regulation Order: Proposed Amendments to the Low Carbon Fuel Standard Regulation. Third 15-Day Changes. See Section 95488.9(g) (page 171).

Throughout the three-year LCFS amendments process, public stakeholders have repeatedly raised concerns about the impracticality, vagueness, and needlessness of the new sustainability requirements. Several elements of the sustainability requirements would be difficult—if not impossible—for many ethanol producers to implement. During both the informal and formal phases of the rulemaking, a diverse array of ethanol market participants provided detailed testimony, written comments, and analysis to CARB outlining the immense cost and nonexistent benefit of the sustainability provisions. Yet, the agency disregarded this public feedback and is planning to move ahead to finalize and implement the measures.

Why Does CARB Think the Sustainability Provisions Are Needed?

The overarching rationale used by CARB to justify the new sustainability requirements is that "...rapid expansion of biofuel production and biofuel feedstock demand [that] could result in deforestation or adverse land use change...", thus necessitating "...additional guardrails on the use of crop-based feedstocks for biofuel production."²

Yet, any objective analysis of trends in ethanol production and feedstock demand related to the LCFS clearly shows that CARB's concern is wholly unjustified and uninformed. A simple review of available data prove that CARB's fears of cropland expansion in connection with California ethanol demand are unwarranted.

Consumption of Grain-Based Ethanol in California has NOT 'Rapidly Expanded' Under the LCFS Program

CARB's purported reason for implementing sustainability requirements is to provide "guard rails" against "rapid expansion of *biofuel production* and biofuel feedstock demand...." However, CARB's own data show that consumption of grain-based ethanol in the state has been remarkably stable since implementation of the LCFS began in 2011. In fact, grain-based ethanol consumption has trended slightly lower in recent years.

Since 2011, annual consumption has averaged 1.407 billion gallons, as seen in Figure 1. And if 2020 is excluded due to the abnormal market effects of COVID, yearly ethanol consumption has fallen within a fairly tight range of 1.331 billion gallons to 1.566 billion gallons.

² CARB. Response to Comments on the Draft and Recirculated Environmental Impact Analyses. Nov. 6, 2024. See page 12. https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/lcfs2024/lcfs2rtc.pdf

Annual —— Average —— Linear (Annual)

1,600,000,000

1,200,000,000

1,000,000,000

800,000,000

400,000,000

200,000,000

2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

Figure 1. California Consumption of Grain-Based Ethanol

The Amount of Cropland Needed to Meet California Demand for Grain-Based Ethanol Has Steadily <u>Fallen</u> Since 2011

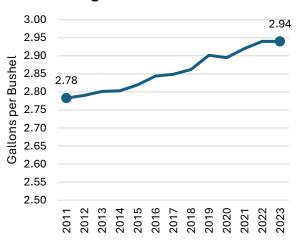
While the amount of grain-based ethanol consumed in California has been relatively stable since 2011, the amount of land needed to produce the ethanol used in California has steadily fallen. The decrease in land use for California ethanol is explained by two primary factors: 1) U.S. grain yield per acre has increased over the 2011-2023 timeframe, meaning more corn and sorghum is grown per unit of land (Figure 2), and 2) ethanol biorefineries are getting more ethanol out of each bushel of grain processed (Figure 3). The combination of these factors means that California ethanol demand was met with nearly 740,000 fewer acres in 2023 than in 2011 (Figure 4). Thus, the supposed increase in feedstock demand and cropland expansion that CARB's sustainability provisions were intended to protect against have not materialized for grain-based ethanol; in fact, just the opposite is occurring.

Figure 2.

Average U.S. Corn Yield per Acre

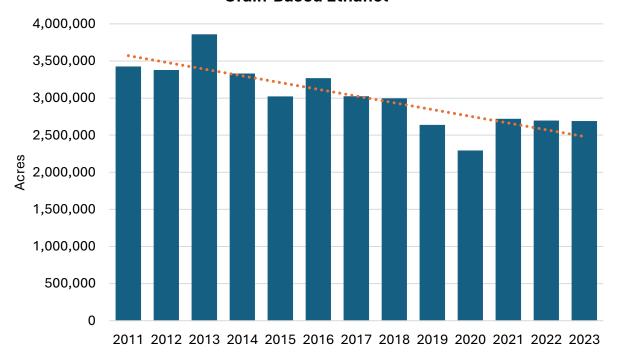


Figure 3.
Average U.S. Ethanol Yield



Source: USDA Source: RFA based on USDA and EIA data

Figure 4. Land Area Needed to Meet California Demand for Grain-Based Ethanol



Source: RFA based on USDA, EIA, and CARB data

Less than 1 Percent of U.S. Cropland is Needed to Satisfy California Demand for Grain-Based Ethanol

In 2023, just 2.689 million acres of cropland were needed to satisfy California's demand for grain-based ethanol. That is equivalent to just 2.8 percent of the 94.641 million acres of corn planted in the United States and just **0.7 percent** of the 385 million acres of U.S. agricultural cropland in 2023 (as estimated by the U.S. Environmental Protection Agency).

Moreover, it is critically important to recognize that the 2.689 million acres of cropland used to meet California ethanol demand in 2023 (1.371 billion gallons) also produced 3.4 million tons of highly nutritious animal feed called "distillers grains." This low-cost feed ingredient is widely used to nourish livestock and poultry across the country, including dairy cows and chickens in California.

Several Factors Other than the LCFS Influence California Ethanol Demand

CARB appears to presume that the LCFS program is the only significant demand driver for biofuels usage in the state and that new sustainability requirements can be used as a "brake" to control or limit the volume of crop-based biofuels consumption.

For ethanol, however, there are several other important factors that determine demand levels in California. While ethanol has been a substantial source of carbon credit generation under the LCFS, It is broadly understood that a significant amount of ethanol would be needed in the state even in the absence of an LCFS program.

Most gasoline blendstock produced by petroleum refineries today must be blended with 10 percent ethanol to achieve the minimum levels of octane necessary for sale at retail. In addition, California fuel refiners and importers must comply with federal Renewable Fuel Standard (RFS) obligations, and blending ethanol is the most economical way for them to do so.

Thus, because of ethanol's value as a motor fuel component, implementing sustainability requirements as part of the LCFS may not limit or constrain its use in California (which is apparently CARB's goal). But it would create unnecessary and impractical cost burdens on the entire ethanol supply chain, which in turn would result in higher fuel prices for California consumers.



April 20, 2025

Air Resources Board 1001 | Street Sacramento, CA 95812

Crimson Renewable Energy would like to first say thank you for the opportunity to comment on the third 15-day package for the Low Carbon Fuel Standard (LCFS) that was published on April 4, 2025.

Additionally, we greatly appreciate the efforts of CARB staff on the LCFS and its engagement with stakeholders in moving forward to meet California's carbon and GHG reduction goals.

Crimson Renewable Energy operates the largest biodiesel production facility in California, creating ultra-low carbon biodiesel to refuel our communities. Via its biodiesel production facility in Bakersfield that has been operating since 2011, Crimson contributes over \$100 million a year to the California and local economy and makes a meaningful contribution to cleaner air in the San Joaquin Valley via cleaner burning biodiesel that offers lower emissions of particulate matter and other harmful air contaminants. Thus, Crimson has been an active stakeholder and direct participant in the LCFS since the beginning of the regulation and continues its longstanding support of California's overall climate and air quality improvement goals.

Reference to Prior Comments

Crimson previously submitted comments that included support of comments made by the Clean Fuels Alliance America (CFAA) and California Advanced Biofuels Alliance (CABA). We reference these previous comments in addition to the new comments below.

Section 95488(d): Entities Eligible to Apply for Fuel Pathways

This section states, "the Executive Officer shall not accept new fuel pathway applications for biomass-based diesel, if the number of unique Class 3-8 ZEVs reported or registered in California exceeds 132,000 ZEVs or NZEVs on December 31, 2029."

The reference of Class 3-8 is not a valid reference for diesel fuel given many of these vehicles are gasoline-powered. The replacement of gasoline-powered engines by ZEVs is not relevant. CARB should change the reference to Class 5-8 vehicles.

Calculation of Deficit Obligation for Verified CI Exceedance

Crimson supports Clean Fuels Alliance America (CFAA) and California Advanced Biofuels Alliance (CABA) comments requesting the Board to direct CARB staff to remove the language in §95486.1(g)(1) requiring deficits to be four times the CI (carbon intensity) exceedance. This amount is excessively punitive.

Provisions already exist in the LCFS regulation to address misconduct and to recalculate credits once final data is available via the Annual Fuel Pathway Report (AFPR) and Quarterly Fuel Transactions Report (QFTR).

Carbon intensity (CI) is a complex calculation and is impacted by many variables. Certified pathway holders calculate CIs from 24-months of data, which serves to include significant feedstock and energy and chemical utilization that determine CI. However, all biofuel production facilities have process variability that will affect energy and chemical utilization, and thus impact the actual CI. The reality of biofuel production operations is that there is always process variability that is less predictable, and this variability may result in a CI that very slightly exceeds the pathway CI and/or the prior annual fuel pathway verified CI. This should not result in automatic and harsh penalties.

CARB has not provided justification or need for such an excessive penalty provision in the LCFS. CARB's enforcement and penalty authority already give CARB the ability to address wrongdoing and already give CARB the latitude to apply harsh penalties where that may be justified. By making the harsh penalty automatic, it removes CARB's ability to remedy situations on a case-by-case basis.

Requirements for Feedstock Attestation Letter

The requirements in section § 95488.8 (g)(D) unnecessarily duplicate responsibilities already on the fuel pathway holder and impose onerous requirements on supply chain participants that may have no willingness or need to participate in the LCFS program. This requirement should be removed.

The requirement that every single node in the specified source feedstock supply chain provide such a letter is unreasonable. For example, the supply chain may include storage sites that are nothing more than a storage tank owner who leases space to a feedstock vendor/aggregator/trader. That owner has no knowledge of LCFS, is not otherwise obligated in any way with respect to compliance with LCFS regulation and would need to hire expensive legal counsel to evaluate the obligations they would be attesting to. Such feedstock supply chain participants will refuse to sign the letter and/or at the earliest opportunity, consider alternative options to renting tank space for feedstock storage that now incurs an additional obligation for regulations that do not otherwise apply to them. This is just one example of supply chain participants opting out from supplying low-carbon feedstocks for biofuel production that for California consumption.

The market has already experienced limitations on specified sources that limit low carbon feedstock availability due to feedstock vendors' unwillingness to submit to existing LCFS verification requirements. The unwillingness is not related to the inability to adhere to program requirements but is because the vendors have alternate markets (e.g. animal feed) without onerous LCFS requirements. Adding additional requirements such as a feedstock attestation from each specified source feedstock supply chain will materially degrade the availability of low carbon feedstocks for credit-generating fuels. Thus, Crimson respectfully requests CARB to remove the unnecessary requirements in § 95488.8 (g)(D).

Tailpipe Emissions in GREET 4.0

The GREET 4.0 model Biodiesel Simplified Calculator includes an updated Tailpipe Emissions value in the Pathway Summary sheet cell F33 (linked to CA-GREET 4.0 cell E28. In GREET 3.0 this value was 0.76. CARB's CA-GREET4.0 Supplemental Document states, "The tailpipe emission factors for biodiesel, renewable diesel, and alternative jet fuel are derived from CAGREET3.0."

If that is the case, the GREET 4.0 model should use the 0.76 value.

Sincerely,

Harry Simpson
President & CEO
Crimson Renewable Energy



April 21, 2025

Dr. Steve Cliff Executive Officer California Air Resources Board 1001 | Street Sacramento, CA 95864

Re: Third 15-day Changes to the Proposed Low Carbon Fuel Standard Regulation

Dear Dr. Cliff:

On behalf of the California Hydrogen Coalition (CHC), we respectfully submit these comments on the California Air Resources Board's (CARB) Third 15-Day Modifications to the proposed Low Carbon Fuel Standard (LCFS) amendments. We thank CARB staff for continuing to engage with stakeholders and for incorporating several critical changes that reflect the economic realities and policy imperatives of expanding hydrogen fueling infrastructure to meet California's climate and air quality goals.

We appreciate and support several revisions made in this 15-day package and applaud CARB for these changes. There are, however, outstanding concerns that, if left unresolved, will fundamentally hinder investment in hydrogen refueling infrastructure and slow the deployment of fuel cell electric vehicles (FCEVs) across both light-, medium-, and heavy-duty segments.

§ 95486.3(a)(4)(H) and § 95486.4(a)(4)(I) – Removal of 1.5x CAPEX Recovery Limit for Both HRI Pathways

We strongly support CARB's decision to eliminate the cap on credit generation at 1.5 times capital expenditure (CAPEX) for both light- and medium-duty (LMD) and heavy-duty (HD) hydrogen refueling infrastructure (HRI) pathways.

This restores the self-regulating nature of the HRI program, providing much-needed investment certainty for stations that must be operational ahead of vehicle demand.

Increased Capacity Factor for HD HRI and Clarification of the HyCap Model

- We appreciate CARB's upward revision of the HD HRI capacity factor to 62.5%, a reasonable improvement from the prior 50%, and the continued commitment to refining and implementing the HyCap model developed by NREL.
- HD hydrogen refueling stations are significant investments and aligning commercial fleets with take-or-pay agreements to ensure a return on capital at this point in the market cycle is exceptionally challenging. The 3rd 15-day changes provide the right policy signal to station developers (certainty of credits generated under potentially adverse market conditions) and helps solve the chicken-and-egg scenario HRI is designed to avert.

§ 95486.3 – LMD Capacity Factor Changes

This change reduces the maximum LMD HRI crediting from 1,200 kg/day to 750 kg/day under the 62.5% de-rate. It is unclear to CHC if this was an unintended change and would oppose the proposed edits to the capacity factor of LMD station capacity credits. Politics and uncertainty have stalled capital markets on decarbonization activities and regulatory changes like the derate to the LMD HRI credits will add additional headwinds to California's zero-emission vehicle goals.

CHC has been consistent in our request to maintain the existing 1,200 kg/day capacity in the LMD credit and worked with CARB to fix this when a 50% capacity factor was introduced in the 45-day draft. "MD vehicles typically require larger stations, and their integration with LD fleets, as opposed to heavy-duty (HD), underscores the importance of incentivizing larger stations. Larger stations, proven to be more reliable, better align with California's policy goals and the current market dynamics. "We worked diligently with staff to fix this issue, and the 2nd 15-day changes provided the appropriate policy and market signal. It is unclear why this changed again.

The 3rd 15-day notice change to the LMD capacity factor discourages the construction of larger and more reliable stations at a time when auto manufacturers are planning to bring medium-duty fuel cell electric vehicles to market, which will require higher throughput infrastructure. Applying the same de-rate across both LMD and HD stations ignores the capital and operational differences and undermines investment in the only hydrogen infrastructure built without state grants. CARB should seek to incentivize larger stations that accelerate vehicle uptake pursuant California's goals and drive cost reductions. The LMD HRI pathway as proposed will not support California's ambitious goals or the vehicle types that these stations need to serve.

Conclusion

The LCFS has long served as a cornerstone of California's decarbonization strategy. With thoughtful revisions, it can continue to support private investment in zero-emission infrastructure. We urge the Executive Officer to finalize the LCFS by:

- Eliminating the LMD HRI de-rate
- Retaining the elimination of the 1.5x CAPEX cap for both HRI pathways
- Finalizing the HD HRI as proposed in the 3rd 15-day notice

We look forward to continuing our work with CARB to ensure the LCFS supports the buildout of the hydrogen economy and the success of fuel cell electric transportation across California.

Thank you,

/s/

Teresa Cooke
Executive Director
California Hydrogen Coalition

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¹ CHC, CHBC, and GHC 45-day Comments



April 21, 2025

Chair Liane Randolph & Members of the Board California Air Resources Board 1001 I Street, Sacramento, CA 95814

Via Electronic Submission

Re: Third 15-Day Changes to the Proposed LCFS Regulation Order

Dear Chair Randolph and Members of the California Air Resources Board:

The Tennessee Soybean Association (TSA) appreciates the opportunity to comment on the proposed modifications to the Low Carbon Fuel Standard (LCFS) program. The TSA has welcomed engagement with the California Air Resources Board (CARB) and staff throughout this multi-year process to update the LCFS program.

TSA represents farmers and landowners who produce soybeans on over 1.8 million acres within the state of Tennessee. Approximately 80% of soybean acreage is produced using a no tillage conservation cropping system which provides income for rural, economically distressed counties while enhancing natural resources through wildlife habitat, nitrate sequestration, and water quality. TSA advocates for the business objectives of soybean producers in an effort to protect and develop the agrarian heritage for which Tennessee is known. We believe Tennessee soybean producers have much to offer in our nation's pursuit of cleaner, renewable energy.

CARB's Third 15-Day Changes to revise the LCFS did not address our major concerns with provisions included in the final amendments approved by CARB. In addition to the new proposals in the Third 15-Day Changes package, TSA remains deeply concerned with the drastic and inequitable pivot CARB has made related to agricultural feedstocks used for biofuels. TSA continues to encourage that updates to the LCFS program are based on upto-date and sound science, as required by AB-32. Outlined below are our concerns and proposed solutions that will enable CARB to meet its climate goals, protect the environment and all Californians, while also supporting American soybean farmers and processors who are investing in the future of low-carbon energy.

Serious Feedstock Cap Concerns and Proposed Solutions

TSA still has significant concerns with the vegetable oil feedstock cap that was included in the initial 15-Day Changes posted in August 2024. The current proposal restricts the amount of soybean oil, canola oil and sunflower seed oil that is allowed to generate credits in the program at an inequitable 20% by company. CARB's own data demonstrates that vegetable oil feedstocks, including soy, have consistently exceeded the proposed cap since 2021.

Capping these proven, sustainable, and scalable feedstocks would suppress the supply of renewable diesel, increase reliance on fossil fuels, and raise fuel prices for California consumers. Even CARB staff acknowledged in the April 2024 workshop that a cap would reduce air quality benefits and likely increase NOx and PM2.5 emissions. All of this, including the recent tariffs on imported feedstocks greatly increase costs and further substantiate U.S. based feedstocks as the clear-cut choice. TSA urges CARB to remove the cap on U.S. based vegetable oil feedstocks to provide a more economically feasible, locally produced and sustainable, climate smart option for the people and the planet.

Agricultural feedstocks for biofuel production are already held to a high standard for participation in the U.S. Renewable Fuel Standard (RFS). Rather than adding sustainable U.S. based feedstocks to its arbitrary proposed cap, CARB needs to update carbon intensity analysis and oversight of imported feedstocks, which are not held to the same level of accountability. Recent actions by the European Union in response to fraudulent Chinese biodiesel imports underscore this concern¹. The EU committee recently met at the request of a member state to discuss alleged fraud in biodiesel imports from China. Fraud continues to be an issue with imported feedstocks and needs to be addressed further. TSA strongly encourages CARB to adopt enforceable traceability and verification standards, including origin disclosures, documentation audits, and physical testing. Without implementing sustainable solutions to the above and not eliminating a cap on U.S. vegetable oil feedstock, CARB is essentially putting the feedstocks from foreign countries (i.e., China) above those of the United States.

Sustainability Guardrails and Traceability Concerns

TSA remains very concerned about the sustainability guardrails. The sustainability guardrails are more onerous than the specified source requirements used for non-U.S. waste feedstock imports. Palm oil in Southeast Asia has had forced labor concerns², but CARB does not require used cooking oil derived from palm to track social or economic sustainability. Concerningly, petroleum does have to track these criteria. CARB's proposal makes it administratively easier to use non-sustainable petroleum³ in the state than biofuels that have lower carbon intensity (CI) scores and are produced from sustainable feedstocks grown in the United States. Land use change is already captured in the indirect land use change (ILUC) score, which still makes it unclear what actual purpose the guardrails serve.

¹ EU industry demands answers as 'fraudulent' Chinese biofuels continue to flow - Euractiv

²https://apnews.com/article/virus-outbreak-only-on-ap-indonesia-financial-markets-malaysia-7b634596270cc6aa7578a062a30423bb

³ https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.858512/full

If CARB insists on agricultural feedstock traceability, then it should reward sustainable practices beyond what is already assumed in the lifecycle analysis (LCA). The U.S. Department of Agriculture (USDA) has developed a tool to quantify the CI reductions for no-till, cover crops and nitrogen inhibitors. Considering this integral information, the carbon intensity of soy-based biofuels could improve through the mentioned climate smart ag practices on the field where the soybeans were produced. Other farming practices like low-till, nutrient management, enhanced efficiency fertilizers, buffers, wetland and grassland management, tree planting on working lands, planting for higher carbon sequestration, and soil amendments all could and should be accounted to assign a lower CI score to an agricultural feedstock. USDA already tracks all these practices through several of their managed conservation programs. In addition, there are a variety of other practices that scientifically lower the CI score of soybean feedstocks for biofuels, and USDA is actively working to develop mechanisms to account for those. If CARB insists on tracing feedstocks back to the farm, then it should also acknowledge when those feedstocks are produced with lower CI practices.

Moreover, USDA has recognized the CI reduction benefits of certain sustainable or climate-smart practices for the purposes of clean fuel transportation programs and is undertaking a rulemaking process to develop final guidelines for the quantification of these practices. Through planting decisions, soil management, and other practices, soybean farmers can continuously reduce environmental impacts. In addition, some soybeans are double cropped meaning they are grown as a secondary crop following a primary crop within a growing season. They are not displacing other crops or land uses. Double-crop soybeans should be eligible to have the ILUC component of the CI score removed or at least shared with the other crop in the rotation. TSA proposes the aforementioned issues to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Modernized, Accurate, Climate Smart Carbon Intensity Modeling and Scoring

TSA remains concerned that without a comprehensive update to the Global Trade Analysis Project model for biofuels (GTAP-BIO) that CARB utilizes, U.S. soy-based feedstocks will be phased out of the LCFS even without the additional limitations included in the Second and Third 15-Day Changes. Current data indicates a much lower CI score for U.S. soybeans, as growers continue to improve soil practices, limit water use, lower on-farm emissions and more. CARB is recommending stringent sustainability guardrails for U.S. soy but is still on track to likely phase-out U.S. soy-based biofuels from credit generation by approximately 2035 or sooner.

As CARB looks to develop a more aggressive auto acceleration mechanism to reach CI reduction benchmarks sooner, using outdated methodologies will only limit the output of actual improvement over time in terms of emissions reductions. As CARB updates all other major lifecycle emissions models through this rulemaking, TSA once again urges action to update the GTAP-BIO model so that the most current, climate smart and science-based data may be used to determine carbon intensity reductions. The reasoning and sources indicated in the Third 15-Day Changes do not address this concern and need to be revised to ensure accuracy. TSA proposes this issue to be solved by proactively addressing via a CARB ILUC modeling work group as soon as possible.

Equitable Entities Eligible to Apply for Fuel Pathways

TSA is very concerned about CARB's decision to give the Executive Officer authority to stop accepting new pathways for biomass-based diesel starting in January 2031. TSA does not understand how this benefits the LCFS. Under AB-32, CARB must under statute minimize costs and maximize GHG reductions. It is unclear how this is served by rejecting new pathways. In fact, the LCFS is best served by allowing the most available and equitable pathways. If these pathways cannot achieve cost-effective GHG savings, they will not be utilized by the market in the LCFS. In essence, an increase in pathways can only serve to improve GHG benefits in California. Singling out a single fuel for prejudicial treatment is baffling given the goals of the LCFS and the authority that establishes it. TSA urges CARB to continue to allow equitable pathways forward with no date of denial.

Recommended Climate Enhancing Solutions for CARB

As CARB finalizes its update to the LCFS, TSA recommends several actions that will likely prevent an increase in fossil diesel use, improve carbon intensity calculations, and improve market access for sustainable U.S. agricultural feedstock providers.

First, CARB should not apply the vegetable oil feedstock cap proposal to U.S. feedstocks. As noted, these feedstocks are already subject to federal guardrails to ensure production on land not converted since 2008. The RFS was designed specifically to prevent land conversion for biofuel production, and USDA data shows a decrease in farmland over the same period.

Second, CARB should convene an expert working group to consider issues related to the sustainability provisions and indirect land use change (ILUC). TSA recommends that this expert working group convene before the end of 2025 and provide recommendations by the end of Fall 2026.

Third, TSA retains strong concerns about the ability of supply chains to comply with the sustainability guardrails. If CARB does move forward with the guardrails, they must reconsider its proposed sustainability requirements to allow soybean growers the opportunity to participate in the California biofuels market through innovative and climate smart agriculture practices. If traceability can be used to show additional benefits in CI scoring, CARB must look to programs already developed through farmer input and provide improved scoring for feedstocks that employ sustainability practices to minimize the

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changes in comparative costs (i.e., USDA accredited programs and practices). CARB should work with USDA to develop an aligned scheme to quantify climate-smart agricultural practices for the purposes of biofuel feedstocks. USDA has already engaged with CARB regarding this project, which could be applied to the work that CARB is doing on traceability and carbon quantification of agricultural biofuel feedstocks.

Lastly, CARB must undertake a comprehensive update of the GTAP-BIO model for soybean oil used in biofuel production. Without using the most up-to-date and accurate data, CARB is doing a disservice to the U.S. feedstock producers and California's citizens by calculating carbon intensity scores not rooted in current facts. Through CARB's own analysis we know prejudicial feedstock treatment will lead to more emissions in the California transportation sector, harming the environment.

Concluding Thoughts/Pathway Forward

TSA is encouraged by the continued successes of programs that support the development of cleaner, low-carbon fuels. However, it is critical that CARB finalizes updates in a way that equitably include U.S. agricultural feedstocks through policies that are science-based aligning with the most up to date information as well as promoting the sustainability of U.S. based products and businesses; including the elimination of capping on U.S. vegetable oil feedstocks and applying sustainability guardrails that are economically feasible for farmers while rewarding their practices that lower CI.

CARB's Third 15-Day Changes did not address any of the fundamental issues raised by TSA in the First and Second 15-Day Changes and fails to acknowledge the potential unintentional consequences of a feedstock outlined by its own employees in previous discussions. CARB is required under the law to achieve the maximum technically feasible and cost-effective reductions in greenhouse gas emissions. The most recent 15-Day Changes show a lack of willingness to achieve the statutory obligations set forth in AB-32 and neglect modernized, climate smart, science-based solutions, ultimately disregarding the protection of U.S. based feedstocks, the people, and the planet. TSA also asks that CARB respond in writing to further substantiate their decisions regarding our concerns expressed in this letter. We look forward to your written responses as a state regulatory body, whose responsibility is to protect its' citizens and the environment by providing transparency on decisions made for those of impact.

TSA is eager to continue working with CARB to support the role of agriculture in diversifying the fuel supply while reducing carbon intensity and increasing clean air in California and beyond. On behalf of U.S. soybean farmers, we appreciate the opportunity to comment and look forward to collaborating with CARB and other relevant stakeholders on implementation of policies that expand the use of U.S. soy-based biofuels and market opportunities for U.S. soybean farmers.

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Sincerely,

Stefan Maupin

Executive Director



April 21, 2025

The Honorable Liane Randolph, Chair State of California Air Resources Board 1001 | Street Sacramento CA 95814

RE: Comments to the California Air Resources Board on Proposed Modifications (Third 15- Day Changes) to the proposed Low Carbon Fuel Standard (LCFS) Amendments

The Green Hydrogen Coalition ('GHC') is appreciative of the California Air Resources Board's (CARB) Low Carbon Fuel Standard Amendments (LCFS). The GHC is a California educational 501(c)(3) non-profit organization that was formed in 2019 to recognize the game-changing potential of "green hydrogen" to accelerate multi-sector decarbonization and combat climate change. The GHC's mission is to facilitate policies and practices that advance green hydrogen production and use across all sectors of the economy to accelerate a carbon-free energy future and a just energy transition.

The GHC appreciates CARB's leadership in advancing clean fuels via the LCFS program and is especially excited by the added ambition in the targets being set by updated regulation. This program is widely considered one of the most successful programs in North America in achieving the deployment of lower carbon fuels and the GHC applauds CARB staff for their thoughtful and forward- thinking proposed modifications to the LCFS. The GHC respectfully submits the following comments to CARB.

GHC recommends strengthening demand and supply signals for alternative fuels – including allowing incentives for renewable H2 as an input for other transportation (non-road) fuels.

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At the time of the initial adoption of LCFS update in November 2024 there was considerable uncertainty about how the new Federal Administration would alter, hinder or otherwise stop the incentives made available by the Inflation Reduction Act. Subsequently, we have



witnessed the Federal Administration pause all support for incentive programs in the near-term, including to Hydrogen Hubs that had already been identified for funding by the prior Administration, and we fear this will become a permanent pause. As a result, the need to focus California policy to deliver the right demand signals for renewable hydrogen production is now more important than ever.

In the consideration of alternative fuels, specifically non-fossil fuels, CARB should focus on developing strong demand signals as it lays out its regulations. This should be a key driver for the design of the LCFS, rather than compartmentalizing fuels into specific usage categories. Namely, under the current proposed rules there is a prioritization on renewable hydrogen used as a finished fuel for road transportation within the LCFS, and not for renewable hydrogen used in the production of other low carbon fuels. Hydrogen can serve as a direct fuel and is an essential renewable energy input for other liquid transportation fuels, including but not limited to renewable ammonia, e-methanol, renewable diesel, or sustainable aviation fuel. These fuels are critically important to deeply decarbonize hard to abate sectors including some of the hardest to decarbonize sectors within the transportation sector such as maritime shipping and aviation. A key barrier to the use of renewable hydrogen for on road applications and for the production of these derivative fuels is its cost compared to status quo fossil fuels. Market signals that will encourage the scaling of renewable hydrogen production will drive down costs for all uses, on road and off road and even hard to abate sectors. The sooner we can scale the production of renewable hydrogen for all transportation end uses, the faster we can achieve our clean energy transition.

In the near term, the available supply of renewable hydrogen will be relatively low compared to the current availability of fossil derived hydrogen. A key problem that CARB and the broader renewable hydrogen economy needs to solve for is instituting the right signals to grow the supply and help ensure that the supply is available to sectors that are being prioritized in other complementary policies (i.e. Advanced Clean Fleets and Advanced Clean Trucks). There are two paths to consider: one in which the LCFS simply prioritizes directing the limited amount of renewable hydrogen to on-road use and a second one that prioritizes scaling the amount of renewable hydrogen produced in California without restricting or directing the final use.

It is worth noting that a ready and available supply of electrons on our grid is enabling the growth in adoption of battery electric vehicles that use substantially more electricity relative to an average household. Except for very large charging operations (at the multimegawatt scale), it is relatively easy to utilize the grid to power battery electric vehicles throughout California without a need to prioritize electrons for on-road use. Similarly, if California can create the underlying infrastructure that can deliver copious amounts of renewable hydrogen to generate ammonia, e-methanol, renewable diesel, or sustainable

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078.2 cont. aviation fuel, it will help guarantee a much larger supply of the resource (and have a much lower-cost, given economies of scale that will be achieved). In other words, if the LCFS were to help catalyze the development of alternative renewable fuels which represents a significant potential near term off take, this would help drive needed scaled demand for renewable hydrogen and facilitate the scaling of renewable hydrogen production, transport and storage facilities, accelerating cost reduction and ultimately creating a virtuous cycle for faster on-road adoption of renewable hydrogen as a direct fuel as well. By not restricting final use of the hydrogen, California can also unlock its vast renewable potential to produce renewable hydrogen at scale and be able to achieve economywide deep decarbonization much faster.

Accordingly, the GHC requests that CARB include additional direction to support the market demand and supply for hydrogen as a part of its Board Resolution adopting LCFS amendments. Specifically, GHC requests the Board Resolution require CARB staff to develop additional demand signals to enable the development of lowest-cost hydrogen for the transportation market, including incentives to utilize renewable hydrogen as an input to transportation fuels for the maritime and aviation sectors.

Thank you for the opportunity to provide comments on this important program for our energy transition. We look forward to getting to work on implementation and progress to meet our shared goal of decarbonizing the transportation sector.

Sincerely,

Janice Lin

Founder and President Green Hydrogen Coalition



April 21, 2025

California Air Resources Board 1001 I Street Sacramento, CA 95814

Via electronic submittal: https://ww2.arb.ca.gov/lispub/comm/bclist.php

RE: Response to April 4th 15-Day Modifications to Proposed Regulation Order

Dear California Air Resources Board,

Advanced Biofuels Canada is the Canadian national trade association for advanced biofuels and renewable synthetic fuels. ABFC members produce a portfolio of liquid low-carbon fuels (including alternative jet fuels), sustainable feedstocks, and intermediary products. Our members operate over 10 billion gallons of low carbon fuel production capacity globally and are significant suppliers to renewable and low carbon fuel regulations in Canada, the US, and worldwide. Many of our members have operations in both the United States and Canada.

Regarding the Proposed Low Carbon Fuel Standard Amendments <u>posted</u> on April 4, 2025:

- The modified language in section § 95488 (d) ('the Executive Officer shall not accept new fuel pathway applications for biomass-based diesel, if the number of unique Class 3-8 ZEVs reported or registered in California exceeds 132,000 ZEVs or NZEVs on December 31, 2029') should be updated in consideration that Classes 3 – 8 is an exceedingly broad a category of vehicles.

ZEV penetration may be higher in lower Classes, with Classes 7 -8 lagging behind. We suggest that specific ZEV penetration values be created for Classes 7 - 8 to ensure that new biomass-based-diesel pathway holders are able to produce fuels for this harder-to-decarbonize vehicle category as the LCFS program continues.

ABFC reiterates stated concerns submitted in October 16th on the previous 15-day comment period regarding the 20% credit generation limit in § 95482 (i). ABFC suggests that CARB take a 'risk-based approach' that relies on quantitative analysis to determine which feedstocks are

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ABFC Comments on Proposed Low Carbon Fuel Standard Amendments



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subject to any type of credit creation limit. This approach is similar to that used in considering ILUC in the Renewable Energy Directive of the European Union and is referred to in the Canadian Clean Fuel Regulations. This approach keeps the LCFS as a 'science-based policy' that makes decisions based on evidence and objective data.

Thank you for this opportunity to provide comments.

Yours truly,

Advanced Biofuels Canada



2134 E. Mineral King Ave Visalia, CA 93292 559-667-9560

April 21, 2025

Ms. Rajinder Sahota Deputy Executive Officer - Climate Change & Research California Air Resources Board 1001 I Street Sacramento, California 95814

Re: California Bioenergy's Comments on CARB's April 4th, 2025 Third 15-Day Amendments to the Low Carbon Fuel Standard Regulation

Dear Ms. Sahota,

Thank you for the opportunity to provide these comments to California Air Resources Board (CARB) relating to the Third 15-Day Amendments to the Low Carbon Fuel Standard (LCFS) Regulation released on April 4th, 2025. California Bioenergy LLC (CalBio) is appreciative of CARB's efforts over the past several years to develop the LCFS program into one of the most impactful policies to support the transition from fossil fuels to lower carbon alternatives.

Founded in 2006, CalBio works closely with California dairy farm families along with local, state, and federal agencies to reduce methane emissions. CalBio is committed to enhancing environmental sustainability for all Californians through our digester projects which produce carbon-negative renewable natural gas and electricity.

CalBio urges CARB and OAL to adopt the latest 15-Day Rulemaking Package as amended

We write these comments to commend CARB's continued leadership in advancing policies that address climate change, promote public health, and stimulate economic growth. The LCFS has been instrumental in facilitating the development of dairy digesters. According to data from the California Department of Food and Agriculture (CDFA), dairy digesters in California are on track to collectively reduce approximately 2.4 million metric tons of CO₂-equivalent (MTCO₂e)¹ emissions annually—marking significant progress toward achieving the 40% methane reduction target set by SB 1383.

Also important to consider are the environmental, health, and economic benefits of the LCFS program. Since its inception, the program has achieved a reduction of approximately 13% in the carbon intensity of transportation fuels, displacing over 30 billion gallons of petroleum fuel and reducing emissions equivalent to removing 6.4 million cars from the road. This reduction in fossil fuels translates directly into public health benefits. CARB estimates that from 2024 to

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¹ California Department of Food and Agriculture Dairy Digester Research and Development Program – Program-Level Data (Updated January 8, 2025) https://www.cdfa.ca.gov/oefi/DDRDP/docs/DDRDP Program Level Data.pdf



Helping dairies fuel a renewable future

2134 E. Mineral King Ave Visalia, CA 93292 559-667-9560

080.1 cont. 2046, the LCFS will result in \$5 billion in savings from avoided health outcomes, primarily through enhanced air quality.²

While we believe there are aspects of the regulation which could be improved – namely the concerns we had raised in previous around data substitution methodologies in Section 95491.2³⁴, we believe CARB and the Office of Administrative Law (OAL) should adopt the final draft regulation of the LCFS Program as written. Given the growing LCFS credit bank, it is imperative that the effective date of the regulation be applicable to Q1 2025 dispensing fuel reporting activities such that the LCFS Carbon Intensity Benchmarks stated in Table 2 and Table 3 of the Proposed Regulation remain in full effect.

At a time where ambitious climate action is needed now more than ever, the LCFS remains the primary example for other states and the world to follow. We appreciate CARB's dedication to environmental stewardship and stand ready to support the continued success of the LCFS.

Sincerely,

Andrew Craig

Vice President, Greenhouse Gas Programs

California Bioenergy LLC

² CARB updates the Low Carbon Fuel Standard to increase access to cleaner fuels and zero-emission transportation options https://ww2.arb.ca.gov/news/carb-updates-low-carbon-fuel-standard-increase-access-cleaner-fuels-and-zero-emission

³ CalBio Comments on CARB's Proposed Tier 1 Simplified Calculator for Biomethane from Anaerobic Digestion of Dairy and Swine Manure released December 19, 2023 https://www.arb.ca.gov/lists/com-attach/6968-lcfs2024-VTYCZQFsV2ZRPgBv.pdf

⁴ California Bioenergy's Comments on CARB's April 10th, 2024 Public Hearing on the Low Carbon Fuel Standard https://ww2.arb.ca.gov/form/public-comments/submissions/11571



21 April, 2025

State of California, Air Resources Board Industrial Strategies Division, Transportation Fuels Branch California Air Resources Board 1001 I St. Sacramento CA, 95814

Re: Comments on Proposed Amendments to the Low Carbon Fuel Standard

Dear LCFS Team:

Thank you for the opportunity to comment on the current rulemaking to amend the Low Carbon Fuel Standard (LCFS). The University of California, Davis Institute of Transportation Studies (ITS-Davis) has been engaged in research, policy analysis, and technical assistance relating to the LCFS since it was first developed, over 15 years ago. Since then, the LCFS has become a critical part of California's climate policy portfolio and a model that has been adopted in many other jurisdictions around the world. Following the strategic vision laid out in the 2022 Scoping Plan, the LCFS is intended to support profound changes in California's transportation and energy systems in order to meet the statutory goals of a 40% reduction in greenhouse gas (GHG) below 1990 levels by 2030, and carbon neutrality by 2045.¹

The 3rd 15-day comment package released on April 4th ("3rd 15 day package") addresses several areas identified as needing additional clarification by the Office of Administrative Law. Resolving these should conclude the rulemaking process that was begun well over 2 years ago. This rulemaking has sought to address persistently low credit prices that present a significant obstacle to California's efforts to achieve carbon neutrality by 2045. Most, though not all, of the changes proposed in the 3rd 15 day package make non-substantive changes from the package of amendments presented to the Board on November 8th, 2024. On the whole, they do not significantly alter the impression of the total effect of the proposed package of amendments that we presented in our comment letter submitted on 16 October, 2024: the proposed amendments are likely to provide some incremental, and likely transient upward pressure on prices but the fundamental credit oversupply facing the market will remain and additional reforms will be necessary to secure the LCFS for long-term stability.²

These comments are presented in the spirit of ITS-Davis's mission to bring science into the policy process. Neither UC Davis nor ITS-Davis seek a specific policy outcome; these comments are offered to help California meet its climate, environmental, and equity goals.

¹ SB 32 (Payley, Chapter 249, Statutes of 2016), AB 1279 (Muratsuchi, Chapter 337, Statutes of 2022)

² See: Our 16 October 2024 comment submitted by in response to 2nd 15 day amendment package. https://www.arb.ca.gov/lists/com-attach/8069-lcfs2024-B3JcOQNdVmFSNVch.pdf

Modifications to § 95482

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Proposed modifications to this section would allow hydrogen produced by steam methane reformation (SMR) with accompanying carbon capture and sequestration (CCS) to count toward the 80% renewable hydrogen requirement for 2030 and be excluded from the planned 2035 phaseout of hydrogen made by SMR of fossil fuels. This change would mean that hydrogen made by SMR+CCS systems would receive approximately equivalent treatment under the LCFS as renewable hydrogen such as that made from electrolysis of water using renewable energy, though the carbon intensity (CI) score assigned to each form may differ. This approach aligns with the LCFS' existing focus on carbon intensity, rather than production characteristics, as the primary metric by which fuel pathways are assessed, however it would put the program out of step with other State and Federal policies, as well as several other provisions within the LCFS.

Multiple policy frameworks adopt a clear distinction between renewable and non-renewable sources of energy, including, and of particular relevance to the LCFS, the Federal Renewable Fuel Standard (RFS), and the State Renewable Portfolio Standard. Both policies distinguish between fossil fuels, for which the supply is finite and non-renewable over policy-relevant timescales, and renewable fuels such as wind, solar, and biomass (or biomass only in the case of the RFS), that can be used over many years without depletion. The LCFS focuses on life cycle carbon intensity as its primary metric for evaluating fuel pathways, however it offers differing treatment to renewable pathways in several critical ways. For example, renewable electricity generation like wind or solar is assumed to have a carbon intensity of zero (despite ample evidence from life cycle assessment literature that there is a small, but non-zero GHG impact from such sources³), rather than going through individual pathway certification like other fuels. To the extent that the proposed changes would extend treatment typically reserved for renewable energy systems to a non-renewable one, it may add complexity to the challenge of navigating California's climate policy portfolio.

There are meaningful technical and operational differences between hydrogen production from electrolysis of renewable electricity, and that made by SMR with or without CCS. Appropriately designed, permitted, operated, and regulated SMR+CCS systems can reduce GHG emissions compared to conventional SMR. However, they are subject to operational constraints like access to geological sequestration sites, and dependence on large quantities of inexpensive methane (e.g., fossil "natural" gas). Similarly, their use is associated with a different slate of environmental impacts and risk factors - e.g., fugitive methane leakage or CCS well failure - that do not apply to electrolytic hydrogen production. These differences must be recognized and appropriately considered if these approaches to GHG reduction can be leveraged to maximize their potential value. The proposed revisions in this section would allow SMR of fossil gas with CCS to be counted against a requirement for "renewable" approaches to hydrogen production,

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³ E,g, Smith, Brittany L., Ashok Sekar, Heather Mirletz, Garvin Heath, and Robert Margolis. 2024. An Updated Life Cycle Assessment of Utility-Scale Solar Photovoltaic Systems Installed in the United States. Golden, CO: National Renewable Energy Laboratory. NREL/TP-7A40-87372. https://www.nrel.gov/docs/fy24osti/87372.pdf.

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which could constrain the ability of the LCFS, or regulatory programs that adopt the LCFS' approach, to recognize and appropriately reflect the meaningful differences between SMR+CCS systems and electrolytic ones (or other renewable approaches to hydrogen production). Maintaining the distinction may be important for LCFS or other climate policies to provide levels of support to each method that are proportional to the GHG or other environmental benefit they provide. Weakening the incentive for non-fossil sourcing for hydrogen production could lead to the risk of stranded assets in the future, given California's commitment to move away from fossil fuel use as much as possible.

Modifications to § 95483

We note that the proposed changes to this section extend the current treatment of a significant fraction of LCFS credit revenue from residential EV charging, which is largely used to fund incentives for MD and HD EV purchase. Given the withdrawal of the waiver application for the Advanced Clean Fleets (ACF) rule, there is a profound need for California to deploy additional support for MD and HD ZEV deployment; while the revenue from the LCFS is unlikely to yield the same net effect as ACF, it can contribute to a portfolio of policies that fill this gap.

Modifications to § 95486.3 and § 95486.4

Changes to this section remove the cap on revenue from infrastructure credits for unused fueling capacity at hydrogen refueling stations, which was previously set at:

"...the difference between 1.5 times the initial capital expenditure, not including on-site generation, land, working capital, or off-site facilities, reported pursuant to section 95486.3(a)(6)(C)1. and the sum of total grant revenue or other external funding before the station is both approved and operational, pursuant to section 95486.3(a)(6)(C)5. and 6. in the prior quarter"⁴

This revenue cap remains in place for capacity credits for unused DC-Fast charging (FCI) stations.

Supporting the deployment of ZEV fueling infrastructure in advance of vehicle fleet transformation aligns with best practices suggested by current research in this space. However, it is not clear why the cap was removed for HRI but not FCI; the differing treatment of two generally similar forms of ZEV fueling infrastructure may cause confusion among stakeholders. We note that the Office of Administrative Law did not identify issues related to the per-station cap on HRI revenue as problematic or needing clarification in their decision to return the

⁴ This language was removed from § 95486.3 (a) (4) (H) and § 95486.4 (a) (4) (I) but remains in § 95486.3 (b) (4) (H) and § 95486.4 (b) (4) (I). Source: Attachment A-2.1 *Proposed Final Regulation Order* https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/atta2.pdf

⁵ Brown, A.L., Sperling, D., Austin, B., DeShazo, J.R., Fulton, L., Lipman, T., Murphy, C., et al. 2021. Driving California's Transportation Emissions to Zero. https://doi.org/10.7922/G2MC8X9X



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proposed amendments for additional clarification.⁶ As such, we question why this change in policy was suggested at this late phase of the rulemaking, after the board had considered and voted to approve the amendments on November 8th.

In addition to the potential confusion resulting from these changes, they may lead to a small handful of projects claiming a disproportionate share of infrastructure capacity credits, resulting in credit revenue flowing in ways that do not support California's ZEV goals. The total number of HRI and FCI credits are each capped at a quantity equal to 2.5% of prior year deficits in any given year, if issued and anticipated HRI and FCI credits would exceed that cap, no new pathways in the category exceeding the cap would be approved. That is to say, if the HRI program is utilized to its fullest extent and supports enough stations to reach the cap, then no additional stations can take advantage of the HRI provisions within that category for a given year. Imposing the 1.5x capital cost cap on total HRI revenue helped ensure that the HRI program would be able to support a greater number of stations, and support the State's goals around widespread ZEV fueling infrastructure availability. If a low utilization station had received total credit value that exceeded the limits as described above, they would effectively be removed from the program and the space under the cap that station had previously occupied would be freed up for another station. This helped ensure that the HRI and FCI provisions supported the deployment of a large number of stations, and created a strong incentive to increase the utilization of existing stations. The changes proposed in the 3rd 15 day package would allow stations to continue receiving HRI credits for the full duration of these provisions and potentially exclude new stations from taking advantage of these provisions.

Beyond this, there is no clear reasoning given why a particular station should receive capacity credits in excess of the difference between capital cost and received grant or incentive revenue. No analysis was presented in the ISOR or any associated LCFS documents that we could find during the rulemaking process that justified this level of support as being necessary or appropriate for the purpose of expanding ZEV refueling infrastructure. Providing 1.5 times the capital cost (less other incentives) offers a sizable incentive for the provision of this type of ZEV fueling infrastructure, considering that such stations will also receive revenue from regular LCFS credits, RFS incentives, sale of fuel and possibly other sources. Work by ITS-Davis researchers (though conducted while at a previous institution) evaluated the projected revenue available to light-duty HRI and FCI stations and demonstrated that these could plausibly receive capacity credits with total value at several multiples of station capital cost.⁷

Without additional analysis or justification, it is difficult to understand how or why this level of incentive is appropriate for the purpose of supporting ZEV fueling infrastructure expansion. The

⁶ Office of Administrative Law (2025) Decisions of Disapproval of Regulatory Action. State of California. https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/disapproval decision.pdf

⁷ These were submitted to the public comment docket for the 2018 LCFS rulemaking here: https://www.arb.ca.gov/lists/com-attach/256-lcfs18-AmxcPwd+ByADYIUw.zip Reference to these comments is a citation to previous work. Neither Nextgen California or any related entity contributed to this letter (dated Apr 21, 2025) and nothing herein should be taken as indicating any statements or expressed positions on their behalf.

081.3 cont.

analysis and concerns presented in that 2018 letter have never been clearly addressed by CARB or related stakeholders; we still lack a transparent statement of capital and operational costs for the types of stations the HRI and FCI provisions seek to support, and cannot evaluate whether the level of support provided by these provision is appropriate or efficient. Unrestricted HRI or FCI crediting could lead to windfall profits for the station developer, in which a low-utilization station could receive substantial credit revenue, potentially in the hundreds of thousands of dollars per year, derived predominantly from charges on petroleum gasoline paid by California consumers, even after the station has fully recouped investment and operational costs. Removing this cap without analysis or justification increases the risk that significant amounts of LCFS credit revenue will be spent in ways that provide little benefit to either California's long-term decarbonization goals or the Californians themselves.

Modifications to § 95488.3

081.4a

This section modifies how the LCFS will account for indirect land use change impacts, especially those for which a pre-calculated value is not presented in Table 6. These changes recognize a clear and important problem that needs to be addressed in order to allow the LCFS to continue to effectively support the decarbonization of transportation fuels. Land use change (LUC), especially market-mediated land use change (known as indirect land use change or ILUC) associated with biofuels can cause significant GHG impacts; ignoring or underestimating these impacts increases the risk that fuels' actual GHG impacts will exceed their assessed CI score. In some cases, per-gallon GHG impacts of ILUC can be quite large, potentially higher than the carbon intensity score of the fuel itself or the petroleum equivalent it seeks to displace.8 Given that CARB has received LCFS credit pathway applications for fuels using feedstocks not reflected in Table 6, it is important to establish alternative protocols for evaluating their GHG impacts, including ILUC. The proposed language presented in the 3rd 15 day package makes steps in this direction. However, it leaves some significant areas of uncertainty and creates a potentially severe risk of inaccurate ILUC assessment. We identify three areas of particular concern - applicability of the definition of "conservative" used elsewhere in the LCFS, lack of clarity regarding the term "modeling framework," and overreliance on satellite imagery; we will discuss each of these in turn.

First, it is unclear what is meant by "conservative" as it is used in § 95488.3 (d) (2). The term is generally defined in § 95481 as "reducing the estimated GHG reduction benefits of an operation or utilizing methods and factors that over-estimate energy usage or carbon intensity (90th percentile or highest value)" however, it's not clear how this would be operationalized in the context of ILUC assessment. The conceptual basis for this guidance - to choose estimates that typically imply higher assessed CI scores - is clear and appropriate, given the asymmetric risk dynamics around ILUC estimation. A preference for overestimation rather than underestimation

⁸ E.g. Table 7.7-1, US EPA, 2023. Model Comparison Exercise Technical Document (No. EPA-420-R-23-017). https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1017P9B.pdf



081.4a cont. of ILUC provides greater protection against stranded assets or significant and functionally irreversible (on time scales relevant to addressing climate change) GHG emissions.9

> While the idea of using the 90th percentile estimate is conceptually clear, it is difficult to operationalize in the context of ILUC modeling, however. The problem is that there is no way to directly sense or measure the ILUC impact of a given fuel+feedstock combination. Any assessment of ILUC is, by necessity, a modeled estimate and therefore based on a set of modeling and analytic assumptions, subject to the limitations imposed by the modeling framework and analytic tools. Quantitative empirical data are measurable, and so long as the measurement instrument is free from systematic bias, a set of measurements could describe underlying characteristics of interest given enough measurements. The statistical tools we have for assessing the validity and representativeness of a sample are often predicated on independent and unbiased measurement error terms. 10 When this is the case, the range of potential outcomes and the distribution of outcomes can be assessed, which allows the identification of a 90th percentile outcome: it is explicitly defined via mathematical formulae. This distinctly contrasts with the modeling tools used to assess ILUC, for which the range of potential outcomes and distribution of results within that range is dependent on the model and input parameters being used. Models are unlikely to have unbiased, independent error terms because the assumptions made to allow a given model to function are likely to bias modeled results towards a certain outcome. This means that the 90th percentile standard articulated in the definition of "conservative" cannot assure a reasonable chance of accuracy for modeled results in the same way that it can when applied to measurements or empirical data. 11 The 90th percentile outcome, as identified by any given model, may be below the actual impact (if such could be conclusively determined). More plausibly, the 90th percentile outcome according to one model may be below the 1st percentile outcome of a different model that is based on equally credible assumptions or methodology. There is no empirical measurement of net outcomes possible to calibrate such models, so the range of outcomes can be quite large, as found in the US EPA model comparison analysis.8 Given that some studies have found that the GTAP model underestimates land use change impacts from biofuels under plausible real-world conditions, 12

⁹ See this explanatory video (https://www.youtube.com/watch?v=eT06-vw0Fnw&t=3s) and this blog (https://its.ucdavis.edu/blog-post/making-policy-in-the-absence-of-certainty-biofuels-and-land-use-change/) for more detail on these risk dynamics.

¹⁰ This is not to say it requires measurement tools that are free from any error at all, but rather that errors are uncorrelated with respect to each other or external parameters.

¹¹ Models can, in some circumstances, be calibrated using past results, however the calibration remains accurate only so long as the modeled conditions in the underlying system remain relatively stable. In the case of ILUC, we know that climate change, geopolitical forces, and advancing technology are causing significant change on the forces affecting land use decisions around the world.

¹² E.g. Malins, et al. (2020) https://www.sciencedirect.com/science/article/abs/pii/S0959652620307630 and Berry, et al. (2024)

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

We also note that the lead investigator on the 2016 effort to develop the ILUC estimates in Table 6 submitted a comment indicating that GTAP estimates likely underestimate actual GHG impacts https://www.arb.ca.gov/lispub/comm/iframe_bccomdisp.php?listname=lcfs2024&comment_num=7063&vir_ t num=380

081.4a cont. even a 90th percentile outcome from a set of GTAP-AEZ modeling that used randomized sets of plausible input parameters could substantially underestimate actual GHG impacts from biofuels.

081.4b

Second, § 95488.3 (d) (2) states that this "conservative" value shall be calculated based on the "same modeling framework" as in § 95488.3 (d) (1), which describes the basic function of the GTAP and AEZ-EF models. It is not clear what the "same modeling framework" means. This could be interpreted to require the use of the same GTAP and AEZ-EF models as were used to provide the LUC adjustment factors adopted in 2016, updated versions of the same model, or equivalent models that adopt the same basic structure - using an economic equilibrium model to determine land changes and an emission factor model to quantify GHG emissions resulting from such changes.

As a term of art used within the research and modeling community, the term "modeling framework" would typically, though not exclusively, be used to describe a conceptual or methodological approach, but not a specific model or version. Multiple models could be described as sharing a modeling framework if they use similar definitions or terminology, data sources, or methodological approaches. When discussing models like those referenced in § 95488.3 (d) (1), we would suggest that the "same modeling framework" requirement is most reasonably interpreted to mean an economic equilibrium model for assessing land use changes and a land use change emission factor model to quantify GHG impacts of such changes. This could mean that models other than GTAP and AEZ-EF would satisfy the "same modeling framework" requirement, though they would need to align their system boundary and other analytic assumptions with those from the earlier CARB analysis where possible, to allow direct comparison with the results presented in Table 6.

Interpreting § 95488.3 (d) (2) to require the use of GTAP and AEZ-EF, or to specify even greater methodological overlap with the 2016 analysis that led to the values presented in Table 6 would limit the analytical tools available to CARB for the purpose of estimating ILUC impacts of biofuels and force the program to rely on existing models regardless of their performance. The scientific discussion includes arguments that the GTAP model in particular, has been shown to yield results that underestimate ILUC impacts under many sets of inputs. The U.S. EPA found GTAP estimates, especially for lipid-based biofuels (such as biodiesel and renewable diesel), to be at the low end of the range of estimates they found from several ILUC models. We will discuss the implications of overestimation and underestimation of ILUC emissions later in this section.

ILUC modeling is a continually evolving field, due to changes in methods as well as on the ground. A wide range of economic, ecological, and social forces impact land use decisions and reflecting these in a computational framework is a complex challenge that has not been conclusively solved by researchers, yet. The inter-model comparison exercise conducted by the U.S. EPA showed that even though estimates of ILUC impact for a given feedstock/fuel combination could vary widely (as they did with soybean oil biodiesel), multiple models and modeling frameworks can coalesce around a relatively smaller range of estimates (as they did with corn ethanol) as well. It is entirely appropriate to set robust standards for analytical rigor

081.4b cont.

and to ensure that results from different models are comparable in a regulatory environment. Limiting to any single modeling framework (including a pair of models as in the GTAP and AEZ-EF case) may overly restrict the set of tools CARB or other stakeholders could use to address this challenge. This is especially problematic when the limitation forces the use of a model (GTAP) that has undergone critique and shown a tendency towards underestimation of ILUC impacts, especially given the intent (expressed via the definition of "conservative") is clearly to lean in the opposite direction.

081.4c

Third, § 95488.3 (d) references satellite imagery data as a primary source to support estimates of land use change impact. Satellite imagery of land cover is a valuable source of such data and routinely utilized in this field. It is important to note, however, that satellite imagery has limitations that impact how it might be used for LCFS ILUC estimation. Land imaging satellites directly sense electromagnetic radiation, and use a variety of mathematical methods to resolve signals carried by such radiation into estimates of the extent of different types of land cover. There is both underlying measurement error in such imagery, as well as continued debate over the most appropriate methods for assigning land classifications based on satellite imagery.¹³

Estimates of changes to land use or cover based on regional or continental satellite data may also overlook impacts that occur elsewhere. ILUC is a global phenomenon; changes in biomass availability or cost may induce changes in land use in distant markets. Existing research has identified the linkage between U.S. or European biofuel consumption and deforestation in Southeast Asia, for example. A 2024 CA State Auditor's report reinforced this conclusion. A hypothetical pathway using novel feedstock (i.e. not represented in Table 6) grown in the U.S. could provide high-quality satellite imagery covering the entirety of North America, and yet this would still not cover the geographies that may be affected by land use change resulting from the use of this fuel. The absence of land use change impacts discernible via regional satellite imagery may mean that such impacts are occurring elsewhere, or that other factors are inducing unrelated changes that obscure the LUC signal from biofuel development. As such, satellite imagery alone, especially when confined to the region in which feedstock is cultivated, is an inadequate protection against ILUC risk.

More importantly, however, satellite imagery can only show things as they exist today or in the past. In many scenarios relevant to LCFS support for biofuels, and indeed in the modeling

¹³ E.g., Kupidura, P. (2019). The Comparison of Different Methods of Texture Analysis for Their Efficacy for Land Use Classification in Satellite Imagery. *Remote Sensing*, *11*(10), 1233. https://doi.org/10.3390/rs11101233, Schepaschenko, D., See, L., Lesiv, M. *et al.* Recent Advances in Forest Observation with Visual Interpretation of Very High-Resolution Imagery. *Surv Geophys* 40, 839–862 (2019). https://doi.org/10.1007/s10712-019-09533-z,

¹⁴ E.g., L. Reijnders, M. A. J. Huijbregts, Palm oil and the emission of carbon-based greenhouse gases. Journal of Cleaner Production 16, 477–482 (2008). https://doi.org/10.1016/j.jclepro.2006.07.054
J. Glauber, C. Hebebrand, Food versus Fuel v2.0: Biofuel policies and the current food crisis | IFPRI: International Food Policy Research Institute (2023).

https://www.ifpri.org/blog/food-versus-fuel-v20-biofuel-policies-and-current-food-crisis.

¹⁵ California State Auditor (2024) *Tropical Forest Risk Commodities* https://www.auditor.ca.gov/reports/2023-129/

081.4c cont.

framework underpinning current ILUC modeling, the ILUC changes most relevant for pathway certification purposes are the ones that have yet to occur, because novel fuel production pathways are unlikely to be present at their full scale when a given fuel+feedstock combination is first certified. That is to say, the increased demand for feedstock that would drive ILUC may not have occurred at the time satellite imagery was collected for the purpose of pathway certification. Alternative fuel producers often seek certification of a pathway based on data from pilot plants or other first-of-kind commercial deployments. If such a pathway is granted, they or other producers may replicate the model for both crop cultivation and fuel production, massively expanding the amount of fuel produced under that pathway, or similar ones, and therefore the amount of area affected by related land use change. Satellite imagery may accurately show minimal land use impacts resulting from the activity used as the basis for certification at the time of pathway certification, however additional impacts may be much more apparent as production achieves larger scales; this could result in changes to the per-gallon or per-MJ estimates of LUC impact, especially when dealing with novel crops or approaches to cultivation. Putting such a heavy emphasis on satellite imagery exposes the program to significant risk that ILUC estimates for fuel+feedstock combinations not present in Table 6 would dramatically underestimate actual impacts.

Additionally, the proposed changes to language in § 95488.3 (d) could be interpreted as limiting the consideration of LUC effects to only those that can be assessed via satellite imagery. Doing so would create a risk that LUC impacts that could reliably be assessed via modeling, aerial or drone imagery, land use surveys, or other methods may be overlooked.

In total, the proposed changes to § 95488.3 (d) clarify many of the key terms referenced in this section and more clearly delineate the responsibilities and authority of the Executive Officer with regards to ILUC assessment. They do not substantively address concerns we, and other authors, have raised about the LCFS approach to ILUC in general, including the fact that the analysis underpinning Table 6 is outdated and assumes a supply shock far smaller than actual biofuel capacity growth in the U.S. ¹⁶ At the November 8th hearing, CARB Executive Board members instructed staff to hold an expert convening to review current science on ILUC, this is a critical first step in a critically important process to examine approaches to ILUC assessment and risk mitigation. Our work on the LCFS and related alternative fuel policies has repeatedly shown that ILUC can exert a significant impact on the CI scores of biofuels and must be adequately accounted for by policies like the LCFS to ensure that assessed GHG impacts align with actual ones and send appropriate associated incentive signals. ¹⁷

Unrelated, and in addition to the above concerns, we note a shift from the use of the word "crop" to the word "biomass" in several places in § 95488.3 (d). This shift aligns with current understanding of biofuel land use impacts; land use change impacts are not solely limited to

¹⁶ See our previous comment letters from <u>August 27th</u>, <u>May 9th</u> and <u>February 20th</u>.

¹⁷ E.g. Brown, at al, (2021), Ro, Murphy, & Wang (2023). Fuel Portfolio Scenario Modeling (FPSM) of 2030 and 2035 Low CarbonFuel Standard Targets in California. https://doi.org/10.7922/G2S46Q8C And Murphy & Ro (2024). Updated Fuel Portfolio Scenario Modeling to Inform 2024 Low Carbon Fuel Standard Rulemaking. https://doi.org/10.7922/G25719BV



081.4c cont. crop-based feedstocks, they can be observed in a variety of non-crop ones, too. As such, this change improves the ability of this section to accommodate the full range of biomass that might contribute to biofuel production in the future.

Modifications to § 94588.9 (f)

081.5

We note changes in § 95488.3 (f) that clarify the Executive Officer's responsibilities related to pathway renewal for biomethane pathways derived from anaerobic digestion of livestock manure. We reiterate a discussion from our October 16th comment letter that questions whether guaranteed renewals of biomethane pathway certification with full avoided methane credits are necessary to achieve state methane reduction goals, and discuss how such automatic recertification disagrees with principles of good LCA methodology. 18 We are finalizing a report that reviews current scientific literature on the topic of LCA methodology for assessing GHG impacts of anaerobic digestion (we have shared, under embargo, a preliminary copy with LCFS program staff for their review and will publish it as soon as possible). This review finds that current LCFS methodology specifies a counterfactual for the purposes of assessing avoided methane credits (open lagoons) that is uncommon among comparable studies. This paper identified 107 studies that reported GHG emission results from life cycle assessment of livestock AD at scales relevant to commercial application, 55 of which discussed counterfactual specification for assessing avoided methane credits in scenarios relevant to commercial application and with enough detail that we were able to ascertain the counterfactual being compared against. Of these 55 directly relevant studies, 9 used open lagoons as the counterfactual. An additional 21 specified other open storage (though likely lower-emitting) counterfactuals. The body of literature on commercial-scale operations in the U.S. was comparatively small, making it hard to ascertain how representative our sample is of projects that would seek LCFS pathways certification, but the diversity of counterfactual specifications under LCA study suggest the current counterfactual assumption in the LCFS may not align with typical practices in peer-reviewed scientific literature, and the extent to which it adequately characterizes the pool of likely LCFS applicants (to serve as a Tier 1 default) deserves exploration. The choice of open lagoons as a counterfactual may, in aggregate, yield CI scores that overestimate GHG benefits of such projects. Guaranteed recertification of pathways that adopt this counterfactual ensures that such overestimates would persist in the LCFS for multiple decades.

Modifications to § 94588.9 (g)

Proposed changes to this section establish a protocol for responding to changes in practices by a certification body that may mean it no longer meets the requirements for certification under the LCFS. Where a body no longer meets one specification in § 95488.9 (g) (8) (A), the proposed changes allow an opportunity for the certifying body to reestablish compliance. This appears to be intended to give certification systems the opportunity to return to compliance without disrupting their operations or the pathways that rely upon them. If non-compliance with one

¹⁸ Link: October 16 comment letter.

081.6 cont.

specification in § 95488.9 (g) (8) (A) does not create a risk that fuels consumed in California would exceed their pathway CI scores, then allowing an opportunity to rectify the error and return to full compliance can help reduce compliance costs and administrative burden. Not all violations of the criteria specified in § 95488.9 (g) (8) (A) are innocuous, however. If the specific violation significantly impacts the assessment of the fuel in question's CI score, then allowing continued operation of the certification body may result in actual emissions that significantly exceed documented levels and appropriate LCFS credit revenue. In cases where companies continue to function despite no longer complying with one criterion in § 95488.9 (g) (8) (A), the Executive Officer may need the authority to determine whether CI scores from the entity appropriately reflect actual emissions from their respective fuels, and if not, appropriate corrective action must be taken to ensure that intentional non-compliance and use of the grace period offered under these proposed changes do not become a tactic to allow favorable, but inaccurate CI scores to generate credit.

Modifications of § 95491.2

The +/- 5% standard of accuracy specified in § 95491.2 (a) (1) (B) is conceptually clear and generally reasonable; however it may not be sufficient to ensure that published CI scores agree with actual GHG impacts. As long as measurement errors are ≤ 5% and independently distributed around the mean, then the aggregate impact of all errors is likely to be small. It must be clear, however, that errors are independently distributed. Where pathway applicants or certification bodies provide their own calibration procedures for measurement equipment, it is important that any errors be independently distributed around the value being measured. LCFS staff should also be aware that not every instrument can be evaluated in such a way as to yield a single accuracy metric, such as a +/- % score. In those cases, alternative assessments of accuracy may be needed. Additional clarity is also needed around how the +/- 5% accuracy standard referenced in § 95491.2 interacts with the 90th percentile standard provided in the definition of "Conservative."

Unclear or Confusing Variable Specification in § 95486.3 and § 95486.4

The 3rd 15 day package makes several changes to proposals relating to HRI and FCI crediting protocols. Several equations are presented to describe the calculation of station capacity, projected capacity, and credit generation for each pathway. While the description of each equation is clear, consideration of the full package of equations is made difficult due to a lack of clarity in variable definition.

Take for example the HD-FCI charging protocols (though the same basic problem is observed in both LD/MD and HD HRI and FCI pathways): § 95486.4 (b) (2) (F) provides the equation

$$Cap_{FCI}^i = F_{HD}^{site} \times P_{FCI}^i \times 24$$

081.8 cont. and states " Cap^i_{FCl} is the FCI charging capacity (kWh/day) for the HD-FCI FSE i".

Later, § 95486.4 (b) (5) states " Cap_{HD-FCI} is the FCI charging capacity (kWh/day) for the HD-FCI FSE. This means that both Cap^i_{FCI} and Cap_{HD-FCI} are described as representing the same parameter (we can ignore the i superscript for this discussion since it implies a numbered example within a set and is relevant to the specific context of § 95486.4 (b) (2) (F)). Similarly, it is unclear whether the use of Cap_{HD-FCI} in § 95486.4 (b) (5) means that the capacity credits should use the nameplate capacity of the infrastructure as the basis for credit generation, or the adjusted capacity which takes into account the p^i_{FCI} utilization factor applied in § 95486.4 (b) (2) (F). Clarity on these issues is needed for stakeholders to fully understand how infrastructure capacity crediting, and the assessment of potential credits in relation to prior year deficits, will proceed.

Unresolved Issues Point to Need for Additional Rulemaking in the Near Term

From the start of this rulemaking process, staff were clear that the scope would be strictly limited in order to allow timely and efficient adoption of changes that could stabilize the LCFS credit market and help strengthen the LCFS credit price. The workshops, engagement opportunities, and discussion materials circulated since then have reflected this agenda. Given the significant decline in LCFS credit prices, and the challenges this presents to California's long-term climate goals, this focus on corrective measures is understandable.

The limited scope, however, meant ignoring many critical and complex structural topics that, when fully explored, might offer avenues to improve the efficiency, resilience, and effectiveness of the LCFS or prevent future destabilizations of the LCFS credit market. As California has progressed through the early phases of its transition toward net-zero emissions, a number of parameters, protocols, or structural assumptions in the LCFS may no longer appropriately reflect current conditions. These include, but are not limited to EERs, ILUC adjustment values, the method by which fossil fuel displacement is credited, interactions or potential double-counting with other climate programs, harmonizing LCFS protocols with other jurisdictions that have similar programs in place or coming online, preparing for radical LCFS credit market shifts anticipated in the 2030's as fossil fuels rapidly exit California's fuel supply, expanding the LCFS to cover air, water, and rail fuels, integrating vehicle or transportation-system effects into fuel CI assessment, and differentiation between so-called "bridge" fuels and those with the capacity to achieve carbon neutrality. As discussed in our many comments throughout this rulemaking process, these issues have demonstrated actual or potential capacity to negatively affect the LCFS and/or continued progress toward California's climate, environmental, and equity goals within the next 5-10 years. The other issues deserve careful consideration and the opportunity for public discussions in a forum that includes stakeholders from a variety of perspectives.

It is especially important in the transportation fuel space to make policy changes as early as possible, in order to avoid a situation that requires precipitous action that may create stranded



081.9 cont.

assets, excessive fuel price volatility, or erode policy certainty about California's climate policy portfolio. The LCFS has in the past conducted major rulemakings following the release of the Scoping Plan; if past patterns hold this would imply the next significant LCFS rulemaking in 2028. By that time, failure to address some of the issues listed above could lead to challenges in LCFS credit markets. While many of these issues are complex and will take significant time and resources to address, most are amenable to solutions that can be gradually implemented, to minimize disruption. Waiting until a crisis emerges increases the chance that precipitous, disruptive change will be required.

CARB should commit to a follow-up LCFS rulemaking, without any limitations to its scope, at the earliest possible opportunity.

Thank you again for the opportunity to provide comments on the proposed amendment package. We appreciate the discussion this process has fostered so far and look forward to continuing our dialog through the coming year. If we can offer any additional assistance or clarify any of the material in this comment, please do not hesitate to reach out to Colin Murphy by email at cwmurphy@ucdavis.edu.

Signed,

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