



December 21, 2022

Dr. Cheryl Laskowski
Branch Chief, Transportation Fuels
California Air Resources Board
1001 I Street
Sacramento, CA 95814

RE: LOW CARBON FUEL STANDARD NOVEMBER 2022 WORKSHOP

Dear Dr. Laskowski:

Thank you for the opportunity to comment on the 3rd Public Workshop to Discuss Potential Changes to the Low Carbon Fuel Standard (“LCFS”) that was held on November 9, 2022 (the “Workshop”). Amp Americas (“Amp”) appreciates the California Air Resource Board’s (“CARB”) leadership on addressing climate change and the significant success the LCFS program has had decarbonizing transportation.

ABOUT AMP

Founded in 2011, Amp develops and operates renewable natural gas (“RNG”) facilities that convert dairy waste into carbon-negative renewable energy. Over our history, Amp’s projects have prevented over 1.2 million metric tons of carbon equivalent emissions. In 2022 alone, our projects abated approximately 450,000 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 five dairy RNG pathways in California’s LCFS program. Our experience developing, operating, and reporting on these and other assets gives us a unique perspective on the impact CARB policy has on development activity. Our projects and resulting methane emissions reductions have been made possible by CARB’s leadership in decarbonizing transportation, and we encourage CARB to continue to support the policy decisions that have made it so successful.

SUMMARY COMMENTS AND RECOMMENDATIONS

Amp appreciates the myriad issues CARB is considering related to RNG development and use and provides a detailed discussion of many of these items in an Appendix to these comments. In short, Amp supports a future transition of RNG to other hard to electrify sectors as proposed in the 2022 Scoping Plan For Achieving Carbon Neutrality, dated November 16, 2022 (“Scoping Plan” or “Final Scoping Plan”), but disagrees with how the Workshop contemplates this change without broader policy support for the transition. The suggested changes to biomethane crediting and book and claim (“B&C”) eligibility in Alternatives A and B have already halted project development. If implemented, these changes will un-do current livestock methane abatement, and eliminate the possibility of future RNG development that is called for in the Scoping Plan.



The rapid development of dairy digesters due to market signals established by the LCFS is a California success story. It directly supports the State's short-lived climate pollutant ("SLCP") reduction efforts, which require CARB and other state agencies to "adopt policies and incentives to significantly increase the sustainable production and use of renewable gas, including biomethane and biogas,"¹ and demonstrates the ability to establish market frameworks to rapidly transform practices in an entire sector.

The LCFS program is succeeding in reducing methane emissions from agriculture within California and beyond California as a market-based program because private capital has invested in the program. There are other contributing factors and complementary conditions, but without private capital investment, the program would not have had the impact it has had.

The CARB staff and board need to carefully consider the high degree of difficulty in attracting private investment in a program without price certainty. LCFS price risk is not 'bankable' meaning project finance is not available to digester projects that rely primarily on LCFS value to justify investment. Therefore, private equity is required to fund projects. Private equity is the most expensive capital and requires high returns and short paybacks – i.e., high LCFS prices.

Low LCFS prices recently have chilled investment. However, confidence in the program has led to private equity lowering return requirements in hopes that CARB would increase CI reduction targets and restore pricing. When staff troublingly suggested ending methane crediting and limiting book and claim, the market took notice. Since the November workshop we have spoken to several investors active in the LCFS market. Many of them were already holding off on new investments in LCFS until CARB completes its rulemaking in 2023. Now all of them are holding off until CARB completely walks back the stances it laid out in the November workshop.

If CARB wishes to prevent freezing digester development, it should immediately, forcefully, and publicly repudiate the proposed limits to methane crediting and book and claim eligibility that were presented in Scenarios A and B delivered in the November workshop.

SUCCESS OF THE LCFS

CARB had a choice when it decided how to fund the LCFS program. Should the program be funded by taxpayers, consumers (e.g., milk buyers), or fuel suppliers? CARB chose fuel suppliers. Further, it had a choice in whether to set the price for carbon or allow it to float freely. CARB chose floating prices without a floor, which means that project owners and investors face uncertain returns on their investment in LCFS projects. Investors facing floating commodity prices such as the LCFS price are said to be taking merchant risk.

Debt is generally the lowest cost form of private capital. However, banks and lenders generally do not take merchant risk. So, due to the design of the program, the lowest cost form of capital is generally less available or unavailable to finance LCFS value in projects. (Note that it may be available to certain types of projects with other revenue streams – e.g., tipping fees. However, dairy RNG projects are methane avoidance projects that exist because of LCFS.) Therefore, LCFS dependent projects must rely on equity for funding.

¹ SB 1383 (Lara, Chapter 395, Statutes of 2016)



CARB did a great job in setting ambitious targets that drove LCFS price high enough to spur investment. Without high prices in 2018-2021, the program would not have the high supply of low carbon intensity fuel it enjoys today. Without higher prices in the future, there will be insufficient private investment to meet CARB's Scoping Plan goals. Furthermore, methane crediting and book and claim are critical to supporting the economics of digesters. Dairy RNG projects will never be economical compared to natural gas and power without avoided methane credits. So long as we wish to prevent methane emissions from agriculture, we need to reward methane avoidance.

These projects reduce significantly more methane per therm of RNG than any other project type but are also significantly more expensive to construct and operate than other low carbon fuels. Dairy digester projects require significant operating and equipment maintenance costs and rely on continuous revenue streams to remain viable. CARB should not presume that once a digester is built it will continue operating and avoid methane emissions in perpetuity. The simple fact is that when costs exceed revenues, digesters will cease to operate, and the associated methane emissions reductions will cease to materialize. That is the condition that clearly existed in the State prior to CARB including avoided methane accounting in the LCFS.

As an experienced project developer, owner, and operator, we are certain that the consequences of proposed changes to biomethane crediting in Alternatives A and B would be increased methane and carbon dioxide emissions in the near-term and post-2030, rather than more rapid development of projects in California. The potential changes would stop current progress towards meeting state climate change and SLCP related goals, create a scenario where emissions that would have been abated are emitted to the atmosphere and never captured, and mothball existing and planned projects.

Further, removing methane crediting will strand assets deployed and people mobilized in reliance on CARB's stated climate goals. CARB earned the trust of investors through its steady commitment to these goals. However, that trust is already damaged, and at risk of destruction if CARB does not act soon to repudiate Scenarios A and B.

Amp does not support the concepts related to limited avoided methane crediting or book and claim accounting presented in Alternatives A and B. We encourage CARB to continue evaluating scenarios in line with the Final Scoping Plan, which was released after this workshop and related analysis was developed, but among the Alternatives presented, Amp supports Alternative C. Our specific recommendations include the following, which are further fleshed out in the sections below:

1. Carbon intensity ("CI") reduction targets
 - CARB should adopt strong CI reduction targets that align with transportation sector emissions reductions and other goals identified in the Scoping Plan.
 - CARB should continue to evaluate targets based on the Final Scoping Plan analysis and goals.
 - Of the scenarios presented, we support the CI targets identified in Alternative C, and would support more stringent targets if subsequent analysis suggests they align with the Final Scoping Plan.
 - CARB should also carefully evaluate the current and expected near-term excess of credits in the market and propose a step down in CI in 2024 to account for current market conditions, rather than simply drawing a line to more stringent targets in 2030.



2. CARB should additionally propose and consider a ratcheting mechanism to increase program stringency, should there be additional opportunity to reduce emissions through the program.
 - Such a mechanism should be in addition to the CI targets included in Alternative C, rather than an alternative to adopting more stringent targets.
3. CARB should not change current practices related to avoided methane or book and claim accounting, which would only serve to restrict project development and increase methane and carbon emissions.
4. CARB should update accounting in the GREET model to reflect the latest science and ensure the most accurate lifecycle accounting possible for fuel pathways, including updating global warming potentials (“GWP”) for methane and other greenhouse gases.
5. Amp supports other proposals suggested at the workshop, including adding intrastate fossil jet fuel as a deficit generator.

RECOMMENDATION 1 – STRENGTHEN CI REDUCTIONS IN 2024-2045 (SUPPORT FOR TARGETS IN ALTERNATIVE C)

As outlined in Governor Newsom’s July 22, 2022, letter to CARB, Amp encourages CARB to “consider an increase in the stringency of the Low Carbon Fuel Standard and to work with relevant agencies to accelerate refinery transitions away from petroleum to the production of clean fuels.”² Amp also supports CARB’s long-stated objective, expressed in this workshop and several previous ones, to align the next set of LCFS amendments with the Scoping Plan. Further, as the CARB LCFS Data Dashboard³ illustrates, the 2021 performance of the LCFS continues to surpass historic compliance targets.

Accordingly, Amp supports a thorough evaluation of appropriate CI reduction targets that align with current market conditions and the modeling and objectives of the Scoping Plan. This should include consideration of targets and appropriate trajectories from 2024-2045, including a potential step down in CI in 2024 and nothing less than the CI reductions included in Alternative C of 35 percent by 2030 and 90% by 2045. Amp encourages CARB to revisit its scenario analysis based on the Final Scoping Plan, which has changed in significant and relevant ways from the Draft Plan that anchored many of the assumptions in the modeling and Alternatives presented at the workshop. Should that analysis suggest more stringent targets than identified in Alternative C to align with the Final Scoping Plan and be appropriate, Amp encourages CARB to propose and consider them.

Targets no less than those identified in Alternative C are achievable and in line with California’s climate change goals and policies. For example, as demonstrated by Oregon Department of Environmental Quality (“ODEQ”), which has promulgated a 37% CI reduction by 2035, CI reductions greater than 30 percent are feasible and programs outside California are reducing transportation fuel CI now. New state and federal incentives, including those under the Inflation Reduction Act (“IRA”) will make projects cheaper and faster to develop and construct. The IRA may especially support carbon capture and sequestration (“CCS”) across a wide array of fuel pathways and direct air capture projects, both of which could create significant new supplies of LCFS credits. California’s climate change policies require CARB to pursue the greatest possible greenhouse gas (“GHG”) reductions, as well. California’s Global Warming

² Governor Newsom July 22, 2022, Letter to CARB (<https://www.gov.ca.gov/wp-content/uploads/2022/07/07.22.2022-Governors-Letter-to-CARB.pdf?emrc=1054d6>)

³ CARB LCFS Data Dashboard (<https://ww2.arb.ca.gov/resources/documents/lcfs-data-dashboard>)



Solutions Act, Assembly Bill 32 (“AB32”), directs CARB to achieve maximum technologically feasible and cost-effective GHG emissions reductions, and Assembly Bill 1279, signed into law in September 2022, requires the state to achieve net zero GHG emissions as soon as possible and to achieve and maintain net-negative emissions thereafter.⁴

California should maintain its clean energy market and climate change policy leadership position. It can do so by setting strong new CI reduction targets that maximize GHG reductions from transportation fuels in line with State policies.

RECOMMENDATION 2 – IMPLEMENT A RATCHET SYSTEM TO IMPROVE MARKET RESPONSE, CONFIDENCE IN PROGRAM

Amp supports the creation of credit-price-band mechanisms in tradeable environmental credit markets—both generally and as preliminary discussed by stakeholders at recent workshops. Such features can increase investor certainty in credit markets and support project development. We encourage CARB to evaluate and propose potential ratcheting mechanisms that would automatically strengthen CI reduction targets should market conditions warrant. Coupled with the existing cost-containment mechanism in the program, this addition would bolster market confidence and program strength by providing increased investor certainty in both higher and lower price ranges of the LCFS credit market.

However, Amp encourages CARB and stakeholders to consider this as an additional and distinct element of the program, separate from strengthened CI targets in-line with State goals. Baseline targets should align with State goals and a ratcheting mechanism should support those goals through improved program design, while supporting additional GHG reductions where feasible and cost effective. Therefore, in addition to tightening the stringency of the LCFS to achieve a minimum 35% CI reduction by 2030, CARB should initiate work with stakeholders to develop a feature that dynamically responds in the event of future sustained and significant CI target reductions by further tightening the stringency. For example, a mechanism such as the one we are proposing might work by resetting the upcoming year’s and subsequent years’ CI targets lower (i.e., more stringent) should actual CI delivered by the market exceed targets for 4 consecutive quarters.

RECOMMENDATION 3 – CARB SHOULD MAINTAIN AVOIDED METHANE CREDITING (SUPPORT FOR APPROACH IN ALTERNATIVE C)

The LCFS is one of the world’s most powerful programs for achieving methane reductions, especially from the agricultural sector. A large part of this success is tied to avoided methane crediting as part of lifecycle GHG emissions accounting for biomethane pathways. This accounting is both scientifically accurate and has been proven successful at supporting project development and significant methane reductions. CARB should maintain its current practice of accounting for avoided methane emissions associated with projects to avoid disrupting the market and ongoing project development and operation.

⁴ https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB1279



For decades, deployment of anaerobic digestion at California farms was stalled. Prior to the LCFS program just a handful of digesters had been developed, and among that group of digesters, some had been developed and subsequently shut down due to high costs and insufficient revenue. Methane emissions from the agricultural sector continued largely unabated. Following development of CARB's Short Lived Climate Pollutant Strategy and the addition of avoided methane crediting in the LCFS, however, projects have rapidly developed, with significant methane and carbon dioxide emissions reductions. Whereas California previously had just a handful of dairy digesters, there are now an estimated 206 digester projects in the state,⁵ all of which have been developed relying on avoided methane accounting in the LCFS.

The proposed changes to avoided methane crediting in alternatives A and B have already stopped new projects from being developed both inside California, as well as nationally, due to uncertainty and "stroke of the pen" risk. Financing decisions and support for methane reduction-to-RNG projects require policy certainty, and markets will fail to attract new investment if regulators propose a new framework that invalidates emissions benefits and deters new projects.

Dairy digester projects cost tens to hundreds of millions of dollars to develop and years (e.g. 2-6 years) to develop and construct. Financing costs, and therefore total project costs, are tied to the stability of ongoing revenue streams. Limiting the availability of methane crediting will eliminate the possibility to obtain private capital to finance future projects. Amp recognizes that the proposal in Alternatives A and B to limit avoided methane crediting is well-intentioned to try to accelerate California project development, however, it would have the opposite effect. Amp strongly encourages CARB to maintain avoided crediting under the LCFS for the duration of the program, and to immediately, forcefully, and publicly signal its intent to do so.

RECOMMENDATION 4 – CARB SHOULD MAINTAIN CURRENT TREATMENT OF BOOK AND CLAIM ACCOUNTING FOR BIOGAS (SUPPORT FOR APPROACH IN ALTERNATIVE C)

Amp does not support the book and claim assumptions that were set forth in Alternatives A and B during the workshop and encourages CARB to maintain current treatment of book and claim, as proposed in Alternative C. California imports almost all its fossil natural gas,⁶ and any biomethane injected into a pipeline system under the LCFS serves to displace fossil natural gas that otherwise would be imported into the State. The North American natural gas grid is interconnected and distinct from the isolated western electricity system, and CARB should not equate the two for the sake of book and claim accounting.

California relies on imports for most of its energy use, including 25% of electricity,⁷ 70% of crude oil,⁸ 90% of fossil natural gas and 90% of biofuels.⁹ The state will continue to rely on imported energy to

⁵ https://www.dairycares.com/files/ugd/e8c369_b8e47af9d6e04bd4a417bb66f5825260.pdf

⁶ According to the California Energy Commission, "California continues to depend upon out-of-state imports for nearly 90 percent of its natural gas supply..." <https://www.energy.ca.gov/data-reports/energy-almanac/californias-natural-gas-market/supply-and-demand-natural-gas-california>

⁷ <https://www.eia.gov/todayinenergy/detail.php?id=46156>

⁸ <https://ww2.arb.ca.gov/resources/documents/lcfs-crude-oil-life-cycle-assessment>

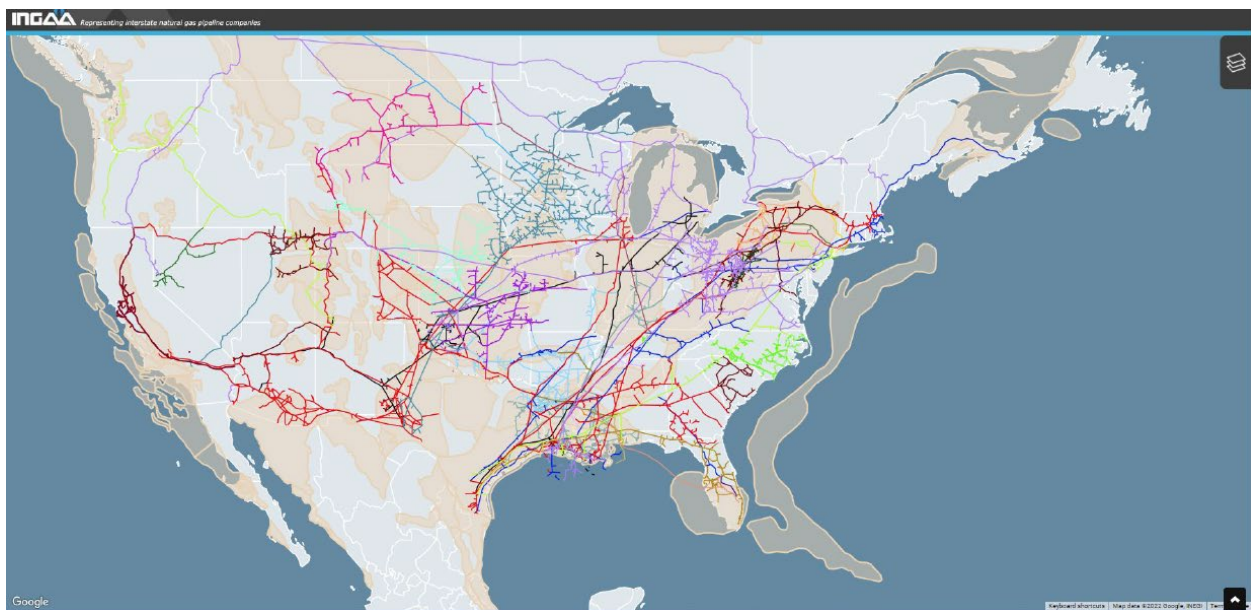
⁹ <https://ww2.arb.ca.gov/sites/default/files/2022-09/fig10.xlsx>



meet its energy requirements, even as the state transitions to clean energy, and restricting access to imported biomethane is simply a commitment to increased use of imported fossil natural gas. CARB should not treat RNG less favorably than fossil natural gas.

The North American gas system is highly interconnected, unlike the isolated electricity grids that populate the continent. According to the United States Department of Energy (“DOE”) Alternative Fuels Data Center, the U.S. has a “vast natural gas pipeline system, which can quickly and economically distribute natural gas to and from almost any location in the lower 48 states.”¹⁰ As shown in Figure 1, the Interstate Natural Gas Association of America (“INGAA”) map shows that there is no “western” network, but rather, a broadly interconnected North American network. In contrast to the physical limits on the Western power grid, pipeline capacity availability and directional flows on the system allow gas to flexibly move from sources of supply to demand. Concerns about deliverability and additionality that may apply to renewable electricity production outside of California or the western electricity grid do not translate to biomethane supplies.

Figure 1 - INGAA Interstate Pipeline System



Interstate pipelines already import natural gas from throughout North America to California end users, using similar methods for tracking gas transmission as those in the LCFS program. The North American gas market is robust and liquid, supporting physical gas deliveries across the continent. It optimizes moving gas from supply to demand in a least cost (and lowest GHG) fashion, as moving gas unnecessarily requires additional energy and emissions from compression stations and potential methane leakage. The conventional gas market long ago created trading hubs and flexible receipt and delivery points to give customers a variety of options in the market. These systems already work well for

¹⁰ https://afdc.energy.gov/fuels/natural_gas_distribution.html



natural gas supplies across the continent and in the LCFS, and they should continue to be leveraged to cost effectively and efficiently support decarbonizing California gas end uses.

The current book and claim system in the U.S. is working, and book and claim accounting is the widely accepted industry standard that allows sources of RNG to be matched to demand. Just as renewable electrons on the electricity grid cannot be separated from other electrons, once RNG is intermingled with fossil gas in the pipeline system, it cannot be physically separated from the other molecules. Chain-of-custody methods, such as book and claim, are needed to guarantee the origin of RNG. Book and claim was pioneered in the European Union to support its renewable fuel policies. It currently works for the LCFS, too, along with other renewable fuel programs throughout North America, including the federal Renewable Fuel Standard, Canadian Clean Fuel Standard, Oregon Clean Fuel Standard, Washington Clean Fuel Standard, and gas utility procurement programs throughout the country.

RECOMMENDATION 5 – CARB SHOULD INCORPORATE THE LATEST SCIENCE AROUND GWPS

The LCFS and success of CARB’s programs is premised on accurate accounting of greenhouse gas emissions. This foundational principle suggests CARB should both continue to account for avoided methane emissions as well as continually update the California GREET (“CA-GREET”) model and CARB’s Tier 1 Simplified CI Calculators to always reflect the latest science.

One key variable to update is the GWP of various greenhouse gas emissions, including methane. CARB currently utilizes GWP values from the 15 year old Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change, which includes a 100-year GWP for methane of 25. However, the most recent scientific consensus, as reflected in AR5 and the forthcoming AR6, suggests the 100-year GWP is 27-30 (Table 1).¹¹

Table 1- 100-year GWP values

	GWP values for 100-year time horizon			
	Second Assessment Report (SAR) (1995)	Fourth Assessment Report (AR4) (2007)	Fifth Assessment Report (AR5) (2014)	Sixth Assessment Report (AR6) (preliminary)
Carbon dioxide (“CO ₂ ”)	1	1	1	1
Methane (“CH ₄ ”)	21	25	28-34	27-30
Nitrous oxide (“N ₂ O”)	310	298	265-298	273

CARB should update accounting in the CA-GREET model and Tier 1 Simplified CI Calculators to reflect the latest scientific consensus and accurate accounting of the climate benefits and impacts associated with transportation fuel pathways. Updating GWPs in the CA-GREET model, Tier 1 Simplified CI Calculators, and LCFS does not need to disrupt other programs or the State’s GHG inventory, which should be updated based on their own programmatic timelines and set of considerations. However, for the LCFS, where a market is created based on precise lifecycle emissions accounting, emissions accounting should

¹¹ <https://www.epa.gov/ghgemissions/understanding-global-warming-potentials>



be consistently updated to reflect the latest science, and the forthcoming program amendments offer an appropriate time to update GWP values.

Finally, given the urgency of climate change and the potent, near-term impacts from methane and other SLCPs, Amp supports consideration of transitioning to 20-year GWP accounting in the LCFS, rather than the current 100-year accounting. This change would reflect the increased impacts of SLCPs over the near term and serve to further reduce those impacts – delivering critical, immediate climate benefits that may help avoid or delay potential “tipping points” and many of the worst impacts of climate change. Whether CARB considers changing to 20-year GWPs or not, the program should at a minimum be updated to incorporate the latest understanding of methane’s climate impact.

RECOMMENDATION 6 – AMP SUPPORTS OTHER PROPOSALS IN THE WORKSHOP

Amp supports other proposals discussed at the workshop, including adding intrastate fossil jet fuel as a deficit generator. Conventional jet fuel and aviation gasoline, both important transportation fuels, are currently exempt from the LCFS Regulation, per Section 95482(c)(2). Currently, only alternative jet is included in the Regulation as an opt-in fuel. The Scoping Plan includes a focus on phasing down petroleum demand, refining, and transitioning to sustainable aviation fuels. Incorporating jet fuel into the program as a deficit generator will support these goals, as well as additional GHG reductions in the State.

CLOSING

Amp supports CARB’s ongoing evaluation of appropriate changes to strengthen the program and align it with State goals and looks forward to continued engagement with CARB and stakeholders throughout the rulemaking process. To support these ongoing evaluations, Amp also encourages CARB to consider additional RNG-related topics in future workshops, including broader uses of RNG to replace fossil fuels in refining and other fuel pathways, the use of off-site renewable energy in RNG production, and CCS.

Amp further supports the comment letters that the Coalition for Renewable Natural Gas (“RNG Coalition”) and American Biogas Council (“ABC”) have submitted regarding the LCFS Workshop.

Amp appreciates the opportunity to respond to the LCFS November 2022 Workshop and thanks CARB for its continued leadership in the program and globally.

Sincerely,

Grant Zimmerman

Grant Zimmerman
CEO
Amp Americas



APPENDIX

ALIGNING RNG DEVELOPMENT AND USE WITH SCOPING PLAN AND STATE GOALS

CARB recently approved the Final 2022 Scoping Plan, setting unprecedented goals for the state. The plan provides a roadmap for achieving 85% reduction in sources of greenhouse gas emissions and carbon neutrality by 2045. CARB staff also recently clarified its objectives around RNG development and some of the proposals included in Alternatives A and B during the November 9 workshop. Amp appreciates this further clarification, including the FAQ released subsequent to the workshop, and ongoing engagement on these topics. This Appendix includes additional perspective on the RNG industry and its alignment with State goals and CARB's objectives.

Amp understands the State's climate objectives related to RNG to center around three main themes, including delivering on California's climate goals, driving private investment in service of California's climate goals, and maximizing impact by coordinating policy efforts with other jurisdictions. Implicit in these themes are simple statements about what is required for the industry to support California's climate goals, which are explored in further detail in the sections below:

1. RNG is critical for achieving California's climate goals.
2. Decarbonization requires private capital.
3. CARB policy has impact far beyond California.

1. RNG IS CRITICAL FOR DELIVERING ON CALIFORNIA'S CLIMATE GOALS

Achieving Carbon Neutrality, State Climate Goals, and Resulting LCFS Targets

RNG provides two benefits that are critical for advancing CARB's goals. RNG prevents methane from being emitted into the atmosphere and it displaces the use of fossil fuels. RNG producers have doubled their contribution to LCFS credit generation over the last several years to approximately 15% of all credits generated. This has occurred due to policy signals and financial incentives that allow the industry to raise and deploy the significant amounts of capital required to convert agricultural waste into biomethane for beneficial use.

It is important to emphasize that preventing methane emissions from dairy waste will always require financial incentives for avoided emissions. Dairy RNG projects are much more decarbonization projects than they are energy production projects. While they offer some of the most cost-effective GHG benefits, on a per-unit of energy basis, they are expensive to build and expensive to operate. The recent success that LCFS has had in terms of reducing methane emissions at dairies is entirely the result of financial incentives for methane avoidance.

Capturing More Methane in California by 2030 and Meeting SB 1383 Targets

Senate Bill 1383 ("SB 1383") established methane reduction targets, including a reduction in statewide methane emissions of 40 percent below 2013 levels and an equivalent methane emission reduction target for the dairy and livestock sector by 2030. It also explicitly highlights the importance of biomethane and biogas development in achieving these goals and directs agencies to consider and



adopt policies to significantly increase the sustainable production and use of biomethane. CARB further emphasized the importance of dairy RNG in achieving these goals in its Analysis of Progress toward Achieving the 2030 Dairy and Livestock Sector Methane Emissions Target dated March 2022 (“Dairy Analysis”). CARB’s Dairy Analysis recommends that at least an additional 210 anaerobic digestion projects be developed in California to achieve the remaining 4.4 million MTCO_{2e} in methane reductions.

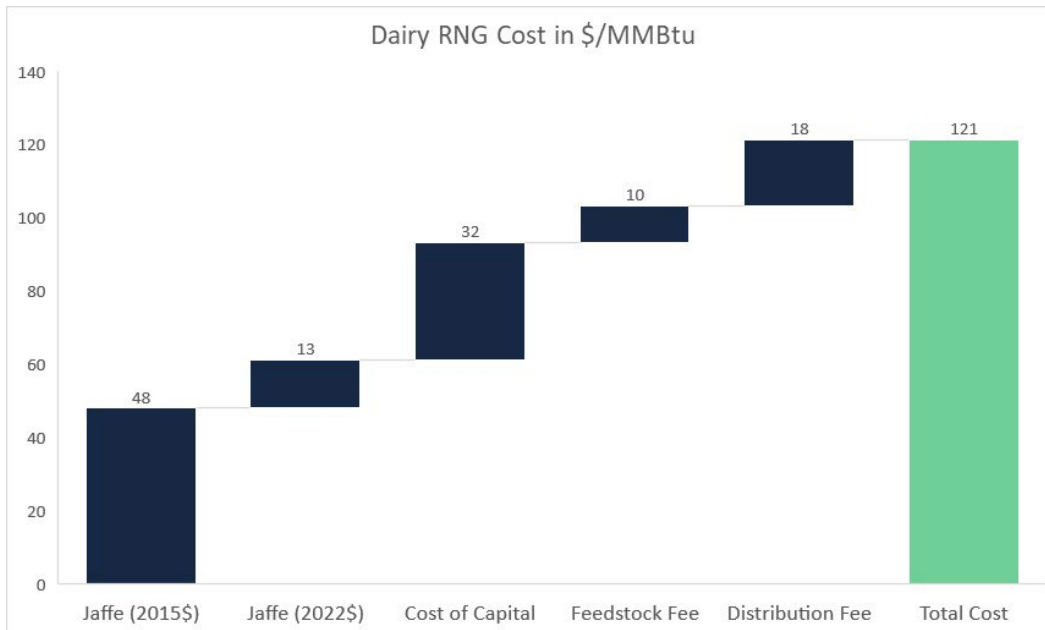
To achieve these methane reductions, there must be permanent policy support that incentivizes methane reduction. Dairy RNG is a very expensive source of energy, but it should also be appreciated that dairy RNG is one of the lowest cost methods for reducing methane emissions available today. Additionally, McKinsey expects that dairy RNG will continue to be one of the lowest cost sources of carbon abatement indefinitely.¹²

In *The Feasibility of Renewable Natural Gas as a Large-Scale, Low Carbon Substitute*, Jaffe analyzed cost curves for producing RNG from various feedstocks in California. This study supports the conclusion that dairy RNG projects are very expensive per unit of energy. The study estimates that at current dairy RNG production of approximately 4.5 bcf per year in California, marginal dairy RNG cost of production is approximately \$48 per MMBtu (in 2015 dollars).

Bridging from \$48 per MMBtu to current actual costs requires several modifications to model assumptions and output. After modifying these assumptions (listed below), Jaffe’s required cost to increase dairy RNG production in California from the current location on the supply curve is \$121 per MMBtu. Note that this analysis does not attempt to quantify capital efficiency gains so \$121 per MMBtu is likely to overstate cost for some projects.

1. The 2015 cost per MMBtu needs to be inflated to 2022 dollars. The Consumer Price Index increased 27% from January 2015 to November 2022.
2. Jaffe assumes 12% cost of capital in a world “where investments in infrastructure are operating under certainty of prices for products.” This is far from the case for dairy RNG projects, and the actual cost of capital given current price volatility and policy uncertainty is approximately double.
3. Jaffe assumes that farmers are financing their own dairy RNG projects. This is rarely true. In practice, feedstock fees range from 5-10% of revenue at the revenue value indicated by this study.
4. Jaffe omits costs for distributing RNG. RNG project owners must pay a distribution fee to the RNG marketers, CNG station managers, and fleets that all must work together to get RNG into fuel tanks so that it can generate credits.

¹² <https://www.mckinsey.com/capabilities/sustainability/our-insights/curbing-methane-emissions-how-five-industries-can-counter-a-major-climate-threat>



Achieving this price for California dairy RNG projects could require placing a premium on the avoided emissions credit that California dairy RNG projects earn, and it will require additional market access for RNG. However, concepts like these should only be considered as additive to the price and market access available to RNG projects outside of California. This is because price is only one of many signals required to compel development and it will always be evaluated in the context of risk to realizing that price. New projects will not get built and new markets for RNG will not develop if prior projects and prior RNG supply agreements that were executed on the expectation of policy stability are compromised.

Removing Barriers to Achieving More Methane Capture in California

California RNG projects are difficult to execute and require more incentives than projects in other parts of the United States. California has some of the most stringent air permitting regulations in the nation, and interconnects with California utilities are hard to come by and expensive. The success that dairy RNG developers have had in California has required grant funding, in addition to the combination of LCFS and RFS credits that projects outside of California also depend on. CARB should consider amplifying the benefits that accrue to California-based dairy RNG projects to overcome the barriers that make California dairy RNG projects difficult to execute.

For CARB to achieve its dairy methane reduction goals, California dairy RNG projects must either be eligible for additional incentives that offset the frictions that make these projects so challenging, or these frictions need to be removed. Since time is of the essence, CARB should focus its resources on what has worked in the past, which is making California projects eligible for additional incentives. CARB must then consider whether it is more likely to be successful in achieving its dairy methane reduction goals with public funding or private funding. It is only reasonable to assume that private funding must be part of the answer, which should force a deep appreciation for the policy stability and price signal that private capital providers will require to deploy capital.



Displacing Fossil Fuels Includes Use of Biomethane

The CARB Scoping Plan calls for a reduction of fossil fuel consumption by 94%, and specifically calls for the use of biomethane to replace fossil natural gas in hard to electrify sectors:¹³

The major element of this unprecedented transformation is the aggressive reduction of fossil fuels wherever they are currently used in California, building on and accelerating carbon reduction programs that have been in place for a decade and a half... It also means scaling up new options such as renewable hydrogen for hard-to-electrify end uses and biomethane where needed.

RNG is an available renewable energy source that can replace fossil natural gas in a wide variety of applications using existing infrastructure. In addition to fueling heavy duty fleets, RNG can be used as feedstock for hydrogen production, renewable energy for hard to abate industrial processes, and it can support electrification of transportation by displacing fossil gas in combined cycle power plants. The Scoping Plan specifically calls for biomethane use and Amp urges CARB to think broadly about the potential ways in which dairy RNG can contribute to the State's goals.

Once RNG is injected into the pipeline, which is increasingly the industry practice inside and outside of California, it can be directed to any sector where it is needed. As CARB continues to evaluate policies to decarbonize industry or other sectors, including through the increased use of RNG, it should continue supporting development of RNG projects and associated RNG supplies, which can be shifted away from the transportation sector to the industrial sector whenever market or policy signals warrant.

DECARBONIZATION REQUIRES PRIVATE CAPITAL

Attracting and Maximizing Private Investment in California

The LCFS program is one of the most effective methane reduction programs in the world. To build on this success and accelerate private investment in California dairy RNG projects, CARB must build on what has worked for the LCFS program to date. CARB has created an industry around methane reduction and achieved success that has the potential to snowball into additional, non-linear success.

There are at least three key assets CARB possesses that it can use to position its policy objectives as uniquely financeable for private investors in California RNG projects:

1. CARB policy has grown the RNG industry to a size that is in a sweet spot for attracting investment right now. The industry is large enough to attract institutional investment, but the addressable market remains massively larger, allowing room for tremendous growth opportunities.
2. CARB has generally created the perception of policy stability, which has enabled institutional capital investment. The recent workshop disrupted that perception significantly in the RNG industry, but we are optimistic that CARB will continue to actively engage stakeholders and

¹³ Scoping Plan, pg. 2. <https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp.pdf>



work through the process to repair investor confidence, raise prices, and maintain policy stability.

3. CARB can create new incentives and alternative end uses for RNG, including in the industrial sector.

Avoiding Stranded Assets

If CARB does not allow dairy RNG projects to receive benefits for the avoided emissions they achieve, or limits eligibility to use book and claim, consequences for the industry will be swift and severe. No new dairy RNG projects will materialize. Existing assets will stop operating. And methane emissions from dairy farms that were previously captured and converted for beneficial use will revert to being vented to the atmosphere.

These outcomes are inevitable because capital markets move quickly in their assessment of risk, and dairy RNG projects require significant capital to build and ongoing revenue to operate. The dairy RNG industry grew rapidly on the premise that there was a stable policy framework that would support efficient and critical GHG reductions. Without the ability to generate revenue for methane reductions, dairy RNG projects cannot exist.

SUPPORTING CLIMATE BENEFITS AND ACTION BEYOND CALIFORNIA'S BORDERS

Capturing as Much Methane as Possible, Regardless of Location

Methane has more than 80 times the warming power of carbon dioxide over a 20-year period and is responsible for approximately 30% of global warming since the industrial revolution. Per the United Nations, "if the world is to achieve the 1.5°C temperature target, it must make deep methane emission reductions."¹⁴ The UN Environment Programme's 2021 *Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions* states:

Reducing human-caused methane emissions is one of the most cost-effective strategies to rapidly reduce the rate of warming and contribute significantly to global efforts to limit temperature rise to 1.5°C. Available targeted methane measures, together with additional measures that contribute to priority development goals, can simultaneously reduce human-caused methane emissions by as much as 45 per cent, or 180 million tonnes a year Mt/yr, by 2030.¹⁵

The good news is that with the LCFS program, CARB has successfully created and executed a program that is very effective at reducing livestock-based methane emissions both inside California and beyond its borders. Amp estimates that the replacement cost of currently operating dairy RNG projects in the United States is approximately \$3.6 billion. Of this \$3.6 billion, \$1.2 billion of dairy RNG projects are in California and \$2.4 billion are outside of California. This is based on a bottom up dairy RNG project

¹⁴ <https://news.un.org/en/story/2021/10/1104492>

¹⁵ UN Environment Programme, *Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions, dated 2021* (<https://www.unep.org/resources/report/global-methane-assessment-benefits-and-costs-mitigating-methane-emissions>)



analysis that estimates total current dairy RNG production at 13 bcf per year and carbon impact at 4 million metric tons per year. In other words, California is getting 2.7 million metric tons of carbon impact per year from outside California dairy RNG projects worth \$2.4 billion at no direct cost to California taxpayers.

Anticipating Complementary State and Federal Policy and Align on Cross-Border GHG Accounting

CARB has created a model for successful decarbonization policy with its LCFS program that other state and federal policymakers are following and building upon. Oregon and Washington's low carbon fuels programs will inevitably look a lot like CARB's LCFS program. The Set Rule for the EPA's Renewable Fuels Standard creates a framework for book and claim use of energy from RNG to produce electricity to charge EVs. The cellulosic RIN generated by this pathway will accelerate production and adoption of EVs in California and beyond. The Inflation Reduction Act of 2022 ("IRA") includes a provision that incentivizes the production of ultra-low CI RNG and adds further incentives for use of RNG in the production of low CI hydrogen.

The result that policy makers are driving towards with these policies is decarbonization with an emphasis on methane reduction. Tackling climate change and methane emissions represents a massive challenge that requires maximum policy impact both inside and outside California. To achieve this, decarbonization policies must exist in harmony with one another, and CARB should focus on economy-wide, performance-based policies that align with federal programs and support the widest array of emissions reductions activities.

CARB should leverage the successful model it has created, including avoided emission crediting and low friction delivery via book and claim, to promote similar policy in other forums. Success in the State could create markets for RNG in hard to abate industrial processes, low CI electrification, and building heat that would collectively dwarf RNG demand for transportation in California. Success in even one alternative end market would create a pull on dairy RNG that would make an engineered push unnecessary.

However, this can only occur if policy is aligned around permanent eligibility for avoided emissions crediting and book and claim delivery. Maximum success can only occur if RNG is fungible across many markets just like natural gas is today.

ACHIEVING CALIFORNIA'S CLIMATE OBJECTIVES

CARB deserves credit for creating a decarbonization policy in the LCFS that has wildly outperformed its objectives. This is even more impressive given the breadth of industries covered by the LCFS program, the size and complexity of California's economy, and the magnitude of the decarbonization challenge that CARB is addressing.

It is critical to reflect on what is unique about CARB's LCFS program that has made it so successful at reducing emissions. It is just as critical to protect these unique policy features and build on them. In fact, this is the only way for CARB to maximize its impact and deliver the results that California and the rest of the world need in order to reduce emissions and minimize the damage caused by climate change.



As a company that has been part of the LCFS program's success, Amp's conclusion is that private capital is the differentiating factor that has enabled the LCFS program's success. Amp fully acknowledges that private capital is only one item that sits on a long list of necessary, but not sufficient conditions for success. But private capital sits at the end of this list and has the power to either enable or prevent success.

In the case of the LCFS program, private capital providers made the decision to invest in CARB's policy objectives because CARB presented a stable, market-based policy for pricing carbon reduction. Dairy RNG projects are a capital efficient means to reduce methane emissions, which is a goal that investors have enthusiastically backed. CARB signaled stability on an ongoing basis by emphasizing the importance of reducing SLCPs like methane in its Scoping Plans and other policy updates.

As the LCFS program proved that a stable, market-based carbon reduction policy could be successful, other policymakers and private industry took notice and began to follow. With the LCFS program, CARB built a model that spawned a private industry. This private industry has tremendous opportunity to grow, increasing impact by reducing methane emissions from other feedstocks and by delivering these avoided emissions for beneficial use in a myriad of hard to abate sectors that need decarbonization tools.

None of this can happen if CARB destroys what it has built. Limiting avoided emissions crediting or limiting book and claim for delivery of RNG would permanently halt RNG project development and undo the positive impact CARB has had. Amp urges CARB to protect what it has built and continue to serve as a model for public policy in which private capital can invest.