

January 31, 2022

Mr. Richard Corey  
California Air Resources Board  
1001 I ST  
Sacramento, CA 95814

**Subject: Public Comment – Low Emission Diesel Study (“LED Study”)<sup>1</sup>**

Mr. Corey:

In response to Staff’s solicitation for comments<sup>2</sup> regarding the subject report, following is California Fueling’s submission. In the best interest of stakeholders, we kindly request that CARB post all submissions for public viewing.

**Executive Summary**

California Fueling LLC (“CF”) pioneered the development of the first CARB approved Alternate Diesel Fuel (“ADF”) regulation NOx mitigant in July 2017; we were subsequently awarded three additional Executive Orders (VESTA® 5000, 5100 and 5115). Our sister company, Hull Partners LLC (“HP”), advancements include the recent granting of Patent 11,186,789 which defines certain biomass-based diesel compositions that, amongst other claims, reduce criteria emissions including NOx and PM. Given the LED Study findings, VESTA® is the only 100% verifiable, including CARB’s Confirmatory and Efficacy Testing of Additive-Based Alternative Diesel Fuel Formulations<sup>3</sup> (“Additive Study”), NOx mitigation option currently available to CARB. While CARB chose to revoke our VESTA® Executive Orders as part of its recent Modified ADF, we strongly believe that action was unnecessary. We remain optimistic that VESTA® will play a critical role in the marketplace, enabling the use biomass-based diesel blends.

The most significant LED Study findings are that renewable diesel provides no offset, R100 directionally increases NOx versus conventional diesel, and combinations of renewable diesel and biodiesel, at any ratio, do not mitigate biodiesel’s NOx emissions. These findings will change the course of the Modified ADF to include: all biodiesel blend levels (>0-20% biodiesel) must be subject to the Alternate Diesel Fuel regulations in-use provisions; all ADF Formulations must be revoked; all exemptions must be revoked; and the sunset provision no longer applies. Beyond the Modified ADF, CARB’s release of the LED Study (a) nullifies renewable diesel’s multimedia assessment and CARB can no longer allow the unlimited use of renewable diesel, and (b) forces CARB to consider its findings when drafting the 2022 State Implementation Plan

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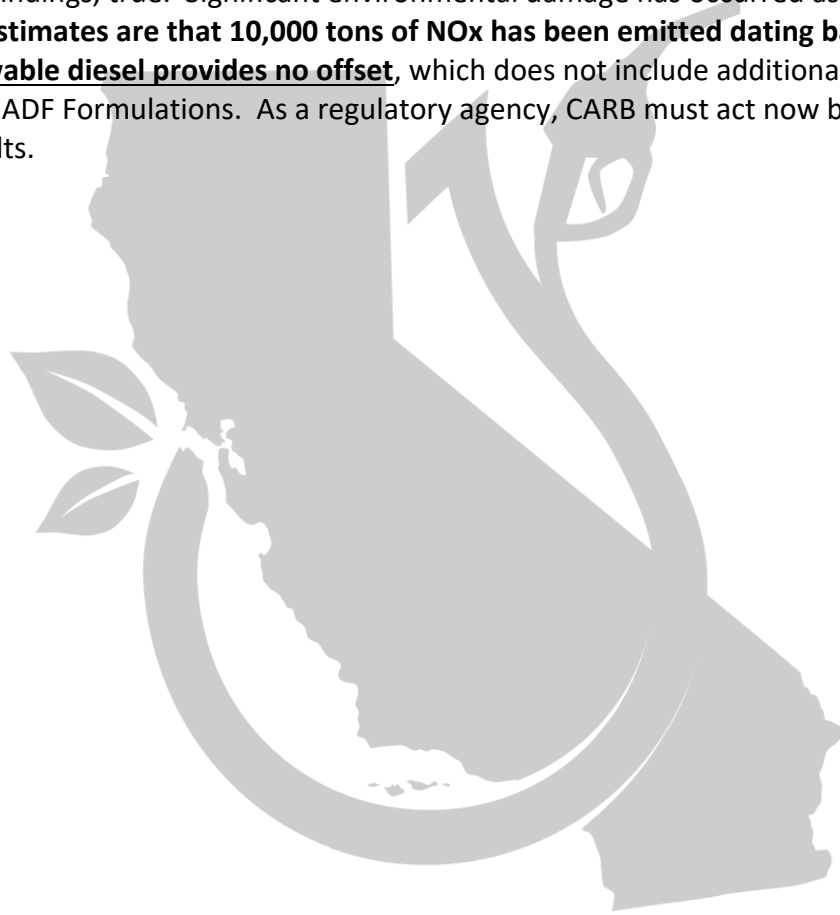
<sup>1</sup> [https://ww2.arb.ca.gov/sites/default/files/2021-12/Low\\_Emission\\_Diesel\\_Study\\_Final\\_Report\\_12-29-21.pdf](https://ww2.arb.ca.gov/sites/default/files/2021-12/Low_Emission_Diesel_Study_Final_Report_12-29-21.pdf)

<sup>2</sup> [https://ww2.arb.ca.gov/sites/default/files/2021-11/CARB\\_Notify\\_for\\_Low\\_Emission\\_Diesel\\_Study.pdf](https://ww2.arb.ca.gov/sites/default/files/2021-11/CARB_Notify_for_Low_Emission_Diesel_Study.pdf)

<sup>3</sup> [https://ww2.arb.ca.gov/sites/default/files/2020-03/ADF\\_BD\\_Additive\\_Testing\\_Report\\_March2020.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-03/ADF_BD_Additive_Testing_Report_March2020.pdf)

("SIP") which can no longer take credit for renewable diesel related NOx emission reduction projects.

Engine technology advancements have reduced emissions by orders of magnitude thanks in part to sophisticated emission control devices which are in themselves presenting performance challenges as separately addressed by legislation (Senate Bill No. 210). Meanwhile, CARB has waited over ten (10) years to conduct New Technology Diesel Engine ("NTDE") testing and as a result CARB will have to play catch-up to properly regulate today's fuels. It appears that CARB have over relied on renewable diesel's NOx emission reductions which are not, as a result of the LED Study findings, true. Significant environmental damage has occurred as a result. **Our conservative estimates are that 10,000 tons of NOx has been emitted dating back to 2013 because renewable diesel provides no offset**, which does not include additional NOx emission increases from ADF Formulations. As a regulatory agency, CARB must act now based on the LED Study results.



## Low Emissions Diesel Study Analysis

Staff's LED Study Notice<sup>2</sup> states it "has identified several questions about the study results that require further discussion and evaluation", in an attempt to debate the merits of its findings, an approach we wished CARB would have taken when publishing its flawed stakeholder opposed Additive Study. Why is CARB questioning the results of a study that involved invited stakeholders, took more than two (2) years to publish, and cost more than \$1 million? There's no reason to debate the merits of the LED Study, the real question is: what will CARB do to address its findings? As opposed to proposing any immediate and warranted corrective regulatory actions, CARB is seemingly questioning the validity of its LED Study results, circumventing its responsibilities to act which should be concerning to all given the inevitability that allowing renewable fuels to be used in the marketplace that damage the environment, for which CARB has previously been admonished by the Courts, is against the law.

Based on the LED Study findings, we have identified previous CARB findings that are no longer correct, requiring CARB responses to each, to include the following:

1. CARB's May 2015 Multimedia Evaluation of Renewable Diesel ("MME-RD")<sup>4</sup>
2. CARB Notice - Low Emission Diesel Study: Biodiesel and Renewable Diesel ("RD") Emissions in Legacy and New Technology Diesel Engines<sup>2</sup>
3. CARB's Proposed Amendments to the Regulation on the Commercialization of Alternative Diesel Fuels ("ADF") 15-Day Changes, Appendix B Staff Analysis of Renewable Diesel/Biodiesel Formulations and NOx Emissions<sup>5</sup>
4. CARB's Modified Alternate Diesel Fuel Regulation<sup>6</sup>
5. CARB's Final Statement of Reasons for Rulemaking, Including Summary of Comments and Agency Response, Public Hearing to Consider Proposed Amendments to the Regulation on the Commercialization of Alternative Diesel Fuels<sup>7</sup>
6. CARB's Final Supplemental Disclosure Discussion of Oxides of Nitrogen Potentially Caused by the Low Carbon Fuel Standard Regulation<sup>8</sup>
7. CARB's 2022 State Implementation Plan ("SIP") Presentation<sup>9</sup>
8. CF's VESTA® Executive Orders ("EO's") – G-714-ADF03, G-714-ADF07, G-714-ADF08<sup>10</sup>

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<sup>4</sup> [https://ww2.arb.ca.gov/sites/default/files/2018-08/Renewable\\_Diesel\\_Multimedia\\_Evaluation\\_5-21-15.pdf](https://ww2.arb.ca.gov/sites/default/files/2018-08/Renewable_Diesel_Multimedia_Evaluation_5-21-15.pdf)

<sup>5</sup> <https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2020/adf2020/15dayattb.pdf>

<sup>6</sup> [https://ww2.arb.ca.gov/sites/default/files/2021-07/ADF\\_Regulation\\_5-3-21.pdf](https://ww2.arb.ca.gov/sites/default/files/2021-07/ADF_Regulation_5-3-21.pdf)

<sup>7</sup> <https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2020/adf2020/fsor2.pdf>

<sup>8</sup> [https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2018/lcfs18/finaldisc.pdf?\\_ga=2.232521946.432167735.1643126770-1587392508.1640785339](https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2018/lcfs18/finaldisc.pdf?_ga=2.232521946.432167735.1643126770-1587392508.1640785339)

<sup>9</sup> [https://ww2.arb.ca.gov/sites/default/files/2021-10/2022\\_SSS\\_October\\_Workshop\\_Presentation.pdf](https://ww2.arb.ca.gov/sites/default/files/2021-10/2022_SSS_October_Workshop_Presentation.pdf)

<sup>10</sup> <https://ww2.arb.ca.gov/resources/documents/alternative-diesel-fuels-executive-orders>

- 1. CARB's May 2015 MME-RD must be updated to include the LED Study results. As a result, CARB can no longer allow the unlimited use of RD. Accordingly, RD use should be regulated under the ADF's in-use provisions.**

Page 1 indicates “[b]efore new fuel specifications are established, California Health and Safety Code (HSC) section 43830.8 requires a multimedia evaluation to be conducted and reviewed by the California Environmental Policy Council (CEPC). The CEPC must determine if the proposed regulation poses a significant adverse impact on public health or the environment.<sup>11</sup> As part of the proposed ADF regulation, a multimedia evaluation of RD was conducted pursuant to HSC section 43830.8.” The MME-RD further indicates “[d]ue to the specific fuel properties and indistinguishable chemical compositions of renewable diesel and CARB diesel, the UC researchers and the MMWG found no significant data needs and, therefore, no additional Tier II experiments were needed.” CARB’s “indistinguishable” terminology is ambiguous at best.

Conventional diesel contains aromatics, polycyclics, naphthenes and olefins<sup>12</sup>, none of which are present in RD, which consists mainly of saturated hydrocarbons. CARB has commented previously regarding the compositional similarity between RD and conventional diesel indicating both fuels have “indistinguishable chemical compositions”. Studies such as Natural Resources Canada’s “Detailed Hydrocarbon Analysis of FACE Diesel Fuels Using Comprehensive Two-Dimensional Gas Chromatography”<sup>13</sup> (“GCxGC”) shows there are significant compositional differences between conventional diesels never mind RD. Given the LED Study finding that RD directionally increases NOx versus conventional diesel, RD’s composition should be further investigated to understand its compositional impact on emissions an effort that’s best addressed by industry stakeholders.

To date, stakeholders have relied on RD and conventional diesel meeting the same specification, ASTM D975, which has very little to do with composition. RD’s composition is not translating into NTDE NOX emissions benefits as evidenced by both the LED Study and Karavalakis Study<sup>14</sup> which each used different RD supply sources. CARB should no longer make misleading statements about RD being compositionally identical or even similar to conventional diesel because it’s not true.

Page A-10 states “[a] key consideration in this Tier I review is how the levels of criteria and hazardous air pollutants emitted during combustion differ from those emitted from an energy-equivalent quantity of renewable diesel verses ULSD. While emissions testing

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<sup>11</sup> California Air Pollution Control Laws. Health and Safety Code, Division 26, Part 5, Chapter 4, Section 43830.8(b).

<sup>12</sup> <https://www.chevron.com/-/media/chevron/operations/documents/diesel-fuel-tech-review.pdf>, pages 30-33

<sup>13</sup> <http://crcsite.wpengine.com/wp-content/uploads/2019/05/GCxGC-analysis-of-FACE-fuels-RG-v4-0-Nov2013.pdf>

<sup>14</sup> “Emissions and Fuel Economy Evaluation from Two Current Technology Heavy Duty Trucks Operated on HVO and FAME Blends,” SAE Int. J. Fuels Lubr. 9(1):2016, <https://doi.org/10.4271/2016-01-0876>

is ongoing, initial studies concluded that in diesel engines: HDRD [also known as RD] fuel showed significant emission benefits compared to ultra-low sulfur conventional diesel fuel. Higher blend percentages resulted in greater benefits.” The LED Study findings clearly conflict with this viewpoint; there is no significant RD NOx emissions benefit versus conventional diesel. The MME-RD goes further and states “[d]ue to the absence of sulfur and aromatic compounds, NExBTL [a specific manufacturer’s RD] exhaust emissions show significant reductions in many regulated and non-regulated compounds compared to ‘traditional’ petroleum diesel.” The LED Study’s findings indicate that the absence of constituents such as sulfur and aromatics in RD doesn’t provide the assumed NOx emissions reduction benefits in NTDEs.

The “compositionally identical/similar” assumption was also used to address the MME-RD Tier II requirements. Page A-14 of states “[d]uring this review, we discovered that there are strong similarities between the chemical composition of petroleum diesel and renewable diesel. These similarities and the likelihood that renewable diesel will be used as a blend with petroleum diesel limits the need for additional Tier II Multimedia experiments or an extensive life-cycle impact assessment.” Clearly, more RD MME-RD Tier II related work is needed to compare the NOx emissions from RD versus conventional diesel and CARB should no longer support the unlimited and non-regulated use of RD.

Engine manufacturers use ASTM D975 fuels when (a) performing EPA heavy-duty diesel engine emissions certification testing and (b) obtaining CARB EO’s for engine use. California Exhaust Emissions Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles”, amended April 2019, page 71 states conventional diesel used in certification testing is “as specified in Table 1 of §1065.703” which seemingly does not allow for RD use given the fuel’s aromatics, sulfur, nitrogen and polycyclic aromatics content requirements. As such, RD is precluded from OEM emissions certification testing because RD contains none of these compounds. There’s clearly a risk of misrepresenting RD’s composition as being identical to that of conventional diesel and convoluting composition with meeting a common fuel specification such as ASTM D975. Based on CARB’s LED Study, while RD and conventional diesel may meet the same specification, both fuels yield different emissions profiles.

Lastly, page A-17 states “[t]his Tier I report sets the stage for determining whether subsequent Tier II and Tier III multimedia assessments are needed and if so with what level of detail.” CARB’s Tier I analysis of the existing MME-RD is flawed based on the LED Study findings and it must be amended in addition to its equally flawed Tier II analysis. As required by law, California Health and Safety Code, Section 43830.8 and California Senate Bill 140 (2007) CARB must lawfully act to update the MME-RD.

2. CARB's Notice<sup>2</sup> poses questions, seeking answers it already knows having explored each question in the lead up to the execution of the LED Test Plan.

Page xi of the LED Study states "[t]he on-road heavy-duty and off-road NTDEs were late-model engines to ensure that the engines were equipped with the most advanced emissions control technology currently available, including SCR and DPF. The on-road heavy-duty NTDE was a Cummins engine. Cummins engines are a staple of the California diesel engine market in Class 7 or Class 8 trucks. The off-road NTDE was a Caterpillar engine, which represents one of the most common engines in the off-road equipment category in California."<sup>1</sup> The LED Study engines are clearly representative of the marketplace.

In terms of the LED Study engine cycles, CARB's Notice<sup>2</sup> asks "How representative are the test cycles in this study to in-use activity cycles?" Page xi of the LED Study states "[t]hree test cycles were used for this program: the NRTC, the FTP, and steady state ramped modal cycles. The NRTC is the transient test used in the engine certification procedure for off-road engines, and the FTP is the transient certification test used for engine certification for on-highway engines. The ramped modal cycles are steady state cycles used in engine certification for both on-highway and off-road engines, with different cycles run for the different engines. For the John Deere constant speed off-road legacy engine, a 5-mode D2 ISO 8718 cycle was utilized, as per U.S. EPA's certification. For the Cummins on-road NTDE, a 13-mode, supplementary emissions test cycle was used, as was used in the certification of this engine. For the Caterpillar off-road NTDE, an 8-mode C1 ISO 8718 cycle was used, which is the cycle typically utilized for certification of variable speed off-road engines." The engine test cycles used in the LED Study were identical to those (a) used in CARB's 2011 "Biodiesel Characterization and NOx Mitigation Study", which CARB has relied upon as a cornerstone reference, and and (b) approved by the Environmental Protection Agency.

CARB's Notice<sup>2</sup> asks "[w]ould the addition of a low-load test cycle contribute to the accuracy of calculating in-use NOx excess emissions from NTDEs?" In the negotiation process leading up to the finalization of the LED Study test plan, which we discovered through Public Record Act requests, CARB appears to have been pressured by the National Biodiesel Board ("NBB") to **preclude** the low load test cycle ("LLC"). An NBB letter to CARB states "**CARB agreed not to include the LLC** in the April 2019 (attached) test plan that was agreed upon" and that as a result "CARB's seeming unwillingness to drop that LLC analysis from this testing, the National Biodiesel Board respectfully requests the immediate return of the Cummins engine. We [NBB] also request that, upon receipt of this letter, that CARB/CE-CERT cease further use and testing with the Cummins engine we supplied." If the LLC cycle was important enough to CARB, they would not have succumbed to the NBB's demand of removing it from the planned duty cycle testing regimen.

**3. Staff's Appendix B<sup>5</sup> Analysis of the Modified ADF entitled "Renewable Diesel/Biodiesel Formulations and NOx Emissions" is flawed and must be corrected. In the interim, CARB must repeal the Modified ADF<sup>6</sup> regulation.**

Page 3 of Appendix B states "Staff developed these proposed [ADF] modifications considering: the importance of renewable diesel as an offsetting factor for NOx emissions from biodiesel blends below the NOx control level (usually B5), data from previous certifications of renewable diesel based ADF formulations, and data from previous CARB studies and analyses of biodiesel and renewable diesel NOx emissions. Each of these considerations contributed to staff's understanding that the modifications listed above are not anticipated to increase overall NOx emissions in California." The LED Study data conflicts with CARB's RD NOx emission improvement assumptions and given CARB's reliance on such they are in violation of The California Environmental Quality Act (CEQA). Under CEQA, public agencies such as CARB are bound to "prevent or minimize damage to the environment through development of project alternatives, mitigation measures, and mitigation monitoring." Regarding RD and biodiesel combinations, CARB clearly violated the provisions of CEQA when it ratified the Modified ADF. What's especially egregious is that CARB was previously admonished by the Courts for a similar matter in *POET v. California Air Resources Board*. CARB simply cannot say that they didn't know any better. While the potential to file a lawsuit exists, we would hope that CARB would act responsibly and repeal the Modified ADF immediately as opposed to being forced to do so by the Court.

Page 3 also states "The ADF regulation NOx mitigation framework relies on NOx emissions reductions from the use of renewable diesel to offset NOx emissions increases from biodiesel blends below the NOx control level (usually B5)." The LED Study findings do not support that RD provides any offset whatsoever.

Page 4 states "Substantial use of renewable diesel in approved and certified ADF formulations to mitigate NOx emissions from use of biodiesel blends above the NOx control level could reduce the amount of renewable diesel available to offset NOx emissions from biodiesel blends below the NOx control level." CARB Staff reached this viewpoint, in part, based on Executive Orders G-714-ADF02 and G-714-ADF06. However, Staff knew better to place significant emphasis of these RD based formulations' data given the reference fuel CARB allowed. CARB Staff used data they knew was flawed to substantiate their view which is far from "sound science".

Pages 4-5 states "Previous CARB staff analyses have also calculated the NOx emissions from biodiesel use at varying blend ratios and the NOx reductions from renewable diesel use" with a footnote indicating "Staff's Supplemental Disclosure Discussion Analysis assumed a NOx decrease of 10 percent for R100, based on the staff report for the 2015

ADF regulation.” The LED Study findings do not support that R100 reduces NOx emissions in comparison to conventional diesel.

Page 5 states “Staff’s analysis demonstrates that the proposed modifications related to the approved ADF formulation blend content are protective of overall NOx emissions and thus beneficial to California’s long-term air quality. Therefore, staff’s analysis supports staff’s conclusion in the 15-day Notice that the proposed modifications do not change implementation of the regulation in any way that affects the conclusions of the environmental analysis (EA) addendum included in the Staff Report.” The LED Study findings do not support either the approval of currently allowed ADF Formulations or CARB’s reliance on any previous Environmental Analysis.

Pages 7-8 states “Table 1 below shows the annual volumes, volume ratios, and NOx emissions for 2018 and 2019 in tons per day (TPD) assuming that additives were ineffective in mitigating biodiesel NOx above the NOx control level during these years.” The Table 1 data is now clearly wrong based on the LED Study findings - no level of RD mitigates biodiesel NOx emission increases and R100 provides no NOx emission reduction, both versus conventional diesel.

Year	Source of Fuel Volume Data	Renewable Diesel Volume (million gallons)	Biodiesel Volume (million gallons)	Renewable Diesel to Biodiesel Volume Ratio	Change in Overall NOx Emissions Relative to Conventional Diesel Use (TPD)
2018	Actuals Based on LCFS Reporting Data	384	184	2.1	-0.2
2019		618	212	2.9	-2.6

There’s no reason, however, for CARB to assume “that additives were ineffective” in reducing biodiesel’s NOx emissions. CARB’s Additive Study clearly shows that VESTA® reduces NOx emissions, at all treat rates tested, versus an overly severe low aromatics reference fuel. These results are further underpinned by Patent 11,186,789 (biomass-based diesel formulations including B20 providing up to 4% NOx reduction). Nevertheless, if CARB does not wish to take advantage of VESTA®’s verifiable NOx reduction, it’s handicapping itself.

4. CARB’s “Final Statement of Reasons for Rulemaking, Including Summary of Comments and Agency Response, Public Hearing to Consider Proposed Amendments to the Regulation on the Commercialization of Alternative Diesel Fuels”<sup>7</sup>, April 2020 document includes Staff responses to stakeholder questions/comments. Staff must now correct some of its statements as outlined following.

Page 18 indicates “Staff has concluded, based on the empirical data from these studies and the emissions analyses, that the approved ADF formulations will be protective of NOx and PM emissions.” Studies is defined by CARB as “prior CARB testing, stakeholder



certifications of renewable diesel based ADF formulations, and staff's analysis of potential NOx emissions associated with the approved formulations...". Staff relied exclusively on non-NTDE data to justify their ADF Formulations' proposal and unfortunately, the LED Study findings do not support Staff's presumption that "ADF formulations will be protective of NOx and PM emissions", where in fact they are presently damaging the environment.

Page 19, in response to CF's question about "the varying composition of RHD, from source to source, and the associated impact of composition on emissions", CARB responded that "[t]he results of this testing [legacy or non-NTDEs] indicated that increases in cetane number result in decreases in NOx emissions relative to CARB diesel; however, these changes in NOx emissions are relatively small compared to differences in NOx emissions between low and high-saturation biodiesels versus CARB diesel." Based on the LED Study findings, which used a high cetane, high saturation biodiesel along with a comparatively high cetane number RD, none of CARB's assumptions about NOx emissions are correct.

Page 22 states "CARB is not planning to conduct further ADF type testing on any newly proposed approved ADF formulation." The comment is disingenuous at best because Staff were well aware of the ongoing evaluation of ADF Formulations in NTDEs as part of the LED Study and had some of the results thereof months before the Modified ADF was implemented.

Page 29 describes Staff's rationale to approve ADF Formulations stating "...the renewable diesel blend content of an approved or certified ADF formulation must be high enough to mitigate biodiesel NOx above the control level on a per-gallon basis **and** ensure NOx emissions increases from biodiesel blends below the NOx control level are fully offset." Based on the LED Study findings, RD will not provide any offset and any ADF Formulation is incapable of mitigating NOx.

Page 102 states "[t]he proposed R55 B20 approved ADF formulation, which has a renewable diesel to biodiesel blend ratio of 2.75:1, is protective and strongly supported by the record. Staff conducted a detailed emissions analysis, provided in the 15-day notice, which justifies the proposed R55 B20 approved ADF formulation." Knowing that CARB was in possession of at least some of the LED Study data before this statement was made indicates that Staff misled the Board and stakeholders which supports our recommendation to repeal the Modified ADF.

5. CARB's "Final Supplemental Disclosure Discussion of Oxides of Nitrogen Potentially Caused by the Low Carbon Fuel Standard Regulation"<sup>8</sup> is wrong, and the Courts must be immediately notified. CARB is in violation of their writ of mandate given CARB's erred

quantification of the NOx emissions attributed to the use of biodiesel and combinations of biodiesel with renewable diesel in the absence of any RD offset.

Page G-1 states “On October 18, 2017, the Fresno County Superior Court (Superior Court) issued a modified writ of mandate<sup>2</sup> in *POET, LLC v. California Air Resources Board* related to CARB’s California Environmental Quality Act (CEQA) analysis for the LCFS and ADF regulations requires CARB to address whether any biodiesel-related increased nitrogen oxides (NOx) emissions had, or are likely to have, a significant adverse effect on the environment or are cumulatively considerable, and, if so, to develop mitigation measures and discuss alternatives to the provisions.” The report addressed the Courts requirement, however, CARB relied on RD’s offset in doing so. Lacking any supportive RD offset data, CARB have no choice but to go back and notify the Court accordingly.

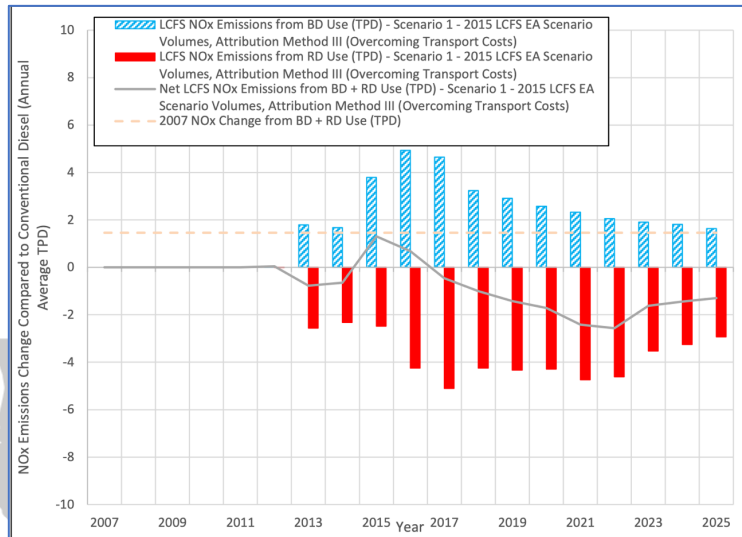
The Court ruled that the “LCFS regulations violated CEQA by impermissibly deferring (1) the analysis of potential increases in the emission of NOx resulting from increased biodiesel use and (2) the analysis and formulation of mitigation measures for any significant increases in emissions. (Poet I, supra, 218 Cal.App.4th at pp. 698-699, 731-741.)” While CARB appears to have met item (1), it can no longer claim it met item (2) considering the LED Study findings.

The question CARB should be asking is how could they have been so wrong about RD’s NOx emissions? Instead, CARB’s Notice<sup>2</sup> asks “Are there additional data or testing results that CARB should be aware of to further evaluate BD and RD emissions performance?” as if to invite stakeholders to submit biased individually developed non-NTDE data.

Page G-24 Table 10 indicates that “NOx Emissions Change Relative to Conventional Diesel, %, for B5, B10 and B20” is 0% in NTDEs for low and high saturation biodiesel. The LED Study used a biodiesel whose cetane number was (on the average) 56.4 which CARB defines as high saturation. Previously, “Staff assumed that all biodiesel use in California is low-saturation biodiesel, which results in higher NOx emissions than high-saturation biodiesel”, but when it came time to run its LED Study program it selected a high saturation biodiesel. Staff purposely selected a high saturation, high cetane number biodiesel hoping that would result in lower NTDE NOx emissions which didn’t happen.

Page G-31 provides an overview of the most recent emissions reduction model relying on RD NOx reductions, which can no longer be claimed because of the LED Study findings, and NTDE penetration (see the following graph). Given RD’s absence of any offset, there is a significant amount of annual NOx increases as a result of biodiesel use dating back to 2013. From 2013-2021, based on CARB’s illustrative model,

approximately 10,000 tons of NOx emissions were emitted from biodiesel and went unaccounted for in CARB’s 2016 SIP.



Page G-48 states “the NOx emissions impact analysis for LCFS attributed biomass-based diesel use is inherently cumulative in nature” which if true requires CARB to correct its past NOx accounting errors.

6. CARB’s 2022 SIP must consider the LED Study findings.

CARB’s LED Study indicates Staff have significantly overestimated the NOx emissions reductions from renewable diesel alone and in combination with biodiesel, at any level (including B5), and as a result RD can no longer be claimed as an offset factor. To a much lesser extent, while RD reduces NOx in off-road legacy engines those engines are only a small percentage of the California on-road fleet.

The 2022 SIP plan must account for Staff’s technically unsupported promotion of RD as a NOx offset factor. CARB’s 2022 SIP Presentation<sup>9</sup> (October 2021) discusses at slide 46 “In-Use Off-Road Diesel-Fueled Fleets Regulation Amendments”, and lists “Renewable Diesel Requirement” as a possible measure to reduce emissions. Based on the LED Study, RD use in off-road and on-road NTDEs will not achieve any NOx emission reductions.

The Los Angeles/South Coast Air Basin along with the San Joaquin Valley, which are extreme non-attainment areas exceeding the 70 ppb 8-hour Ozone Standard, should be extremely concerned with the LED Study findings. The 2016 South Coast Air Quality

Management District SIP Study<sup>15</sup> states “that in each annual demonstration report for Calendar Years 2018 through 2031 submitted to U.S. EPA by April 1 of the following year, the SCAQMD Governing Board commits to .... (3) determine whether the identified projects are projected to achieve the full amount of NOx emission reductions identified”, page 16. The SCAQMD must acknowledge that any CARB measure to reduce NOx emissions using RD can no longer be claimed based on the LED Study findings.

The 2016 Mobile Source Strategy<sup>16</sup> “Estimated Emissions Reductions” (page 154), relies on legacy engine emissions reduction wherein “... NOx ... would be reduced by 9 percent to 18 percent ...”. The LED Study found that RD use in off-road legacy engines reduces NOx by 5.2% (average for the two cycles), well below the previous claimed range. The LED Study finding that, in NTDEs, RD provides no incremental NOx reduction as compared to conventional diesel fuel will result in CARB having to restate its previous and significant RD related NOx emission’s accounting errors when drafting its 2022 SIP plan and CARB must identify real NOx emission reductions to offset those previously claimed from the use of RD.

The Health and Safety Code (H&SC) section 39607(e)<sup>17</sup> requires CARB to establish and periodically review area designation criteria. These designation criteria provide the basis for CARB to designate areas of California as attainment, nonattainment, or unclassified for the State standards. In addition, H&SC section 39608 requires CARB to use the designation criteria to designate areas of California and to annually review those area designations including ozone and PM<sub>2.5</sub> – see State Area Designations<sup>18</sup>, Particulate Matter<sup>19</sup> and Ozone<sup>20</sup> - Air Basin Notifications. Non-Attainment Zones for Ozone and PM<sub>2.5</sub> include the following Air Basins: San Joaquin Valley, South Coast, San Francisco Bay Area, San Diego, etc.<sup>21, 22</sup>

CARB must immediately notify all Air Basin authorities regarding the LED Study findings particular to RD NOx related emissions including the lack of any offset. CARB must correct any past reports taking credit for any associated RD NOx emission reductions and must take this matter into consideration when drafting their 2022 SIP.

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<sup>15</sup> <http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2016-air-quality-management-plan/final-2016-aqmp/final2016aqmp.pdf>

<sup>16</sup> <https://ww3.arb.ca.gov/planning/sip/2016sip/2016mobsr.pdf>

<sup>17</sup> [https://leginfo.ca.gov/faces/codes\\_displayText.xhtml?lawCode=HSC&division=26.&title=&part=2.&chapter=3.&article=](https://leginfo.ca.gov/faces/codes_displayText.xhtml?lawCode=HSC&division=26.&title=&part=2.&chapter=3.&article=)

<sup>18</sup> <https://ww2.arb.ca.gov/our-work/programs/state-and-federal-area-designations/state-area-designations>

<sup>19</sup> <https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health>

<sup>20</sup> <https://ww2.arb.ca.gov/resources/fact-sheets/what-ozone>

<sup>21</sup> <https://ww3.arb.ca.gov/desig/changes/ozone.pdf>

<sup>22</sup> <https://ww3.arb.ca.gov/desig/changes/pm25.pdf>

7. A thorough analysis of the LED Study findings supports a request to reinstate CF's VESTA® Executive Orders ("EO's") – G-714-ADF03, G-714-ADF07, and G-714-ADF08<sup>23</sup>, given VESTA® is the only proven option that reduces the NOx generated from the use of biodiesel.

CF was awarded three (3) EO's by CARB for VESTA® at various treat rates (1000 ppm, a dilution thereof and 1500 ppm) which were revoked as part of the flawed Modified ADF. CARB's Additive Study indicates that VESTA® reduces NOx at all treat rates tested. Our biodiesel blend compositions are patented and were independently verified to reduce NOx as evidenced by the granting of Patent 11,168,789. Given the LED Study findings, VESTA® is the only verified NOx Mitigation option available to CARB yet it persists in not allowing its use, while continuing to allow the use of RD and biodiesel combinations while taking credit for RD's offset. We would respectfully request that CARB re-enact our EO's which is completely within the Executive Officer's authorities.

For the LED Study, CARB enlisted support in formulating and obtaining the test fuels which included the reference fuel, biodiesel and RD. All fuels selected appear to have relied on a scheme to maximize diesel fuel emissions while minimizing those from RD and biodiesel. Following is a comparison of the reference fuels used by CARB in their Additive Study and LED Study.

Reference Fuel Specifications

Property	Fuel Specifications	Additive Study	LED Study
Sulfur Content, ppm	15 ppm maximum	<0.5	<0.5
Aromatic Hydrocarbon Content, Volume %	10 % maximum	6.5	9.9
Polycyclic Aromatic Content, Weight %	1.4 % maximum	0.2	1.2
Nitrogen Content, ppm	10 ppm maximum	<1	4.9
Unadditized Cetane Number	48 minimum	53.3, 53.2, 51.9	48.1, 48.2, 48.3

CARB relied on an industry association to formulate the LED Study reference fuel and the same industry association and a biodiesel and renewable diesel manufacturer to select/provide a biodiesel and renewable diesel, relying on direct assistance from third parties. For the Additive Study, CARB granted CE-CERT the authority to obtain available test fuels and neither part showed and interest in their selection. The takeaway from the LED Study and Additive Study is that CARB did everything in its power to impact an outcome. Unfortunately, the LED Study emission results were far worse than anticipated and CARB must, like they did in the Additive Study outcome, make the

<sup>23</sup> <https://ww2.arb.ca.gov/resources/documents/alternative-diesel-fuels-executive-orders>

necessary changes to address NOx emissions from RD and biodiesel blends and do so with the same sense of urgency.

CARB should acknowledge that VESTA® reduces NOx in biodiesel blends. It's in the best interest of all stakeholders to do so and it's justified. Re-enacting our VESTA® EO's will provide the market with a viable option to reduce the NOx from certain biodiesel blends. The alternative to continue and allow for the use of ADF Formulations that increase NOx does not serve the public's best interest.

## Summary

CARB collaborated with a variety of industry experts to develop and execute the LED test plan over a two-year period which demonstrated that all combinations of renewable diesel and biodiesel blends tested increased NOx in NTDEs and R100 (100% RD) directionally increases NOx emissions versus CARB Diesel. CARB cannot sidestep its responsibilities by pontificating on the merits of the LED Study data and as a result, CARB must immediately repeal the Modified ADF, revoking its approved ADF Formulations and all ADF fleet and retail fueling exemptions (approved pursuant to section 2293.6(a)(5)(A)2 of the ADF). In light on the LED Study, which comports with the results of the 2016 Karavalakis Study<sup>14</sup>, CARB lacks any reliable scientific basis to allow ADF Formulations and NTDE exemptions.

CARB Staff asked its Board to approve the Modified ADF while having access to the LED Study NTDE data that did not support and in fact conflicted with its proposed ADF Formulations yet elected to suppress the data. Why Staff did not share any of the LED Study findings in a more forthright manner, especially given the level of stakeholder opposition to the implementation of the Modified ADF during the rulemaking process, is reprehensible given the ADF's significant adverse environmental impacts. Staff must now make the Board aware of the LED Study findings and repeal the Modified ADF. Staff promoted their unsubstantiated Modified ADF Formulations while revoking our VESTA® Executive Orders which have proven to reduce NOx emissions in B20 blends. As we've informed CARB and stakeholders, HP biodiesel blend formulations are now patented (Patent Number 11,186,789). The US Patent and Trademark Office scrutinized our emissions data for over four (4) years and upheld our claims which include NOx reduction in biodiesel blends including B20. It's clear from CARB's actions that when implementing the Modified ADF they were more concerned with revoking our EO's than doing what's required of them to protect the environment. This pattern of poor decision making will continue to go unchecked until it is addressed internally and while our hope was that CARB would change their ways after numerous LCFS/ADF fiasco's, that has not happened.

The LED Study findings are shocking to some, but a reality to all stakeholders. While more emissions work may be necessary in due course, CARB have relied on the data its developed to pave the way for new, and improve existing, regulations. There are lots of corrections and changes that CARB must make in response to its LED Study findings. CARB are seemingly

encouraging a debate about the results; we would hope this is short term. It's time for CARB to be far more judicious about the renewable fuels which earn LCFS credits. We've consistently been writing to CARB regarding false pretenses associated with LCFS credit generation since 2018. CARB must be careful not to use its stature to build markets only to jerk the rug out from underneath them. Two of the top five LCFS credit generators, biodiesel and RD, have now potentially experienced such a phenomenon. There seems to exist a significant divide between developing sound science and regulating based on such as opposed to regulating first with a predestined outcome. If there's no accountability for this type of approach, it will continue, and the renewable fuels of the future will be subject to the same rules which works against innovation, investment, and advancement. We eagerly await CARB's responses to the points noted herein.

Thank you for the opportunity to submit our comments.

Respectfully,

*Patrick J McDuff*

Patrick J McDuff  
CEO  
California Fueling LLC

