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December 9, 2022

California Air Resources Board
1001 I Street
Sacramento, CA 95814
Via Online Submission

Comments on November 9, 2022 Workshop LCFS Regulation

Dear California Air Resources Board (CARB) Low Carbon Fuel Standard Program Staff:

Thank you for the opportunity to provide comments in response to the "Low Carbon Fuel Standard Public Workshop" held November 9, 2022. We appreciate CARB hosting this workshop.

Oberon is pleased to be able to provide comments on several areas of LCFS policy. We will also summarize our prior remarks.

As background, Oberon is an innovative California company founded in San Diego 12 years ago with a focus on decarbonizing the global LPG/propane industry while laying the foundation for green hydrogen. We are accomplishing this today by producing renewable dimethyl ether (rDME) at our Brawley, California production facility. rDME can be made from various in-state waste streams (*e.g.*, dairy manure biogas), which can enable smaller, often stranded, biogas suppliers to participate in the LCFS program, thereby creating commercial opportunities under the program, avoiding wasteful non-fuel uses of low carbon feedstocks and providing similar or reduced greenhouse gas emissions for the DME lifecycle.[1] rDME can reduce the carbon footprint of transportation when used as a: 1) blending agent with Liquid Petroleum Gas (LPG)/propane; 2) hydrogen carrier to power the growing fuel-cell electric vehicle market; and 3) diesel substitute.

Responses to November 9 Workshop Presentation

Additional Feedstocks - Poultry Manure: The CARB staff presentation of the CATs model invited comment on additional feedstocks that might be included. Oberon notes that we are considering poultry manure as a potential feedstock and that we believe it will meet the significance threshold for inclusion.

[1] The California Air Resources Board has estimated dairy biogas-based DME made by the Oberon process has a carbon intensity of -278.

According to ATiP[2] data there are 247 poultry operations in California with 83 million chickens. While site specific practices vary, many of these farms currently use lagoons to store manure, resulting in emissions similar to those from unabated dairy and swine operations. Typically poultry manure holds twice the biogas potential of dairy manure. Eighty-three million chickens will produce about 3 million tons of manure per year, which would be able to create 91 million British Thermal Units (mmbtu) of usable biogas. Future projects that capture biogas produced by poultry manure would be consistent with existing state policy and are a significant opportunity to reduce methane emissions, displace petroleum, and support the ambitious path for greenhouse gas emission reductions presented in the 2022 Scoping Plan.

Protocols and Data

The LCFS permits an avoided emissions credit for RNG produced from dairy and swine manure. That's because CARB uses the Livestock Offset Protocol (the "LOP") to specify the types of livestock manure that can obtain the AEC. However, the LOP was first adopted by CARB in 2011 for California Cap-and-Trade as a cost containment mechanism. That regulation's caps on the use of offset credits created pursuant to the LOP inherently limits the potential for investment in these projects. The LCFS serves a fundamentally different purpose – it specifically creates a market mechanism to incentivize carbon emission reductions, without bias as to the type of fuel or feedstock. There is no legal, regulatory or policy requirement for CARB to be bound by the Cap-and-Trade's LOP in determining which types of livestock manure can obtain an avoided emissions credit. See Appendix A to this comment that reprises our comments to the August 18 workshop discussing application of 17 CCR 95488.9(f).

The LOP uses methane conversion factors taken from Chapter 10 of the 2006 Intergovernmental Panel on Climate Change ("IPCC") entitled *Emissions from Livestock and Manure Management* ("Chapter 10"). Section 10.4 of Chapter 10 (pp. 35 – 52) provides these factors for many types of livestock in addition to dairy and swine, including poultry (both layers and broilers) and beef cattle.

Given that we have a California industry currently responsible for substantial methane emissions stored in uncovered lagoons and given that we have the methane conversion factors for poultry manure from the IPCC, it makes sense for CARB to amend the LOP (or create a separate LOP for the LCFS) in which poultry manure can obtain avoided emission credits.

Staff Scenarios

[2] http://atipfoundation.com/

Oberon supports CARB's efforts to present scenarios considering various combinations of policy changes to the LCFS including significantly increasing the stringency of the program as well as incorporating a dynamic feature in the regulation that triggers additional tightening of the carbon intensity standards in event of sustained overperformance to ensure emission reductions are not left on the table. Specifically, Oberon continues to support the most aggressive greenhouse gas reductions possible and therefore favors the Alternative C target. Alternative C would result in faster near-term greenhouse gas emission reductions, which is critically important to bend the emissions curve and avoid locking in long-term warming impacts. Alternative C will also help ensure that the program does not become a victim of its own success, with near- and longer-term investments in low carbon fuels at risk due to the depressed LCFS credit values arising from the currently abundant credit "bank".

Biomethane Crediting

Inclusion of avoided methane emissions is foundational to the long-standing design of the LCFS as it is scientifically robust and subject to extensive pathway documentation that is publicly vetted. Changing direction on this longstanding principle is not warranted.

As Oberon wrote in our comments to the July 7th LCFS workshop, there exists an interplay between the Short-Lived Climate Pollutants Program (SLCPP) regulations and the LCFS. To the maximum extent possible, CARB should harmonize the SLCPP's regulations to support further use of the LCFS to reduce methane emissions. These two programs can complement each other to incentivize the fastest, most economic, and equitable environmental outcomes.

It appears on slide 30 of the November 9th staff presentation that CARB is doing the hard work to find a regulatory structure that achieves this harmony. Oberon believes CARB outlined the right goals on slide 30 that reflect a thoughtful consideration of the issues. All three alternatives on slide 31 are an improvement to the uncertainty of the status quo. All three provide some extended certainty to project developers that through at least 2030 avoided emissions projects will be able to monetize their positive environmental impact via the LCFS. We are thus generally supportive of the direction of CARB in updating the avoided methane provisions.

Oberon strongly urges CARB to make positive statements regarding supporting the development of projects with pathways whose CI scores reasonably reflect credit for avoided methane emissions. We strongly urge CARB to make full use of its regulatory discretion and the Tier 2 pathway process to evaluate and approve novel feedstocks and pathways that include avoided methane emissions, beyond

the specific requirements for dairy or swine manure digestion or organic material diverted from a landfill.

The LCFS can provide a market signal to help facilitate the long lead times necessary to invest in and build physical infrastructure in hard-to-decarbonize regions throughout California. Billions of dollars of additional investments are anticipated. However, preliminary signals at the workshop have created uncertainty that will likely stifle investments in clean fuels if not addressed. A regulatory structure that cuts off new projects – even in 2030 - will hinder deployment, send the wrong signals to critical private capital, and halt future innovation of business models that support both farmers and clean transportation. Of the alternatives, Alternative C provides the clearest policy signal to avoided methane emission projects.

We note that the scenario remains high-level and conceptual and suggest CARB consider the value of further nuance to the avoided emission requirements. Emissions from dairy and swine manure, and organic material diverted from landfill, are subject to other California statutory and policy considerations. Therefore the current LCFS provisions are necessary to ensure statutory alignment and to explicitly emphasize that such projects must be additional to any other legal obligations. For feedstocks other than dairy and swine manure and organic material diverted from landfill there is no need for regulatory harmonization, nor has the market yet begun to mature for reducing and avoiding methane emissions from these other sources, such as poultry manure. CARB should provide a longer runway (project starts through 2040) or no limit at all on avoided emissions for these opportunities.

Biomethane Crediting – Book and Claim

On slide 32 of the staff presentation CARB discusses potential changes to the Book & Claim rules. The proposed limitations on Book & Claim as suggested are problematic, out of step with historical precedent, and will chill investments that are leading to projects reducing millions of metrics tons of GHGs. Oberon is a supporter of Book & Claim, although our business model advantages us by moving physical molecules and is not generally reliant on the use of Book & Claim accounting to achieve low carbon fuel production. Our support is therefore because Book & Claim accounting is a powerful tool to help develop the renewable fuel market and decarbonize our future economy.

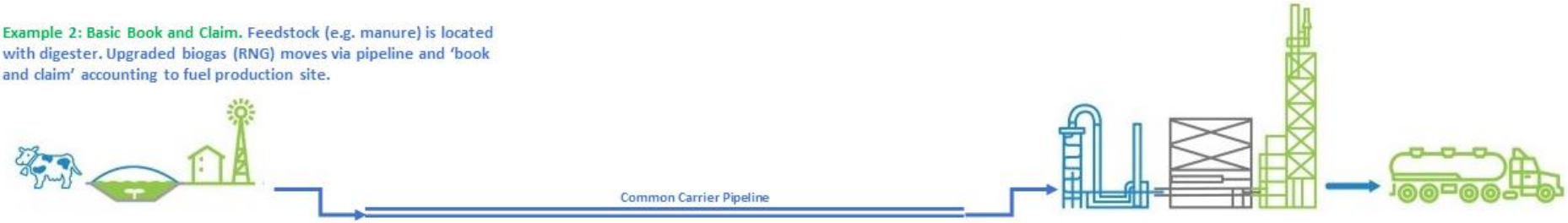
Biogas is a critical, limited, and renewable alternative to fossil natural gas, petroleum, and coal. Even if we seek to shrink the direct use of RNG in the transportation sector, rewarding and using fuel with progressively lower carbon intensity remains important. Oberon Fuels and many other market participants would expand the number of organic feedstock sources to produce a wider-variety

of biogas-based transportation fuels, thereby reducing overall carbon intensity of transportation and hard-to-decarbonize sectors, if the LCFS recognized book-and-claim use of renewable natural gas: 1) produced from a wide variety of methane-mitigating waste streams; and 2) used as a feedstock and/or process energy to produce any LCFS-eligible finished fuels (not just CNG or LNG).

Increased production of rDME and other fuels through Book & Claim pathways would directly support, sustain, and speed implementation of the Scoping Plan's strategies. As such, Oberon's position is to support Alternative C enabling all North American RNG projects to remain eligible for Book & Claim. For Alternative A and B, CARB is considering limiting Book & Claim to projects in the "Western NG network." A clearer understanding of the problem that concept is attempting to correct would be useful. This "Western NG network" remains undefined, but for CARB's consideration here are several hypothetical project structures for discussion. These figures illustrate how different pathways intersect with the Alternative scenarios as discussed at the workshop and could lead to perverse outcomes and incentives:

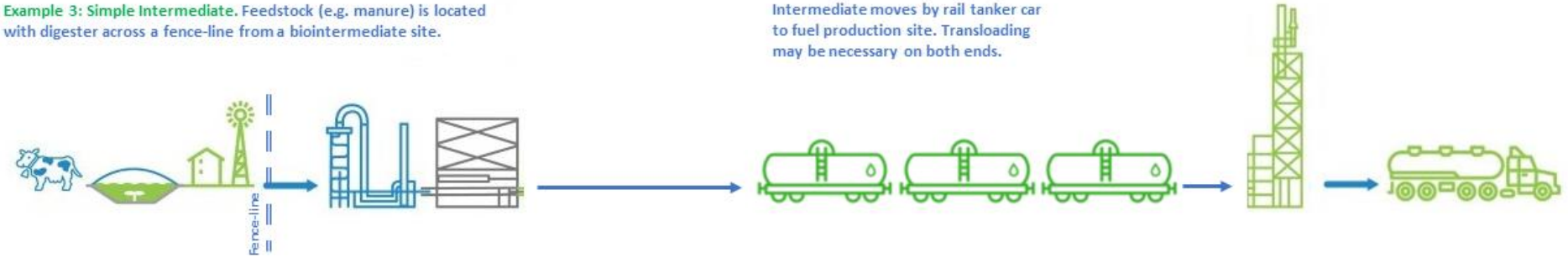
Example 1: Standard Model. Feedstock (e.g. manure) is located with digester across a fence-line from a fuel production site. Raw biogas moves across the fence via direct pipeline and/or dedicated truck.

Example 2: Basic Book and Claim. Feedstock (e.g. manure) is located with digester. Upgraded biogas (RNG) moves via pipeline and 'book and claim' accounting to fuel production site.



Example 3: Simple Intermediate. Feedstock (e.g. manure) is located with digester across a fence-line from a biointermediate site.

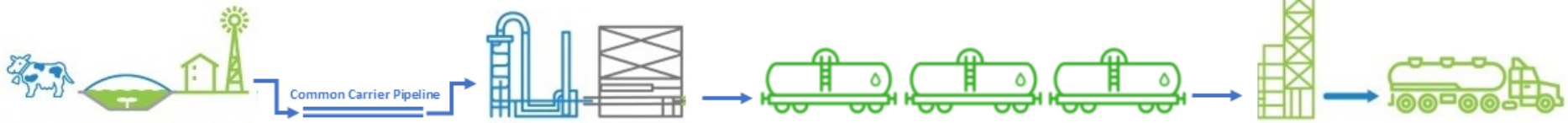
Intermediate moves by rail tanker car to fuel production site. Transloading may be necessary on both ends.



Example 4: Book and Claim + Biointermediate. Feedstock (e.g. manure) is located with digester. Upgraded biogas (RNG) moves via pipeline and 'book and claim' accounting to intermediate production.

The intermedate plant is a dedicated facility serving only this feedstock and offtake.

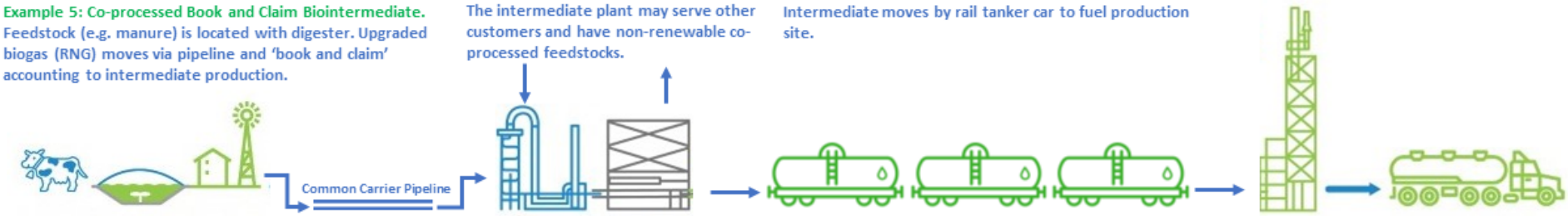
Intermediate moves by rail tanker car to fuel production site. Transloading may be required.



Example 5: Co-processed Book and Claim Biointermediate. Feedstock (e.g. manure) is located with digester. Upgraded biogas (RNG) moves via pipeline and 'book and claim' accounting to intermediate production.

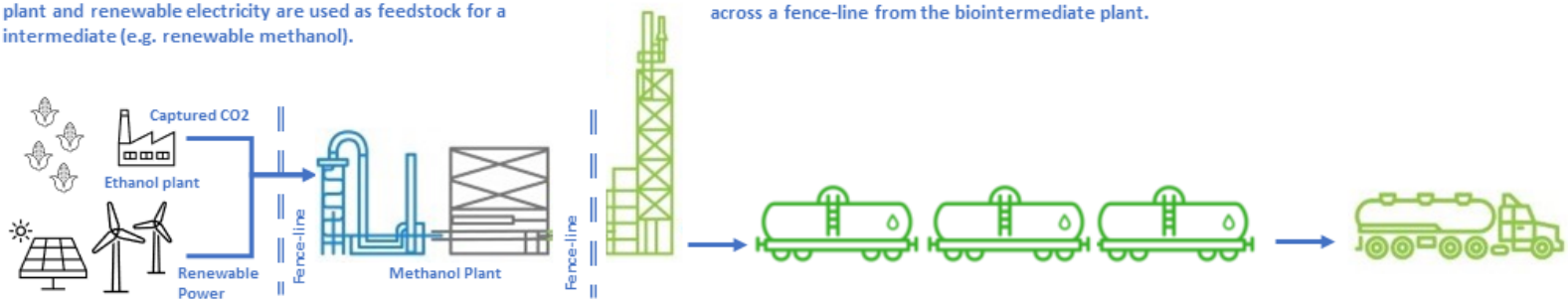
The intermediate plant may serve other customers and have non-renewable co-processed feedstocks.

Intermediate moves by rail tanker car to fuel production site.



Example 6: E-fuels. Captured biogenic CO2 from an ethanol plant and renewable electricity are used as feedstock for a intermediate (e.g. renewable methanol).

A fuel production site is either integrated into or located across a fence-line from the biointermediate plant.



Example 1 and Example 3 above are physically moving molecules from feedstock source to end market with full traceability and no Book & Claim issues.

Examples 2 and 4 grow more complicated depending on facility location:

Example 2:

RNG Source Location	DME plant location	End Market	Alt A/B Impact
West	West	California	Eligible
East	East	California	Ineligible
East	West	California	Ineligible
West	East	California	Unclear

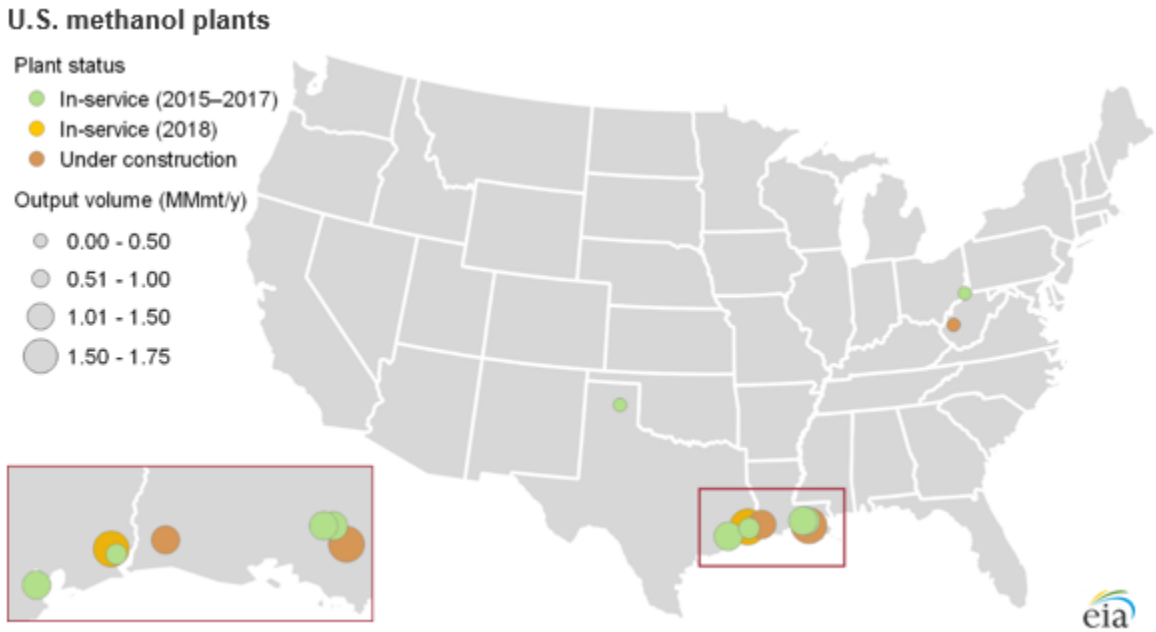
Example 4:

RNG Source Location	Intermediate Methanol	DME plant location	End Market	Alt A/B Impact
West	West	West	California	Eligible
West	West	East	California	Eligible
East	East	East	California	Ineligible
East	East	West	California	Ineligible
East	West	East	California	Ineligible
East	West	West	California	Ineligible
West	East	West	California	Unclear
West	East	East	California	Unclear

Example 4 is of special importance because it serves as a proxy for utilization of existing industrial infrastructure. To help anchor this concept let us consider a hypothetical fuel pathway. In eastern Texas an unabated dairy farm using lagoons for manure storage sits on a natural gas pipeline with direct connection to the industrialized gulf coast including a methanol plant (see map below of methanol plant locations). Today this methanol plant draws fossil natural gas off the pipeline and produces fossil methanol. An existing methanol-to-DME facility is in California. Absent a Book & Claim structure these facilities will operate in isolation. With a Book & Claim allowance the dairy will capture its emissions, the methanol facility will convert from a fossil feedstock to a renewable feedstock, and the DME facility can increase production of fuel in California. This can be done at lightning speed relative to large greenfield fuel production projects because the limiting factor is only construction of the digester and RNG injection. The economics benefit by using the existing fossil methanol asset. And the workforce benefits by a seamless conversion from fossil to renewable. Further, substantial costs, construction emissions, and risk are reduced by avoiding greenfield construction.

The Example 4 West-East-West case is even more compelling, where a California

located biogas source may contract with a gulf coast methanol plant for a Book & Claim production of renewable methanol used as an intermediate. The physical methanol is moved back to California and turned into rDME in the state for final use as a fuel.



Source: US Energy Information Administration https://www.eia.gov/todayinenergy/detail.php?id=38412

Example 5 introduces additional monitoring and reporting challenges, but nothing that is beyond existing practice.

Example 6 presents complications on the use of Book & Claim renewable power for the input to e-fuels, but should not be otherwise impacted by facility location.

There are also detailed questions to ask regarding the definition of the western natural gas network, the extent and direction of pipeline flows, and the importance of political (i.e., state) boundaries. EIA data shows the current California natural gas pipeline network to include large inflows from states as far east as Texas and Oklahoma via both the Transwestern Pipeline and the El Paso Pipeline.[3] Is there a different verification and validation challenge for facilities in California, Nevada, Colorado, or stretching east to Oklahoma? If a project in Montana is considered valid why not one in Texas? Will the political boundaries be determinative or will physical connection to a west-flowing interstate natural gas pipeline be required? If a project uses intermediate facilities on the gulf coast will east-flowing pipeline connections be required or if the feedstock source where the emissions reductions are occurring is in the "west" is that sufficient?

[3] https://www.eia.gov/naturalgas/archive/analysis_publications/ngpipeline/interstate.html

Oberon is concerned the approach in Alternatives A and B will be challenging to implement, negatively distorting of prices to consumers, and limiting to project development which in turn reduces the supply of renewable fuel and the avoidance of greenhouse gas emissions. We are also concerned that arbitrarily drawing the line between west and east will strand many otherwise viable assets and sharply reduce California's ability to leverage the existing industrial base and speed the renewable transition of labor and capital infrastructure.

Use of Biomethane in Hard to Decarbonize Sectors

All the feedstock and production pathways described above create opportunities to bring more rDME to market in California - using that biomethane in hard to decarbonize sectors through the unique value proposition of rDME. The first commercial entry to the California fuel market for rDME is blending into propane to reduce its carbon intensity in existing LCFS-eligible applications such as forklifts. There are other fuel applications in California to which CARB could extend the LCFS to cover that would quickly bring more rDME into the market. For example, there are many areas of niche value where DME's zero-soot clean burning properties are a value-add benefit, such as providing heat, power, and a clean CO_2 exhaust to greenhouses and grow houses. Also, there are broad categories and applications for DME that CARB could include, such as the following:

A rDME/propane blend:

- In agriculture including tractors, irrigation engines, heaters, frost protection/wind machines (mobile and semi-mobile)
- In power generation applications
- In entertainment and leisure, including small propane cylinder use for portable heaters and barbeques
- In residential and commercial applications such as cooking and home heat

Neat rDME:

- The applications noted above
- Diesel replacement for vehicles, generators, engines, and heaters
- Propane replacement for vehicles, generators, engines, and heaters

Expanding the LCFS to cover the above applications will reduce compliance complexity and help accelerate the market development of nascent fuels such as rDME. In general, such expansion will reduce complexity by capturing a larger share of end-uses that fuel dispensers may not currently track and reduce the use of non-renewable fuels in end uses without credit generating opportunities. With regards to rDME, expansion or other incentives would also support market

development because inclusion of more mobile and semi-mobile[4] sources under the program would provide mutual support to decarbonizing agricultural and industrial sectors with traditional vehicles. The relatively higher value of rDME and other nascent technologies to reducing emissions in, for example, portable heating, will support rapid deployment. This will drive down costs for widespread use in vehicles.

We support the recognition of low-carbon fuels as a tool to help decarbonize transportation, as well as all other fuel uses, including heating, agricultural, industrial, and power generation. We note that the success of the LCFS in reducing fossil fuel use in transportation is a function of strong financial incentives. We suggest CARB apply or adapt the LCFS structure to help facilitate use of biomethane as a feedstock for decarbonization of other gasoline-, diesel-, fossil natural gas-, and propane-fueled applications. Oberon believes that allowing users to receive credit for reducing the carbon intensity while using in-service equipment will help facilitate quicker emissions reductions, fossil fuel displacement, and market transformation. Again, taking opportunities to leverage existing infrastructure reduces costs, speeds uptake, and supports workforce transition.

Conclusion

While CARB's current approach is time and staff intensive, it has proven effective with the combination of flexible rules, project-by-project evaluation, and strong monitoring and validation. We reiterate:

- Our support for CARB's overall direction
- Specific support for Alternative C
- Inclusion of avoided emissions credits for projects starting through 2040
- Explicit support of avoided emissions for poultry manure projects
- Continued use of Book & Claim for projects nationally
- Expansion of the LCFS to cover more mobile or semi-mobile applications

Thank you for your time and consideration. Please do not hesitate to contact me at david.mann@oberonfuels.com with any questions.

Sincerely,

David Mann
Vice President, Regulatory and Government Affairs
Oberon Fuels

[4] Mobile sources include engines such as tractors while semi-mobile includes portable or towed engines such as frost protection devices.

APPENDIX A: EXCERPT OF OBERON FUELS RESPONSE TO AUGUST 18 CARB WORKSHOP REGARDING POULTRY AVOIDED EMISSIONS CREDITS

Oberon strongly urges CARB to remove any ambiguity in the current regulations that may restrain, if not prevent, the development of projects with pathways whose CI scores reasonably reflect credit for avoided methane emission. We strongly urge CARB to make full use of its regulatory discretion and the Tier 2 pathway process to evaluate and approve novel feedstocks and pathways that include avoided methane emissions, beyond the specific requirements for dairy or swine manure digestion or organic material diverted from a landfill.

Avoided methane emissions are tremendously important because they represent immediate and significant avoidance of potent methane greenhouse gas emissions that threaten to lock-in large warming impacts relative to similar quantities of CO_2. Staff should therefore invite and encourage applicants with avoided methane projects.

The current ambiguity stems from the rules as written in 17 CCR 95488.9(f), which provide specific instructions for avoided methane emissions for dairy or swine manure or organic material diverted from a landfill, but not for other feedstocks.

Emissions from dairy and swine manure, and organic material diverted from landfill, are subject to other California statutory and policy considerations and therefore the aforementioned LCFS provisions are necessary to ensure statutory alignment and to explicitly emphasize that such projects must be additional to any other legal obligations. The qualifier to the inclusion of avoided emissions in fuel pathways in § 95488.9(f) is that the emissions reductions must be achieved by "voluntary capture of methane"[5], and by "voluntary diversion from decomposition in a landfill"[6]. This is emphasized in (f)(1)(B) and (f)(2)(C), both of which provide that the quantity of avoided methane used in the CI calculation is "additional to any legal requirement for the capture and destruction of biomethane". The remainder of § 95488.9(f) reinforces this viewpoint and focus on interaction with other California law.

In short, § 95488.9(f) has three subparts covering the circumstances in which avoided methane credit may appear in pathways for certain biomethane feedstocks. As noted above, § 95488.9(f)(1) has specific requirements for dairy and swine manure. Section 95488.9(f)(2) has specific requirements for organic material diverted from decomposition in a landfill. Section 95488.9(f)(3) provides general requirements for dairy and swine manure and organic waste projects.

[5] *See 17 CCR 95488.9(f)(1)*
[6] *See 17 CCR 95488.9(f)(2)*

There is no room for interpretation that § 95488.9(f) prohibits CARB from considering avoided emission reductions for other types of projects or pathways. We note first that § 95488.9 (f)(3) discusses "organic waste projects" - not necessarily "organic material" that is "voluntary[ily] diver[ted] from decomposition in a landfill. This can reasonably be interpreted as CARB acknowledging that other types of organic waste projects may exist and provides special case rules for them under (f)(3)(B) and (f)(3)(C) to avoid future regulatory conflict.

However, even if CARB takes the view that "organic waste projects" referenced in § 95488.9(f)(3) are equivalent to "organic material" voluntarily diverted from a landfill as referenced in (f)(2), then at best the provisions of § 95488.9(f) can only be read as silent on all other types of projects or pathways which could reasonably claim credit for avoided methane emissions. Without an express prohibition on other such projects' eligibility and given the open pathway application process provided by the Lookup Table, Tier 1 and Tier 2 options, an applicant should be able to propose an avoided emissions project for CARB's consideration. Statutorily, the door is open to applicants and CARB must conduct a fair review process. The Tier 2 pathway process supports this approach. As stated in § 95488.1. Fuel Pathway Classifications (d):

> The Tier 2 pathway classification shall apply to fuel pathways that the Board's staff has limited experience evaluating and certifying, including fuel pathways that are not currently in widespread commercial production. The Tier 2 classification includes all fuel pathways not included in Tier 1 or the Lookup Table pathways.

The Tier 2 classification specifically includes in (d)(2) "Biomethane from sources other than those listed under the Tier 1 classification in (c)(5)" as well as "(d)(6) any fuel produced from unconventional feedstocks…". In other words, the rules explicitly provide opportunities for a thorough and complete evaluation for biomethane projects from feedstocks that are not dairy, swine, food, urban landscaping, or other organic waste, and/or for biomethane projects for which the CARB-developed simplified calculators do not capture material inputs necessary to evaluate the full fuel lifecycle.

Further, as noted in § 95488.7(d)(2), "Tier 2 pathways are expected to be unique with no predetermined life cycle analysis profile…" The rules make clear that the applicant can propose and model a carbon intensity that is scientifically defensible. While the specifics of an applicant's project may vary, the general principle of avoided methane emissions is enshrined in the LCFS and in the practice of lifecycle assessment as scientifically defensible, auditable, and verifiable.

Therefore, no additional rule changes are necessary to allow CARB to process a Tier 2 pathway application that includes avoided methane emissions from a non-dairy, non-swine, and non-organic waste diverted from landfill feedstock. We recognize that creating category rules and moving new feedstocks to a Tier 1 pathway take significant effort. But given the mandates from the CARB Board, the Governor, and the voters of California, CARB staff should enthusiastically welcome Tier 2 applicants and engage with these early movers to begin developing robust data and encourage the fastest/largest emissions reductions achievable.

We encourage CARB to convene any workshops, data collection and stakeholder engagement necessary to provide broader guidance or create a Tier 1 calculator option for various classes of avoided methane emission projects. If necessary, CARB may wish to use the anticipated LCFS update amendments to provide whatever additional regulatory clarity or flexibility necessary to enable the win-win of rapid methane abatement through low-carbon fuel projects that achieve methane emissions avoidance.