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America's Advanced Biofuel

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

Re: Proposed Amendments to the Low Carbon Fuel Standard Regulation.

Dear Air Resources Board Members and Staff:

Thank you for the opportunity to comment on this proposed regulation. We continue to appreciate the tremendous job you and CARB staff do on behalf of the clean fuels industry and all Californians. It has been a pleasure to work with you over the years.

The National Biodiesel Board (NBB) serves as the trade association for the U.S. biodiesel and renewable hydrocarbon diesel industries. The NBB represents more than 90 percent of domestic biodiesel and renewable diesel production, including five biodiesel production facilities and one renewable diesel production facility located in California. In addition to governmental affairs activities, the NBB coordinates the industry's research and development efforts.

The California Advanced Biofuels Association or CABA (formerly the California Biodiesel Alliance) is a not-for-profit trade association promoting the increased use and production of biodiesel and renewable hydrocarbon diesel fuel in California. CABA has represented biomass-based diesel (BMBD) feedstock suppliers, producers, distributors, retailers, and fleets on state and federal legislative and regulatory issues since 2006.

Despite some challenges resulting principally from litigation and related market uncertainty, biodiesel and renewable diesel have performed well under the low carbon fuel standard (LCFS). Biomass-based diesel volumes have increased from 14 million gallons in 2011 to more than 500 million gallons in 2017 and are expected to exceed 1 billion gallons in 2020. Similarly, biodiesel and renewable diesel have transitioned from modest credit generators to mainstays of the program, accounting for nearly 45% of LCFS credit generation in 2016.

On the following pages, we have detailed comments on various portions of the regulatory package. Thank you for considering our views on these matters.

Biomass-Based Diesel Emissions Profile

A fair amount of conversation has occurred around the POET, LLC v. California Air Resources Board case and biodiesel's theoretical NOx impacts on air quality. We would like to briefly speak to this issue because we are not convinced it is well understood.

First, while we understand the court's strict interpretation of CARB testing data and its conclusion that a NOx impact with biodiesel above certain volumetric thresholds exists, we—and the National Renewable Energy Laboratory—disagree that the results are measurable, significant, or outside the margin of testing error. More in line with our view on the subject, we were pleased to read the following summarizing text from page 2 of CARB's Appendix G:

> "Overall, biodiesel attributable to the LCFS is beneficial in terms of health impacts for all years considered. In fact, staff found that any use of biodiesel, with or without offsetting factors, would be considered beneficial in terms of overall health impacts because the health benefits from particulate matter (PM) reductions outweigh the health impacts from any NOx increases. That is, as an overall air quality matter, LCFS-attributable biodiesel increases improved health outcomes in all years."

As CARB notes, biodiesel is beneficial not only in terms of carbon reductions but also overall air quality and associated public health. The following chart, which summarizes emissions from biodiesel and renewable hydrocarbon diesel compared to CARB diesel, provides insight into why this is the case[1].

Biodiesel

Engine Type	B20 NOx	B20 PM
Non-NTDE	+1.5-+4%	-19%
NTDE	0.0%	-19%

Biodiesel (Additized)

Engine Type	B20 NOx	B20 PM
Non-NTDE	-1.9%	-18%
NTDE	0.0%	-19%

Renewable Diesel

Engine Type	R20 NOx	R20 PM
Non-NTDE	-2.9%	-4%
NTDE	0.0%	-4%

[1] Emissions data excerpted from the following sources: Pages G-31 and G-32, Appendix G, Draft Supplemental Disclosure Discussion of Oxides of Nitrogen Potentially Caused by the Low Carbon Fuel Standard, CARB, March 6, 2018; Executive Order G-714-ADF01 approval for Vesta 1000 NOx additive; and Evaluation of the Impacts of Biodiesel and Second Generation Biofuels on NOx Emissions for CARB Diesel Fuels, Durbin et al, July 12, 2012.

Alternative Diesel Fuel (ADF) Regulation

The Alternative Diesel Fuel regulation currently includes a sunset provision for biodiesel that is initiated when 90% of the on-road "fleet" is comprised of New Technology Diesel Engines (NTDEs), based on vehicle miles travelled. This benchmark was chosen because new diesel engine technology provides NOx neutrality, or even slightly reduced emissions, regardless of fuel type used[2]. Therefore, once NTDEs reach a certain level of market penetration, NOx-reducing biodiesel additives no longer offer environmental or public health benefits.

We understand concerns about the off-road fleet transitioning more slowly than predicted when the ADF was originally approved by the board and, like CARB, we support addressing this issue by including the off-road market within the scope of the regulation. However, we fail to understand why both on- and off-road fleets must transition to NTDEs before either fleet may receive a sunset from the mitigation requirement, especially since numerous natural barriers exist—tax, economic, and otherwise—that keep these fuel pools segregated from one another.

As we understand it, the on-road fleet is expected to reach 90% NTDE penetration in the 2022-2023 timeframe, while the off-road fleet is not expected to reach that level until much later—not before 2030. Because of the markedly different turnover rates between the on- and off-road fleets, we do not believe biodiesel used in the on-road market should have to be mitigated once that segment has met the 90% threshold—the point at which NOx neutrality or better has been achieved. *The logical path is to require NOx mitigation only in the fleet that necessitates it*—in this case, the off-road fleet after 2023.

We appreciate CARB citing the possibility and benefits of "bifurcating" the on- and off-road fleets in the proposed regulation. Our members strongly support this approach so that on- and off-road fleets would sunset independently of one another resulting, in CARB's words, "in an earlier anticipated sunset date for on-road vehicles while preventing any NOx increases above the baseline[3]." Bifurcating the fuel pools in this way would provide two obvious advantages:

1) LCFS compliance costs would decrease, modestly on a per-gallon basis but materially across the broad spectrum of on-road diesel fuel; and
2) CARB's regulatory burden would be reduced since the volume of fuel requiring oversight for ADF compliance purposes would be diminished by at least 75%[4].

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[2] Appendix G, Draft Supplemental Disclosure of Discussion of Oxides of Nitrogen Potentially Caused by The Low Carbon Fuel Standard, Page G-5-1, California Air Resources Board, March 6, 2018.

[3] Appendix G, Draft Supplemental Disclosure of Discussion of Oxides of Nitrogen Potentially Caused by The Low Carbon Fuel Standard, Page G-7, California Air Resources Board, March 6, 2018.

[4] Adjusted Sales of Distillate Fuel Oil by End Use, Petroleum and Other Liquids, U.S. Department of Energy, U.S. Energy Information Administration, December 19, 2017.

While bifurcating the on- and off-road requirements is undoubtedly the superior regulatory approach, we understand that different viewpoints can arise on most any subject, regardless of how benign the issue or how obvious the proper conclusion may be. For this reason, we have identified potential concerns about bifurcating the two fuel markets and provided our thoughts on these scenarios.

In our view, the most likely potential criticism of a bifurcated regulatory system is that someone could purchase unadditized on-road fuel and use that product in off-road applications, thereby avoiding the cost of additizing biodiesel. While this could in theory occur, doing so would be a clear violation of the law. In addition, there is no financial incentive to violate the law in this manner since the value of the road tax exemption one receives with the purchase of dyed diesel exceeds the cost of additization by a factor of at least three. In other words, the economics strongly incentivize compliance.

Another scenario that could be raised, albeit far less likely, includes a fuel user purchasing on-road fuel for off-road purposes and then applying for a tax refund at the end of the quarter or year, depending on the circumstance. The fuel user could theoretically purchase on-road, unadditized fuel for use in off-road applications and recoup the tax exemption at a later date.

So how likely is this to occur? We think not very likely for a variety of reasons. First, the costs of additization are a fraction of the value of the tax exemption and therefore would not seem significant enough to materially change the financial calculus. In other words, if a particular fuel purchaser was unwilling to break the law for 36 cents per gallon (the tax refund value), he or she would likely be unwilling to break the law for 46 cents per gallon (the cost of additization plus the tax refund[5]).

A review of figures from the California Department of Taxes and Fees Administration (CDTFA) shows that, in fact, the total amount of excise tax refunds sought has remained relatively static over the years and represents a small percentage of the total off-road gallons sold on an annual basis (.0082% in 2016)[6]. This would seem to indicate that if violations are indeed occurring, they represent an exceedingly small portion of overall fuel sales. Moreover, these purchases are audited by CDTFA, further decreasing the likelihood of illegal activity. If anything, adding another layer of criminal charges and oversight by an additional government agency (CARB) decreases rather than increases the likelihood of such activity. Ultimately, we believe this scenario is too remote to merit serious consideration.

[5] https://www.arb.ca.gov/lists/com-attach/11-lcfs18-VDgHYlUyWHgEXVAi.pdf.
[6] Off Highway Analysis for Years 2007-2016, Business Tax and Fee Division, California Department of Tax and Fee Administration.

Nevertheless, to fully exhaust the conversation, let us consider the example of the off-road agriculture sector where a regulatory structure exists to ensure that fuel purchasers and users abide by the law. In this sector, the purchaser can also qualify for a sales tax exemption when purchasing diesel fuel. To do so, the purchaser must sign an exemption certificate, under penalty of perjury, which declares the use of the fuel for agricultural purposes and indicates whether it will be used in the on- or off-road market. This exemption certificate is retained by the fuel distributor and subject to audit by the CDTFA. The additional layer of government oversight on this particular industry seems to make the potential for gaming the system to avoid the cost of additization even more remote.

In terms of general enforcement by CARB, a clear record exists of fuel purchasers who have claimed tax refunds.[7] This information could be used to aid in enforcement because those who claim the exemption are the only individuals who have the potential to engage in fraudulent activity. In addition, aggregated data is publicly available from CDTFA. Therefore, CARB will know: a) who the pool of potential fraudulent actors is; and b) whether exemption claims—and therefore *potential* fraudulent activity—has increased against the pre-2019 baseline. The mechanism for conducting compliance reviews would be exactly the same as if CARB were auditing the entire diesel fuel pool. By simply reviewing bills of lading (BOLs), which are required to be maintained for LCFS compliance purposes, fuel purchasers would need to demonstrate that they purchased an amount of additized biodiesel equivalent to the fuel claimed on tax exemption requests.

Even if CARB chooses not to utilize individual or aggregated information from other agencies, the fact remains that the pool of fuel purchasers who need to be monitored and possibly audited would be reduced by at least 75%. This is, in and of itself, an enormous benefit to the agency.

In conclusion, we support the bifurcated regulatory structure CARB proposed in Appendix G because it facilitates attainment of LCFS goals and minimizes CARB's enforcement responsibility. Bifurcation of the ADF requirement for on- and off-road fleets is the obvious solution to the off-road issue CARB has identified and we strongly support the agency moving forward with implementation of the concept through this regulation.

Revised Carbon Intensity Benchmarks[8]

We are inclined to accede to CARB's judgement and support the changes recommended regarding program compliance benchmarks. That said, obligated parties have been aware of the 2020 reduction requirements for more than 10 years and it seems to us that if they are not on a smooth glidepath toward compliance that this circumstance conveys far more about their level of enthusiasm for program compliance than the progress and availability of clean fuels technology.

[7] https://www.cdtfa.ca.gov/formspubs/cdtfa101.pdf.
[8] Appendix A, page 61.

Though we support the current proposal, we would strongly oppose any further amendments. Government certainty, which our industry has rarely enjoyed, is paramount for the clean fuels sector as is an increasingly stringent requirement that portends future growth. We believe that a 7.5% reduction in carbon intensity in 2020 is readily achievable and that annual increases of 1.25% from that point forward represent the minimum advances needed to continue drawing investment into the sector.

<u>Specified Source Feedstocks</u>

We are concerned with CARB's characterization of Used Cooking Oil ("UCO") as a feedstock with higher risk for mischaracterization that requires chain of custody evidence to the point of origin. While it is true that feedstocks with lower CIs are more attractive for financial reasons, we believe there are other ways to ensure compliance with the program that do not place an undue burden on producers or renderers. We offer the following suggestions:

- Require producers to submit a copy of the Separated Food Waste Plan that is necessary for federal Renewable Fuel Standard compliance rather than requiring duplicative information. This plan requires producers to list the names and addresses of their feedstock suppliers and the estimated travel distance for the feedstock. Producers should be allowed to rely on statements from suppliers for this plan when submitting pathway applications. Severe penalties should be limited to cases of fraudulent or other nefarious conduct, while those participating in the market in good faith should be provided a reasonable degree of latitude to cure defects in supplier information through assessment of deficits.

- Third-party verifiers should conduct a mass balance of the chemical inputs and outputs at plants. To convert used cooking oil to biodiesel, plants commonly utilize distinct levels of methanol, catalyst, and other process chemicals. A plant utilizing a virgin feedstock would use less methanol and catalyst for the conversion of triglycerides and would not utilize catalysts that esterify free fatty acids. A baseline should be established at validation and be verified by the third-party verifier. In addition, a plant utilizing used cooking oil would generate a lower quality glycerin co-product. We believe a mass balance of chemicals used in processing may be equally effective and yet far less burdensome than chain of custody tracking for restaurant grease.

- At the site visit and during CARB audits, representative samples should be collected from feedstock tanks and sent to a laboratory to check for certain markers that would help identify the type of oil present.

Section 95500(b). Verification of Annual Fuel Pathway Report (CIs)[9]

We continue to believe the verification system is generally well thought out, but that it also has the potential to become overly reliant on third-party entities. While there can be a valid role for qualified, third-party businesses in expanding the reach of government, at a certain point expanding the reach of government can become an abdication of government responsibility. We have observed that governments tend to underfund enforcement activities like this when third-party systems are in place. This model can be effective, but it also has limitations.

To address this concern, we believe that CARB staff should conduct unannounced spot checks of facilities to administer audits because they can be the only truly objective agency in the process. In general, we are concerned about a lack of oversight and direct involvement in the process by CARB enforcement staff. We have seen similar agencies in similar circumstances defer their proper governmental enforcement functions to third parties, with poor results.

In particular, we are concerned about a lack of oversight of foreign entities, especially those which have a financial incentive to claim that virgin palm oil or palm fatty acid distillate is "used cooking oil." For example, the volume of approved pathways and applications for production of biodiesel from domestically sourced used cooking oil in South Korea exceeds the amount of oil available in that country. This is a red flag that should be investigated by CARB staff directly rather than by the third-party auditors who have been hired by the respective companies.

While it would be inconvenient for CARB staff to conduct in-person audits of these facilities located thousands of miles away, that is precisely the point—many of these facilities are located half a world away and do not have other agencies such as U.S. EPA and the U.S. Internal Revenue Service overseeing their activities, like U.S. biofuel plants. In reality, what these companies are doing on a daily basis is a complete unknown. And unless CARB conducts unannounced spot checks, it will continue to be.

We believe unannounced audits and inspections should be prioritized based on the following factors: (1) distance of production facility from California; (2) total distance travelled by feedstock; (3) complexity of supply chain; (4) use of mass-balancing compliance approach with high carbon feedstocks; (5) production facility reliance on used cooking oil not collected from local sources; and (6) volume of fuel sold into the Low Carbon Fuel Standard program.

We also continue to suggest that CARB require bonding for international fuels like the U.S. EPA does for the federal Renewable Fuel Standard. While U.S. producers face severe legal consequences for participating in fraudulent activities, this is not the case for foreign individuals and entities, which creates a special danger and necessitates that something be at risk if fraud occurs. U.S. EPA has recognized and addressed this fact; CARB should as well.

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[9] Staff Report: Initial Statement of Reasons, page. III-143.

Biomass-Based Diesel Definition

According to the regulation, co-processed renewable diesel is defined as “biomass-based diesel when it is greater than 5% of the total diesel volume.”[10] It is our strong preference that co-processed renewable diesel simply be termed “co-processed renewable diesel.” Neither the Internal Revenue Service nor the U.S. Environmental Protection Agency—for Renewable Fuel Standard or associated programmatic purposes—considers co-processed renewable diesel to be “biomass-based diesel.” We continue to recommend that CARB utilize existing federal government and fuel industry definitions to avoid unnecessary confusion, especially considering the inherently complex nature of these intersecting state and federal policies.

In addition, the Congress has specifically denoted that co-processed renewable diesel cannot be considered biomass-based diesel. 42 U.S.C. § 7545(o)(1)(D) states in relevant part that “Renewable fuel derived from co-processing biomass with a petroleum feedstock shall be advanced biofuel if it meets the requirements of subparagraph (B), but is not biomass-based diesel.” Therefore, a state agency defining co-processed renewable diesel in the way CARB suggests would seem to conflict with federal law.

Co-Processed Renewable Diesel

We understand CARB’s desire to facilitate the near-term ability of obligated parties to generate LCFS credits. However, due to the immense scale of refining operations and their astonishing level of complexity, we believe more time is needed to study this subject before carbon intensity pathways are issued. Specifically, we recommend that CARB restart its Co-processing Workgroup to help ensure pathways are promulgated in a manner that is 100% accurate for each refinery project and carried out in a manner fully consistent with the long-term goals of the LCFS program. We further believe that no pathways should be approved until the Co-processing Workgroup has reviewed key issues and developed a set of recommendations.

We suggest the following areas for further consideration by CARB and/or the Co-processing Workgroup:

- Lifecycle models. CARB suggests that “Evaluating co-processing pathways using a Tier 2 framework is consistent with the goal of streamlining the pathway application and certification process.”[11] At this point in time, we disagree that this is an appropriate approach because models for each respective refinery technology do not exist—they still need to be developed by CARB. And since the Tier 2 framework is usually masked in redacted statements, that process alone will not afford the level of public review necessary to provide confidence to stakeholders that carbon intensity values are accurate.

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[10] Appendix A, page 7.

[11] https://www.arb.ca.gov/regact/2018/lcfs18/isor.pdf, page III-72.

- Public information. Refineries should be required to provide the same level of operational detail that has been made available by and for other industries. If co-processing is allowed to generate LCFS credits, the technology must go through a public process that provides sufficient information for the public to validate the accuracy of carbon intensity pathways. In addition, data marked as "confidential business information" submitted on Tier 2 applications should be reviewed by CARB legal staff to ensure it meets the criteria set forth under California law.
- Verification of renewable content. It is believed that a very small fraction of renewable feedstock inputs become renewable diesel fuel through co-processing. Therefore, it is critical that renewable content in finished fuel be measured via C14 radiocarbon dating rather than a mass-balance approach, which would overestimate renewable content. ASTM test method D6866 has been approved for this analysis.
- Limitation on co-processing. If co-processing is allowed under the LCFS, boundaries for this type of credit generation should be considered. We recommend the Refinery Investment Credit Pilot Program (RICPP) as a sensible model. Under RICPP, projects are of limited duration, refiners are not allowed to generate more than 20% of their obligation through the program, and credits cannot be traded. Given the incredible complexity and scope of refinery operations—and the corresponding potential for outsized errors—we believe moving forward in a methodical way is justified.
- Additional processing. Carbon intensity pathways should account for energy used when (and if) refineries isomerize co-processed fuels to improve cold flow performance.
- Emissions. We have not been able to find published literature regarding emissions and public health impacts for co-processed fuels. Since the technological process is the same as that which creates CARB diesel and the finished product is chemically indistinguishable from CARB diesel, we are not convinced that the environmental and public health impacts of co-processing should be assumed to be positive.
- Technical properties. Potential concerns about cold-flow performance, stability, and incomplete refining could require additional test parameters and limits to be included.
- Indirect effects. When bio-based feedstocks are comingled with fossil feedstocks, refiners should supply CARB with enough verifiable information to enable a full assessment of the indirect effects of co-processing on other refinery operations. This information should be made available in the same manner that Tier I framework biofuels have made information publicly available.
- ASTM specification. Co-processed renewable diesel does not have an ASTM fuel or blend specification. We believe parameters for co-processing diesel fuel may be needed to help demonstrate complete processing and a fit-for-use fuel.
- Alternative Diesel Fuel (ADF) regulation. Co-processed renewable diesel is a new fuel that should go through the ADF process like biodiesel has—and other renewable diesel replacement fuels will in the future. This step would ensure that emissions, public health, and operability data is available to CARB and the public for evaluation.

Lifecycle Analysis and Simplified CI Calculators

Biodiesel and Renewable Diesel Simplified Calculator Comments

Several hidden rows exist on the biodiesel and renewable diesel production sheets that have calculations which are not being used. There are also 18 hidden sheets in the calculator. A number of cells on the reference sheet take their values from a "User Defined" sheet. They are in several rows that are hidden, and they only go forward to the hidden LFG sheet.
These hidden sheets should be removed if they do not impact the model, and any that are required should be unhidden to improve the transparency of the model.

Multiple errors exist in the biodiesel and renewable diesel Simplified Calculator. Most of them are on the renewable diesel calculator sheet—one is large, but the rest result in small errors. The errors generally result in calculated emissions being lower than they should be. There are also some fixed values used by CARB that are not in the existing calculators or result in the double-counting of real world emissions. The issues are documented below.

Biodiesel Production Sheet

- *Used Cooking Oil (UCO)*

There is a fixed value of 0.03 g/MJ for UCO collection that is separate from UCO transport that was not in the CA GREET 2.0 Tier 1 calculator. This is a fixed value independent of any user input. It appears to derive from some type of electricity. If so, where is the documentation? It is our view that undocumented emissions should not be included in the simplified calculator. They are not in the tallow pathway.

Appendix C states that the UCO collection energy is the same as CA GREET 2.0, but this is not the case.

BD Production UCO: H119 multiplies by F184 instead of dividing by F184, it should be:

H119=F119*J119/2000/$F$118/$F$184*$C$48*$E$246

- *Corn Oil*

The extraction energy and GHG emissions (2.91 g CO_2eq/MJ biodiesel or renewable diesel) being applied to corn oil is inappropriate and results in this energy being double-counted, first at ethanol plants and then for biodiesel/renewable diesel plants.

Ethanol plants are being asked for all their electricity and natural gas consumption based on invoices. In the ethanol simplified calculator, there is no opportunity to subtract the portion of the energy derived from the corn oil extraction process.

The CI of corn ethanol is the sum of the emissions from all inputs less the emissions allocated to the co-products.

The corn oil is being assigned the same emissions as is provided by the DDG credit in the ethanol pathway. This is the proper alignment of the two system boundaries. By adding the corn oil extraction emissions to the corn oil biodiesel pathway, the system boundaries are distorted and the emissions are counted twice—once in the ethanol pathway and once in the biodiesel.

The corn oil pathway should not include the corn oil extraction emissions.

- *Tallow*

There are no collection emissions for tallow. This should also be the case for UCO.

BD Production Tallow: M141, M154, M155, M156, M157 should use B85 off of Fuel Specs instead of B83. Currently B83 and B85 are the same value, but that could change in the future.

BD Production Tallow: H140 has the same issue as UCO H119. It should be:

H140=F140*J140/2000/$F$139/$F$184*$C$48*$E$249

<u>Renewable Diesel Production Sheet</u>

The most significant error is in cell I208 on the RD Production sheet. The formula is:

=H208/$C$51*References!$C$116/Fuel_Specs!$B$18*10^6

It should be this: =H208/$C$51/Fuel_Specs!$B$18*10^6

The CARB value takes the gallons of renewable diesel, converts it to pounds and then uses the energy content per gallon to arrive at the total emissions avoided. The value is too high by a factor of 6.5 (the pounds of RD per gallon). The result is an exaggerated co-product credit for renewable diesel.

There are some small inconsistencies in the ratio of the results for the renewable diesel pathway to the biodiesel pathway. This is shown in the following tables.

The first table shows the emissions for a given set of inputs for the fuel production stage for each feedstock. As should be the case, all the values are the same for each feedstock and the ratios of the biodiesel and renewable diesel values are constant.

Feedstock	Biodiesel Fuel Production	Renewable Diesel production	Ratio RD/BD
Soy oil	9.63	10.27	1.0665
Canola Oil	9.63	10.27	1.0665
Corn Oil	9.63	10.27	1.0665
UCO	9.63	10.27	1.0665
Tallow	9.63	10.27	1.0665

When the same calculation is done for the feedstock, the ratios are all different. Unlike the fuel production values, the feedstock emissions should not be the same for all feedstocks. But since the feedstock emissions should be scaled by the energy efficiency of the process, the ratios of the feedstock emissions should be the same. In two cases, soy oil and corn oil, the ratios are the same, but that is not the case for the other feedstocks.

Feedstock	Biodiesel Fuel Production	Renewable Diesel production	Ratio RD/BD
	g CO_2/MJ		
Soy oil	13.65	13.49	0.9881
Canola Oil	22.75	22.42	0.9856
Corn Oil	12.94	12.79	0.9881
UCO	5.74	5.49	0.9563
Tallow	18.27	17.20	0.9413

Every single stage should come out to 0.98811. Working through the calculations identified the following errors in the calculator.

- RD Production Soy Oil: M59 and M60 are incorrectly pulling B79 off fuel specs instead of D79. B is BD and D is RD.
- RD Production Soy Oil: J74 to J77 are static numbers rather than being linked to the same numbers on EF Table sheet.
- RD Production Canola Oil transport errors: F96, F97, F98 are referring to the wrong columns. It should be I, K, M, respectively.
- RD Production Canola Oil: M81 and M82 are missing the F80 yield factor.
- RD Production Canola Oil: H81 and H82 are calculated completely differently from both their equivalents on BD production and from H80. They should be:

  H*1=F81*J81/$F$80/Fuel_Specs!$D$53/$F$189*$C$52*$E$255

  H82=F82*J82/$F$80/Fuel_Specs!$D$53/$F$189*$C$52*$E$255
- RD Production Corn Oil: M102, M103, M115, M116, M117, and M118 are all pulling D83 off of fuel specs instead of D87. D83 is UCO BD not Corn Oil BD.
- RD Production UCO: M121 uses B83 off of fuel specs instead of D83.
- RD Production UCO: H122 has an incorrect math operation as was the case for BD. It should be:

  H122=F122*J122/2000/$F$121/$F$189*$C$52*$E$257

- RD Production Tallow: M143 should use D85 off of fuel specs instead of D83
- RD Production Tallow: H143 has an incorrect math operation as was the case for BD. It should be:

  H143=F143*J143/2000/$F$142/$F$189*$C$52*$E$260
- RD Production Tallow: D150 and D162 are switched. The distance and the emission factors are correct if the labels are reversed.
- RD Production: Cells H197 and H201 have an incorrect reference. They should be

  F197*J197***$C$52***Fuel_Specs!$B$79/Fuel_Specs!$F$69

Making these corrections now provides the same ratio of renewable diesel to biodiesel feedstock emissions for each feedstock, as should be the case.

- *EF Table Sheet*

There are a significant number of inconsistencies on the emission factors used for the different products. While these all arise from GREET 2016 values, they clearly do not reflect industry practice or the current knowledge concerning energy use in transportation.

- *Oil Seed Transportation*

The emission factors for soybeans and canola seeds are compared in the following table.

	Soybeans		Canola
	gCO_2e/ton-mile	gCO_2e/metric ton-mile	gCO_2e/metric ton-mile
MDT	352.70	387.97	371.69
HDT	370.24	407.26	390.18
Rail	31.50	34.65	33.20
Barge	85.41	93.95	90.07

It is not clear why the soybean transportation energy use is 4.4% higher than the canola values. In CA GREET, they have the same energy use per ton-mile. It is also not logical that the energy use is lower for a medium-duty truck than it is for a heavy-duty truck. CA GREET appears to have overestimated the fuel use for a heavy-duty truck and underestimated the fuel use for a medium-duty truck compared to the most recent values in the Oakridge National Laboratories Transportation Energy Use Data Book[12].

	CA GREET	Transportation Energy Use Data Book
	Miles per gallon	
MDT	10.4	7.4
HDT	5.3	5.9

[12] Transportation Energy Data Book. https://cta.ornl.gov/data/index.shtml.

In addition to the energy use being questionable, the load size is too small for the heavy-duty truck at only 15 tons. While the maximum load size will vary by state, a typical value is 20 tons for a heavy-duty truck. The model also uses the same energy per ton-mile for an empty trip as a fully loaded trip. This is incorrect as the empty energy use should be about half of the fully loaded energy use—the difference in weight between an empty and fully loaded truck.

All rendered oils use the same emission factors, but they can be compared to the values for oilseeds as shown below. They are all lower. The load size for a HDT for rendered oil is 25 tons vs the assumed 15 tons for oilseeds.

	Rendered Oil	Soybeans	Canola
	gCO_2e/ metric ton-mile	gCO_2e/ metric ton-mile	gCO_2e/ dry metric ton-mile
HDT	212.59	407.26	390.18
Rail	30.14	34.65	33.20
Barge	81.73	93.95	90.07
Ocean tanker	38.28		

Finally, CA GREET assumes a different size for the ocean vessel for biodiesel and renewable diesel compared to the rendered oil. Those emission factors are compared in the following table. This would put California producers who import feedstock at a disadvantage to out-of-state producers who can ship by ocean vessel.

	Rendered Oil	BD	RD
	gCO_2e/metric ton-mile		
HDT	212.59	213.04	213.04
Rail	30.14	30.21	30.21
Barge	81.73	81.90	81.90
Ocean tanker	38.28	20.08	20.08

The higher energy intensity for barge transportation than for rail is not supported by the literature. Again, this could be the result of old data that has not been updated. The rail and domestic water energy use in CA GREET is compared to the data from the Transportation Energy Data Book in the following table.

	CA GREET	Transportation Energy Use Data Book
	BTU/ton mile	
Rail	274	292
Barge	735	214

In both cases, the methodology is to take the total energy consumption for the mode and the total ton-miles of freight moved. This automatically accounts for the "back-haul," and there is no need to add additional energy for this movement as is done in CA GREET. It appears the barge transport emission factor in CA GREET is too high by a factor of 3.4.

This is confirmed by the recent National Academies publication "Funding and Managing the U.S. Inland Waterways System: What Policy Makers Need to Know (2015)". In appendix G[13] it is stated that:

> Some studies show barge to be more energy efficient, while others show rail as the more energy-efficient mode. In term of British thermal units per ton-mile, Davis et al. report that rail (294 Btu/ton-mile- in 2012) is 40 percent more energy intensive than barge (210 Btu/ton-mile in 2012), nearly the same percentage difference as reported by Kruse et al. (2013). These average energy intensity values represent the two-way transport average of upstream and downstream transport (upstream transport may require more energy to account for barge movement against downstream current velocities, and downstream transport energy may benefit from the river current). Alternatively, Dager (2013) reports even lower energy intensity for inland barge transport on the basis of independent data and fuel use modeling corresponding to about 196 Btu/ton-mile, or about 60 percent better energy intensity than average rail.

The emission factors for biomass and renewable natural gas (cells 45 and 35) are too high. They do not recognize the biogenic nature of the combustion emissions. Both values are used on the renewable diesel production sheet although other inputs that would be required to use the emission factors are missing.

Indirect Land Use Change (iLUC)

The Initial Statement of Reasons indicates that "Staff has not observed sufficient evidence in literature to justify modifying the LUC CI values for the proposed regulation[14]. Updates to LUC CI values may be considered for future rulemakings, if appropriate."

In our view, substantial progress has been made on the issue of indirect land use change since CARB last considered it in 2015. For example, the previous version of the Global Trade Analysis Project (GTAP) model used by CARB relied on a database that represented the world in 2004. Scientists at Purdue University have since integrated data through the year 2011. GTAP is now more capable of modeling the world in which the current biofuels industry operates. In our view, this alone makes new GTAP runs more accurate and worthy of full-scale review by CARB.

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[13] Appendix G. https://www.nap.edu/read/21763/chapter/15.

[14] Staff Report: Initial Statement of Reasons, page III-86.

Beyond the 2004 to 2011 updates, the increase in data now available provides more evidence to help validate and calibrate the model. The enhanced analysis and structural improvements incorporated since 2015 by Purdue could not have occurred earlier because the data simply did not exist. We have referenced for your review several papers that have been published in various scientific journals[15]. These papers elaborate on advances made in the field of indirect land use change since CARB's last review in 2015.

Finally, CARB is to be commended for setting these developments in motion by investing in the GTAP model and by helping develop the methodology used to assign iLUC and carbon intensity values within the LCFS. The science has continued to advance and that is due in no small measure to CARB's investment and stewardship. Since 2015, the reliability and accuracy of the GTAP-BIO model has improved exponentially. For this reason, we believe CARB should embark upon a process to update these values in 2019.

<u>Conclusion</u>

Thank you for considering our views on these important matters. Our members have greatly enjoyed the opportunity to partner with CARB to help meet shared climate goals. We look forward to continuing this collaboration for many years to come and hope that you will feel free to contact us if any questions should arise.

Sincerely,

Jennifer Case
Chair
California Advanced Biofuels Alliance

Shelby Neal
Director of State Government Affairs
National Biodiesel Board

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[15] Taheripour F., Zhao X., and Tyner W. (2017) "The Impact of Considering Land Intensification and Updated Data on Biofuels Land Use Change and Emissions Estimates," *Biotechnology for Biofuels*, 10: 191.

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