Responses to Comments

on the

Draft Environmental Analysis

for the

Low Carbon Fuel Standard and Alternative Diesel Fuel Regulations

California Environmental Protection Agency
AIR RESOURCES BOARD

Released September 21, 2015

to be considered at the

September 24, 2015 Board Hearing

This page intentionally left blank.

TABLE OF CONTENTS

This page intentionally left blank.

PREFACE

The California Air Resources Board (ARB) released a Draft Environmental Analysis (EA) for the proposed Low Carbon Fuel Standard (LCFS) and Alternative Diesel Fuel Regulations (ADF) on January 2, 2015 for a 45-day public review and comment period that concluded February 17, 2015. Revisions to the LCFS Regulation were released for three 15-day comment periods starting on June 4, June 23, and July 31, 2015 and closing on June 19, July 8, and August 17, 2015, respectively. Revisions to the ADF Regulation were released on May 22, 2015. They were subject to a 15-day comment period, which ended on June 8, 2015. A total of 183 comment letters were received on the proposed regulations during the public comment periods, 27 of which addressed the Draft EA.

ARB staff made minor modifications to the EA based on responses to comments and other updates. To facilitate identifying modifications to the document, modified text is presented in the final EA with ~~strike-through~~ for deletions and <u>underline</u> for additions. None of the modifications alter any of the conclusions reached in the EA, introduce new significant effects on the environment, or provide new information of substantial importance relative to the EA. As a result, these minor revisions do not require recirculation of the draft document pursuant to the California Environmental Quality Act (CEQA) Guidelines, California Code of Regulations, title 14, section 15088.5, before consideration by the Board.

This page intentionally left blank.

1. INTRODUCTION

The California Air Resources Board (ARB) staff prepared and circulated for public review a Draft Environmental Analysis (EA) for the proposed Low Carbon Fuels Standard (LCFS) and Alternative Diesel Fuel (ADF) Regulations. The draft regulations and EA were released for public review on January 2, 2015. The public comment period for all documents concluded on February 17, 2015.

ARB received numerous comment letters through the two comment dockets opened for the proposed LCFS and ADF Regulations during that time. Comments are available on the ARB website at: http://www.arb.ca.gov/lispub/comm/bccommlog.php?listname=lcfs2015 and http://www.arb.ca.gov/lispub/comm/bccommlog.php?listname=adf2015. Pursuant to ARB's certified regulatory program, staff carefully reviewed all the comment letters received to determine which ones raised significant environmental issues related to the EA requiring a written response.

This document presents those comments and ARB staff's written responses for the Board to consider for approval prior to taking final action on the proposed LCFS and ADF Regulations. Although this document includes written responses only to those comments related to the EA, all of the public comments were considered by staff and provided to the Board members for their consideration. The full comment letters are reproduced before each set of responses, with individual comments identified by number on the comment letter or transcript containing the comment. For reference purposes, this document includes a summary of each comment followed by the written response. Attachments and appendices to these comment letters can be found at the link provided above. When ARB made a change to the EA or either of the proposed regulations in response to a comment, that change and reasons for it are noted in the response. In all other cases, ARB's response sets forth the reason ARB disagrees with the comment or otherwise does not believe the comment warrants a change in the EA or the proposed regulations.

Following consideration of the comments received on the EA and during the preparation of the responses to those comments, ARB revised the EA to prepare the Final EA released September 21, 2015.

A. Requirements for Responses to Comments

These written responses to public comments on the EA are prepared in accordance with ARB's certified regulatory program to comply with the California Environmental Quality Act (CEQA). ARB's certified regulations states:

California Code of Regulations, title 17 section 60007. Response to Environmental Assessment

(a) If comments are received during the evaluation process which raise significant environmental issues associated with the proposed action, the staff shall summarize and respond to the comments either orally or in a supplemental written report. Prior to taking final action on any proposal for which significant environmental issues have been raised, the decision maker shall approve a written response to each such issue.

Public Resources Code section 21091 also provides guidance on reviewing and responding to public comments in compliance with CEQA. While this section refers to environmental impact reports, proposed negative declarations, and mitigated negative declarations, rather than an EA, it contains useful guidance for preparing a thorough and meaningful response to comments.

Public Resources Code section 21091, subdivision (d) states:

(1) The lead agency shall consider comments it receives … if those comments are received within the public review period.

(2) (A) With respect to the consideration of comments received …, the lead agency shall evaluate any comments on environmental issues that are received from persons who have reviewed the draft and shall prepare a written response pursuant to subparagraph (B). The lead agency may also respond to comments that are received after the close of the public review period.

(B) The written response shall describe the disposition of each significant environmental issue that is raised by commenters. The responses shall be prepared consistent with section 15088 of Title 14 of the California Code of Regulations.

California Code of Regulations, title 14, section 15088 (CEQA Guidelines) also includes useful information and guidance for preparing a thorough and meaningful response to comments. It states, in relevant part, that specific comments and suggestions about the environmental analysis that are at variance from the lead agency's position must be addressed in detail with reasons why specific comments and suggestions were not accepted. Responses must reflect a good faith, reasoned analysis of the comments.

California Code of Regulations, title 14, section 15088 (a – c) states:

(a) The lead agency shall evaluate comments on environmental issues received from persons who reviewed the draft EIR and shall prepare a

written response. The Lead Agency shall respond to comments received during the noticed comment period and any extensions and may respond to late comments.

(b) The lead agency shall provide a written proposed response to a public agency on comments made by that public agency at least 10 days prior to certifying an environmental impact report.

(c) The written response shall describe the disposition of significant environmental issues raised (e.g., revisions to the proposed project to mitigate anticipated impacts or objections). In particular, the major environmental issues raised when the Lead Agency's position is at variance with recommendations and objections raised in the comments must be addressed in detail giving reasons why specific comments and suggestions were not accepted. There must be good faith, reasoned analysis in response. Conclusory statements unsupported by factual information will not suffice.

B. Comments Requiring Substantive Responses

Staff is required to prepare substantive responses only to those comments that raise "significant environmental issues" associated with the proposed action, as outlined in California Code of Regulations, title 17, section 60007(a). As stated above, of the total 183 comment letters submitted on the two comment dockets for the proposed regulations, staff determined that 27 of the letters mentioned or raised an issue related to the EA or an environmental issue related to the Draft EA. Staff was conservatively inclusive in determining which letters warranted a written response.

Public comments on the proposed LCFS and ADF Regulations submitted prior to the Board's second hearing are available on ARB's website at: http://www.arb.ca.gov/lispub/comm/bccommlog.php?listname=lcfs2015 for the LCFS Regulation and http://www.arb.ca.gov/lispub/comm/bccommlog.php?listname=adf2015 for the ADF Regulation. Comments on the draft EA were considered by staff and provided to the Board members for their consideration.

This page intentionally left blank.

2. RESPONSES TO COMMENTS

The comment letters were coded by the order and the comment period in which they were received, and also tagged for LCFS and/or ADF, along with the name of the commenting organization or individual.

Table 2-1. Comment Letter Codes

Comment Code	Comment Period Received
OP	Comments received during the 45-day comment period of the original proposal, January 2 – February 18, 2015
B	Comments received as written materials during the board hearing , February 19, 2015
T	Comments received as testimony at the Board hearing, February 19, 2015
FF	Comments received during the first 15-day comment period June 4 – June 19, 2015 for LCFS
SF	Comments received during the second 15-day comment period June 23 – July 8, 2015 for LCFS
TF	Comments received during the third 15-day comment period July 31 – August 17, 2015 for LCFS
F	Comments received during the first 15-day comment period May 22 – June 8, 2015 for ADF

ARB received 27 comment letters that relate to the EA or an environmental issue, as listed in Table 2-2. Comment letters have been reproduced and bracketed to demarcate specific issues and to allow for thorough responses. Responses are limited to comments that raise substantial environmental points, as required by California Code of Regulations, title 17, section 60007(a). That is, responses to comments that do not pertain to the content of the Draft EA are not provided in this document but are instead included in the Final Statement of Reasons for the LCFS and ADF rulemakings. All comment letters received on the proposed LCFS and ADF Regulations are available for review at www.arb.ca.gov.

Table 2-2. List of Commenters

Comment Letter Code	Commenter	Affiliation
4_OP_LCFS_SVLG	Mike Mielke	Silicon Valley Leadership Group
21_OP_LCFS_UCS	Jeremy Martin	Union of Concerned Scientists
29_OP_LCFS_CATF	Jonathan Lewis	Clean Air Task Force
35_OP_LCFS_AAUSA	Kelly Stone	ActionAid USA
40_OP_LCFS_WSPA	Catherine Reheis-Boyd	Western States Petroleum Association
43_OP_LCFS_POET	Joshua Willter	POET LLC
44_OP_LCFS_P66	Daniel Sinks	Phillips 66
45_OP_LCFS_Dillard	Joyce Dillard	Individual
46_OP_LCFS_GE 17_OP_ADF_GE	Joshua Willter	Growth Energy (single letter submitted in both LCFS and ADF rulemakings)
60_OP_LCFS_CBD	Brian Nowicki	Center for Biological Diversity
7_B_LCFS_CATF	Jonathan Lewis	Clean Air Task Force
9_FF_LCFS_ALON	Gary Grimes	Alon USA
43_FF_LCFS_WSPA	Catherine Reheis-Boyd	Western States Petroleum Association
45_FF_LCFS_GE	Joshua Willter	Growth Energy
8_SF_LCFS_GE	Joshua Willter	Growth Energy
2_TF_LCFS_GE	Joshua Willter	Growth Energy
5_OP_ADF_POET2013	Brian Guarraci	POET LLC
7_OP_ADF_CRE	Harry Simpson	Crimson Resources
8_OP_ADF_NBB	Shelby Neal	National Biodiesel Board
11_OP_ADF_IWP	Curtis Wright	Imperial Western Products
13_OP_ADF_WSPA	Catherine Reheis-Boyd	Western States Petroleum Association
16_OP_ADF_POET	Joshua Willter	POET LLC
3_B_ADF_GE	Joshua Willter	Growth Energy
9_T_ADF_ALA	Will Barrett	American Lung Assoc.,Calif.
14_T_ADF_DTF	Fulks	Diesel Technology Forum
1_F_ADF_WSPA	Catherine Reheis-Boyd	Western States Petroleum Association
5_F_ADF_POET	Joshua Willter	POET LLC

Comment letter code: 4_OP_LCFS_SVLG

Commenter: Mike Mielke

Affiliation: Silicon Valley Leadership Group

The following letter was submitted to the LCFS Docket during the 45-day comment period.

This page intentionally left blank.

February 9, 2015

Mary Nichols, Chairman
California Air Resources Board
1001 I Street, PO Box 2815
Sacramento, CA 95812

4_OP_LCFS _SVLG

Re: Support for LCFS

Dear Chairman Nichols and Members of the Air Resources Board:

On behalf of the Board of Directors and member companies of the Silicon Valley Leadership Group, I am writing to offer our support of the California Air Resources Board's continued leadership on our state's pioneering climate policies and to urge the swift re-adoption of the Low Carbon Fuel Standard (LCFS). The Silicon Valley Leadership Group, founded in 1978 by David Packard of Hewlett-Packard, represents almost 400 of Silicon Valley's most respected educational institutions and high-tech, bio-tech, and clean-tech employers; our members collectively provide nearly one of every three private sector jobs in Silicon Valley.

We support the LCFS and believe it is an important component of the state's overall strategy to reduce greenhouse gas and other harmful air emissions and drive clean tech innovation. Further, we believe that continuing the transition to lower carbon transportation fuels helps:

- **Diversify the state's fuel supply mix and drive innovation.** From 2011 to 2013 alternative fuels comprised a steadily increasing share of transportation energy use in California[i] and the clean fuels market has grown faster than anticipated. [ii] — LCFS 4-1
- **Save consumers money.** Introducing choice in the market drives competition which will help California households save money on their transportation fuel bills. This is complemented by other policies such as more fuel efficient cars and mass transit. — LCFS 4-2
- **Improve air quality**. The LCFS has already cut carbon emissions by about 9 million metric tons, the equivalent of removing almost 2 million passenger cars from the road each year.[iii] By 2020, it is estimated the LCFS can help reduce emissions by 35 million metric tons, the equivalent of removing about 7 million passenger cars from the road per year.[iv] — LCFS 4-3
- **Improve public health.** It is estimated that the LCFS will result in $1.4 to $4.8 billion in societal benefits by 2020, accruing from reduced air pollution.[v] The benefits could be even greater, $10.4 billion by 2020 and $23.1 billion by 2025, when other state fuels policies are included.[vi] — LCFS 4-4
- **Secure California's cleantech market leadership.** California has approximately 40,000 businesses serving advanced energy markets, employing roughly 431,800 people.[vii] It is estimated that the LCFS could contribute up to 9,100 new jobs, and potentially many more if the state continues to attract more clean fuel providers.[viii] — LCFS 4-5

We believe that there is a strong business case for clean fuels, and that clean air and a growing economy go hand-in-hand. We applaud your leadership and urge you to re-adopt the LCFS.

Sincerely,

Mike Mielke
Senior Vice President, Environment and Energy
Silicon Valley Leadership Group
408-501-7858

CC: Governor Jerry Brown
Senate President pro Tempore Kevin DeLeón
Assembly Speaker Toni Atkins

---

[i] UC Davis, *Status Review of California's Low Carbon Fuel Standard*, July 2014

[ii] ICF International, *California's Low Carbon Fuel Standard: Compliance Outlook & Economic Impacts*, April 2014

[iii] NRDC Fact sheet. 9 MMT reduced. Calculated from http://www.epa.gov/cleanenergy/energy-resources/calculator.html

[iv] ARB ISOR estimates 35 MMT from the LCFS alone. In combination with other fuel and vehicle standards, the program is expected to result in 63 MMT. Calculated from http://www.epa.gov/cleanenergy/energy-resources/calculator.html

[v] ICF International (2014).

[vi] American Lung Association in California and Environmental Defense Fund. *Driving California Forward*, May 2014

[vii] Advanced Energy Economy Institute, *California Advanced Energy Employment Survey*, December 2014

[viii] ICF International (2014).

Comment Letter 4_OP_LCFS_SVLG Responses

LCFS 4-3 ARB staff appreciates the support for the LCFS Regulation's contribution to improved air quality.

LCFS 4-4 ARB staff appreciates the support for the LCFS Regulation's contribution to improved public health.

This page intentionally left blank.

Comment letter code: 21_OP_LCFS_UCS

Commenter: Jeremy Martin

Affiliation: Union of Concerned Scientists

The following letter was submitted to the LCFS Docket during the 45-day comment period.

This page intentionally left blank.

21_OP_LCFS
_UCS

Union of Concerned Scientists
ucsusa.org Two Brattle Square, Cambridge, MA 02138-3780 t 617.547.5552 f 617.864.9405
1825 K Street NW, Suite 800, Washington, DC 20006-1232 t 202.223.6133 f 202.223.6162
2397 Shattuck Avenue, Suite 203, Berkeley, CA 94704-1567 t 510.843.1872 f 510.843.3785
One North LaSalle Street, Suite 1904, Chicago, IL 60602-4064 t 312.578.1750 f 312.578.1751

February 17th, 2015

Air Resource Board
California Air Resources Board
1001 "I" Street
Sacramento, CA 95814

The Union of Concerned Scientists has been working with the Air Resource Board (ARB) to develop a science based Low Carbon Fuel Standard (LCFS) since the program's inception, and has joined other organizations on other letters supporting the readoption in general and making several specific recommendations. However, we have been extensively involved in the getting the science right on the important issue of accounting for biofuels indirect land use emissions (ILUC), and wanted to make some more specific comments on that topic.

First thanks to the ARB staff for tireless work to address stakeholder and expert input on ILUC analysis. With the dedicated work of ARB staff and many contractors and collaborators the models used in 2009 have been adapted to more carefully model animal feed markets, to take into consideration irrigation, and to adapt the model structure of both GTAP and the associated emissions factor model to take into consideration considerably more detailed information, especially about the US and Brazil. This process enhanced the technical foundation of the LCFS, and also advanced the state of the art on the study of land use changes associated with expanded biofuels production. The board is on sound footing to adopt updated emissions values as part of the LCFS readoption.

But despite this important progress, there remain important areas for continued investigation. The most critical of these is related to palm oil. Palm oil is one of the most important drivers of deforestation, and a significant global source of biofuel. The emissions from palm oil are relevant not only for palm biodiesel itself, but for fuels made from other fats, oils or oil biproducts that may substitute for palm oil in the marketplace. The interconnected markets for biodiesel and renewable diesel feedstocks are complicated and the data is imperfect. Moreover, as ARB staff has highlighted, there are likely some structural limitations in GTAP that make it difficult to adjust the model to reflect key market dynamics. But this area of inquiry is clearly critically important going forward. Additional investigation is needed to ensure the link between palm and deforestation is understood, and that California fuel regulations do not inadvertently increase deforestation from palm oil. LCFS 21-1

This is particularly important because LCFS compliance may lead to a significant increase in the use of fuels made from oils and fats. I urge the ARB to seek expert input on key land use issues raised by palm oil in particular, and large increases in the use of bio-based diesel in general. ARB certainly has important technical work to continue, refining the GTAP model LCFS 21-2

and associated emissions factor models, but a broader perspective on the drivers of palm oil deforestation is also critical to ensure that California's fuel regulations avoid becoming an indirect driver of deforestation and support deforestation-free fuels. LCFS 21-2 cont.

My comments are focused on palm oil because it is a leading driver of deforestation and a weakness in ARB's otherwise strong analysis, but the other areas identified for further long term work are also very important. The forestry issues associated with the treatment of unmanaged land in GTAP are very important to ILUC for all fuels, and especially palm oil, and deserve further attention. LCFS 21-3 It is also worth understanding the discrepancy between ARB's irrigation results and those of Taheripour, Hertel and Liu (*Energy, Sustainability and Society* 2013, 3:4). LCFS 21-4 Analysis of fertilizer, paddy rice and livestock emissions, and consideration of a dynamic GTAP model is also worthwhile. LCFS 21-5 And as cellulosic biofuels feedstocks scale up and begin to be significant driver of land use change, it will be important to understand their land use impacts. LCFS 21-6

I also wanted to include some comments on recent publications related to ILUC.

Babcock and Iqbal.

At the highest level, the recent white paper by Babcock and Iqbal suggests that calculations of indirect land use change (ILUC) emissions that ARB finalized in 2009 and related studies US Environmental Protection Agency finalized in 2010 may overestimate ILUC emissions. Of course with the updated analysis the 2010 values are indeed being lowered. But of course there is a lot more to it than that, and I want to comment on four specific points.

1. The findings of the Babcock and Iqbal study are strongly connected with the reduced rate of deforestation in Brazil, which is an important success story (see UCS report *Deforestation Success Stories* – also my colleague's papers in *Tropical Conservation Science* and *Solutions Journal*). This success was no means automatic, and reflects not simply the option value of intensification, but also considerable pressure on soybean traders and the Brazilian government to stop deforestation. Fully accounting for emissions associated with deforestation was part of that pressure, and thus reduced deforestation in Brazil is a success that vindicates the importance of land use change emissions accounting.
2. However, while there is an important success to report in Brazilian soy, the Babcock and Iqbal study also demonstrates that for palm oil production just the opposite is true, with substantial expansion on the extensive margin, primarily from deforestation and expansion onto peat, rather than on the intensive margin. This demonstrates the importance of focusing on emissions from palm oil, pushing customers, traders and governments to invest in yield increases and to block expansion into forests and peat. Palm oil is a significant global source of biofuel, and these first ARB estimates to be released require thorough scrutiny before these results will be up to the same standard the corn, sugar and soy results are now. Additional expert work is LCFS 21-7

needed in this area to ensure the links between palm and deforestation are understood. LCFS 21-7 cont.

3. Also, while the Babcock and Iqbal's analysis makes a compelling case that expansion at the intensive margin is important, this kind of intensification can only go so far before the growing season is fully used and the planted land is fully harvested. Furthermore, for perennial tree crops like oil palm, double-cropping is not feasible and increasing the proportion of the planted area that is harvested has very limited potential. So the mechanisms Babcock identified cannot continue if biofuels production grows indefinitely.
4. Finally, the Babcock and Iqbal study concludes with a promise to extend their analysis into a statistical model that could be incorporated into future attempts at estimating greenhouse gas emissions caused by biofuels or other drivers of agricultural production. This forthcoming model may well enhance the next round of analysis performed by ARB or others, but the opportunity for future improvements is no reason to hold up the updates based on work done over the last five years or the regulation in general. The refinement of models is an ongoing process, and further improvement is always possible. The changes regarding intensification, improved treatment of unmanaged land, and more scrutiny of palm and peat are all warranted. But future changes will need to be incorporated into future policy updates. LCFS 21-8

Searchinger and Heimlich

In a recent World Resources Institute report, Tim Searchinger and Ralph Heimlich argue that in light of the looming challenge of producing food and other needs for the world population in 2050, there is no space for any use of crops to produce fuels on a significant scale. The question of whether crop production will succeed or fail to keep up with demand growth over the next 35 years is not a matter of scientific consensus and depends on many non-technical factors. I agree that competition for land with crops, forests and other land uses must be considered in assessing the limits on the productive scale of bioenergy, so it is a mistake to target an arbitrary fraction of future fossil energy demand, whether 10% or 20%.

Searchinger and Heimlich argue that most bioenergy policies are based on faulty accounting that double counts carbon. They propose that the low carbon fuel standard be dropped in favor of other measures in support of electric or hydrogen vehicles or at a minimum they should disqualify biofuels grown on dedicated land from contributing to low carbon fuel standards. The electricity-only focus is too narrow to meet climate goals, and the remedy of disqualifying biofuels seems to reflect a fundamental misunderstanding of how a performance standard works. By definition all fuels must be included in the standard to fully assess the overall average fuel carbon intensity. Moreover, by including an accounting for indirect land use change, the California LCFS has avoided the basic double counting problems associated with Kyoto accounting, as they call it. The last element of so called double counting Searchinger and Heimlich mention is associated with lost food consumption.

Competition of bioenergy uses of crops with food or with land for growing food is an important policy question, although primarily a moral question rather than a matter of carbon accounting. Biofuels use in California seems unlikely to put significant pressure on global food production in the timeframe of the current LCFS (through 2020), but as more ambitious targets are considered, measures to mitigate food versus fuel conflicts may be an appropriate addition to mechanisms to mitigate ILUC emissions.

The Searchinger and Heimlich report suggests that for crop based bioenergy to have real carbon reductions compared to fossil fuels additional carbon uptake is required, which can only arise in highly restricted situations and not from using current crops like maize or soybeans. It is interesting to compare the findings of this report with the findings of Babcock and Iqbal that much of the increased production of major crops in Brazil arose from double and triple cropping and from increasing the fraction of planted acreage that was harvested. These examples point to the real potential for increases in the utilization of existing land, which would meet the theoretical "additional carbon" test proposed by Searchinger and Heimlich. I mention this to highlight that alternative accounting schemes are not necessarily consistent with their claims that carbon mitigation credit can only arise for residues.

Searchinger et al.'s 2008 paper in Science on indirect land use change was in part responsible for initiating a great deal of detailed research on how increased biofuel production would reverberate through the global agricultural system. The understanding of the world represented by the totality of this research is far more nuanced than the zero sum game portrayed by this latest Searchinger and Heimlich report

The practical reality of transportation fuel markets is that biofuels are now a significant component of the fuel system. The administration of a carbon intensity based fuels policy framework like the LCFS requires a credible climate accounting framework that should be based on the best available science rather than an interest to promote or disqualify any particular fuel. The role of agriculture in energy markets and the impact for food and forest protection are important, but the potential contributions of bioenergy to carbon mitigation cannot be dismissed out of hand, no more than can the ultimate constraints on this contribution.

John DeCicco's Liquid Carbon Challenge paper

In a recent review John DeCicco argues that the combination of consequential and attributional lifecycle analysis in what he calls Fuel Cycle Analysis used to administer the LCFS is fatally flawed, and that "emissions from liquid fuels must be balanced by increasing the rate of net carbon fixation." The uncertainty about the carbon benefits of biofuels arises from the question of whether their expansion comes at the cost of carbon stored in forests and soils, rather than to the annual flows into and out of annual crops. Since the primary changes in forest cover occur in the tropics, and the connection to biofuels use is mediated by global agricultural commodity markets, the uncertainty about these benefits can only be resolved by examining the whole system, and especially the impact on forests and other carbon rich

ecosystems. This creates a complicated analytical problem, but not one that is necessarily clarified by changing the accounting framework.

DeCicco's argument about the theoretical challenges associated with combining attributional and consequential lifecycle analysis is well taken, and research in different approaches is advisable. But his argument seem to reach beyond methodological issues and argues that the climate benefits associated with biofuels in the analysis underlying California's LCFS stem from analytical errors. It is not at all clear that his theoretical musings support this conclusion and in any case his paper lacks concrete suggestions that would improve the administration of the LCFS.

In conclusion, we applaud the work ARB staff has done these last five years to advance the state of knowledge on indirect land use change emissions. The LCFS regulation is on solid ground for reauthorization through 2020. As the ARB starts to look beyond 2020, it is appropriate to consider whether other analytical approaches, lifecycle frameworks, and protective measures are needed to ensure that California's low carbon fuels meet diverse policy goals. These goals start with carbon mitigation, but must also ensure that California's climate mitigation strategies do not export problems in food markets or forest protection elsewhere in the world. We look forward to continued engagement with ARB on these issues over the next few years. LCFS 21-9

Sincerely,

Jeremy Martin, Ph.D.
Senior Scientist and Fuels Lead
Clean Vehicles Program

This page intentionally left blank.

Comment Letter 21_OP_LCFS_UCS Responses

LCFS 21-1 The commenter provides information related to the use of palm-oil-based biodiesel and other biofuels, and states that there is a link between this feedstock type and deforestation.

The concerns related to the use of palm oil as a feedstock for biodiesel and other biofuels are noted. Palm-based biodiesel has a substantially higher indirect Land Use Change (iLUC) value when compared to other feedstocks. These comparative values are reproduced from Table ES-2 of the Staff Report: Initial Statement of Reasons (Staff Report or ISOR).

Summary of iLUC Values	
Biofuel	iLUC (gCO2/MJ)
Soy Biodiesel	29.1
Canola Biodiesel	14.5
Palm Biodiesel	71.4
Source: page ES-6 of the ISOR	

While the proposed LCFS Regulation allows for many compliance strategies, it is a performance-based, fuel-neutral regulation that does not dictate the types and quantities of fuel used for compliance. Instead, it relies on a market-based approach to achieve the lowest possible cost of compliance. Palm oil would not be explicitly disallowed from regulation under LCFS and ADF; however it is subject to a high carbon intensity (CI) value, much higher than other biodiesel feedstocks. Therefore, it likely would not be used as biofuel feedstock to a large degree.

Concerns associated with the connection between feedstocks and land use changes are acknowledged in the EA, under Impact 11.b, "Long-Term Operational Impacts on Land Use Related to Feedstock Production." As stated:

> With respect to effects related to only land use and planning, the long-term conversion of lands required to meet the upstream demands for fuels to meet the proposed LCFS and ADF Regulations could also conflict with local conservation plans or zoning policies. The increased demand could result in continued occurrences of direct land use change due to the expansion of agricultural lands and continued occurrences of indirect expansion of displaced agricultural lands. This could then result in an intensification of adverse

effects associated with the conversion or modification of natural land or existing agriculture such as impacts on sensitive species populations; soil carbon content; annual carbon sequestration losses, depending on the land use; long-term erosion effects; adverse effects on local or regional water resources; and long-term water quality deterioration associated with intensified fertilizer use, pesticide or herbicide run-off.

The EA further determined that certain potentially significant effects related to land use change with respect to agriculture and forest resources, biological resources, geology and soils, and hydrologic resources would remain significant and unavoidable after feasible mitigation.

LCFS 21-2

The commenter suggests that the proposed LCFS Regulation could result in increased deforestation associated with the use of palm oil and suggests continued research in the future. Current evaluation of palm oil indicates the potential for land use change and deforestation. As a result, the iLUC value is estimated at 71.4 CO_2e/MJ. ARB staff believes this iLUC value appropriately represents the land use effects and it would provide a signal to minimize deforestation. However, staff will follow future research developments on the subject of land use changes associated with palm oil production. See also response to comment **LCFS 21-8**.

While palm oil could be used as a feedstock for an alternative diesel fuel, it may not be a prominent source for biodiesel production, because it is subject to a high iLUC value (see response to comment **LCFS 21-1**). It should be noted that palm oil is not currently on ARB's list of certified pathways.

LCFS 21-3

The comment expresses concerns related to the forestry issues associated with the treatment of unmanaged land, and suggests additional attention be given to these concerns and the use of palm oil. As discussed under response to comment **LCFS 21-1** and **LCFS 21-2**, palm oil is subject to a relatively high iLUC value and; therefore, would likely not be incentivized under the proposed regulation. Impact 4.b, "Effects on Biological Resources Associated with Land Use Changes," discusses the use of GTAP modeling, which includes a description of life cycle carbon intensity (CI) impacts related to potential or actual deforestation and conversion of other land use types. Mitigation Measure 2.b could reduce these impacts to a less than significant level through various suggested mitigation actions. But because ARB does not have the

authority to implement these types of mitigation measures when it adopts the regulations, and as a result of inherent uncertainty in the degree of mitigation that may ultimately be implemented, this impact is considered to be potentially significant and unavoidable.

The EA provides the appropriate level of detail at a programmatic-level of analysis. While the commenter is correct that palm oil could be used as a biofuel, it would not be encouraged for use as biofuel feedstock because it is subject to a high iLUC value, as noted in response to comment **LCFS 21-1**. Additionally, because the proposed regulation is market-driven, the extent to which a specific feedstock could be used is unknown and cannot be known at this time.

LCFS 21-4

The commenter requests information related to the "discrepancy" between ARB staff's irrigation results and those of Taheripour, Hertel, and Liu (Energy, Sustainability and Society 2013, 3:4). Appendix I of the ISOR provides information related to refinements to the iLUC analysis using the GTAP-BIO model. The discussion lists many of the revisions and updates to the model. These revisions included:

> Split crop production into irrigated versus rain-fed and develop datasets and metrics to assess impacts related to water-constraints in agriculture across the world. Details of the modeling efforts to include irrigation in the GTAP-BIO model are included in a report by Taheripour et al[6]. Determining regions of the world where water constraints could limit expansion of irrigation was developed by researchers at the World Resources Institute (WRI) and is detailed in reports published by WRI [7, 8.]

The footnoted references are provided as follows: [6]F. Taheripour, T. Hertel, and J. Liu, The role of irrigation in determining the global land use impacts of biofuels, Energy, Sustainability, and Society, 3:4, 2013, http://www.energsustainsoc.com/content/3/1/4; [7]F. Gassert, M. Luck, M. Landis, P. Reig, and T. Shiao, Aqueduct Global Maps 2.1: Constructing Decision-Relevant Global Water Risk Indicators, Working Paper, World Resources Institute, April 2014; and [8]F. Gassert, P. Reig, T. Luo, and A. Maddocks, A weighted aggregation of spatially distinct hydrological indicators, Working Paper, World Resources Institute, December 2013.

It is unclear from the information provided in the comment where the discrepancy exists, if it does, between the result of Taheripour,

Hertel, and Luis 2013 versus staff's irrigation results. As a result, no further information can be provided.

LCFS 21-5 This comment states that ARB should continue to investigate the role of fertilizer, paddy rice, and livestock emissions. ARB staff agrees and will continue to investigate the effects on fertilizer use, paddy rice, and livestock changes.

This comment also suggests that the GTAP model should be dynamic. ARB staff plans to work with appropriate entities to develop a dynamic model as suggested by the commenter. Analysis performed using the dynamic model would be considered in a future update**.** While a dynamic model is desirable, the static model used in this rulemaking reflects the best available scientific tool.

LCFS 21-6 The comment states that the land use impacts of cellulosic biofuel feedstock should be analyzed. Land use impacts of cellulosic biofuel feedstocks are discussed in the EA under Impact 11.b, "Long-Term Operational Impacts on Land Use Related to Feedstock Production."

LCFS 21-7 This comment refers to a study by Babcock and Iqual that demonstrates the link between palm oil and deforestation. Please see responses to comments **LCFS 21-1** through **LCFS 21-3**.

LCFS 21-8 The comment suggests updates to future modeling efforts that reflect future research associated with GHG emissions caused by biofuels and other drivers of agricultural production. The re-adoption of the LCFS Regulation being presented for formal consideration by the Board includes refinements to existing elements and inclusion of new components to strengthen the current LCFS Regulation. It represents the culmination of efforts by ARB staff, with experience from the last four years when the regulation has been in effect, to refine and strengthen several aspects of the current regulatory framework.

ARB staff is committed to evaluating new data and science, fuel availability, etc., and analyzing feedback from enforcement and verification of approved fuel pathways and their supply chains. Specific areas mentioned by the commenter such as intensification, improved assessment of unmanaged land, and additional scrutiny of peat and palm could be considered during this process.

LCFS 21-9	The commenter's appreciation for advanced knowledge related to iLUC emissions is noted. Issues related to displacement of existing cropland are discussed in the Draft EA under Impact 2.b: Agricultural and Forest Resource Impacts Related to Feedstock Cultivation; Impact 10.b: Long-Term Effects on Hydrology and Water Quality Related to Changes in Land Use; Impact 11.a: Short-Term Construction-Related Impacts Related to New or Modified Facilities; and Impact 11.b: Long-Term Operational Impacts on Land Use Related to Feedstock Production.

This page intentionally left blank.

Comment letter code: 29_OP_LCFS_CATF

Commenter: Jonathan Lewis

Affiliation: Clean Air Task Force

The following letter was submitted to the LCFS Docket during the 45-day comment period.

This page intentionally left blank.

29_OP_LCFS
_CATF

Comments to the California Air Resources Board by the Clean Air Task Force

CLEAN AIR TASK FORCE

On the Proposed Re-Adoption of the Low Carbon Fuel Standard

February 17, 2015

SUMMARY

The Clean Air Task Force (CATF) appreciates this opportunity to comment to the California Air Resources Board on the Low Carbon Fuel Standard (LCFS). CATF is a nonprofit organization that works to help safeguard against the worst impacts of climate change by catalyzing the rapid global development and deployment of low carbon energy and other climate-protecting technologies through research and analysis, public advocacy leadership, and partnership with the private sector.

Our comments focus on the following points:

- ARB should readopt the LCFS through 2020. Achieving compliance with the 2020 target will be difficult, but the LCFS remains the most promising policy tool available for reducing the climate impacts of the transportation sector. LCFS 29-1
- The LCFS's promise is undermined by the proposed adjustment to the lifecycle emissions for corn ethanol, and by the likelihood that regulated entities will increase their reliance on corn ethanol to meet LCFS targets. LCFS 29-2
- The proposed adjustment to corn ethanol's lifecycle emissions score rewards corn for its negative impact on global food security. ARB must acknowledge and address this issue before it erodes the legitimacy of the LCFS program. LCFS 29-3
- The prospects for deep reductions in transportation sector GHG emissions are likely to improve significantly after 2020, particularly if liquid ammonia's potential as an affordable low-carbon fuel is proven out. LCFS 29-4

READOPTION OF THE LCFS

Consistent with an order issued by the California Court of Appeals in *POET, LLC v. California Air Resources Board*, 218 Cal.App.4th 681 (2013), ARB staff has reviewed and revised the LCFS, and is now

> proposing that the Board re-adopt the LCFS, replacing the current LCFS regulation in its entirety. The proposed LCFS regulation will maintain the basic framework of the current LCFS regulation, including: declining carbon intensity targets; use of life cycle analyses; inclusion of indirect land use change effects;

quarterly and annual reporting requirements; and credit generation and trading.[1]

CATF urges the Board to readopt the LCFS. California's LCFS is the country's most promising public policy for bringing low-C fuels into the transportation market. It has several key attributes, all of which positively differentiate it from the federal Renewable Fuel Standard (RFS):

- Dynamic requirements: Increasingly stringent annual reduction requirements dissuade regulated entities from investing in marginally effective compliance strategies.
- Dynamic analyses: There are important ongoing debates about the performance of lifecycle GHG analyses—both with respect to specific technologies and their overall effectiveness. Regular reanalysis of compliance strategies prevents "lock-in" of outdated analyses and ineffectual technologies.
- No grandfathering: Under the LCFS, compliance options are measured according to their performance. Under the RFS, corn ethanol—which is largely exempt from the program's GHG reduction requirements—accounted for 83% of the overall volume mandate finalized by the Environmental Protection Agency (EPA) in 2013, the most recent year in which final renewable volume obligations were issued by EPA.
- Not limited to biofuels: Climate change mitigation depends on strategies that are scalable. That poses a problem for biofuels: the climate benefits of conventional biofuels typically diminish as production scales up, and advanced biofuels tend to be difficult (or impossible) to produce at a large scale.
- Clear focus on GHG reductions: The LCFS cannot blind itself to critically important non-climate impacts, especially the effect that increased consumption of biofuels can have on food prices and global food security. With appropriate safeguards in place, however, ARB can pursue the program's singular goal of GHG reductions without having to accommodate related-but-different objectives like price support for the agricultural sector or energy security.

LCFS 29-2 cont.

A strong, stringent, flexible, intellectually honest LCFS creates a forum in which to consider new, truly low-carbon fuels, and a key market in which to commercialize them. It needs to succeed. However, that success must be achieved in terms of real GHG reductions, not merely on paper. CATF is concerned that a short-term reliance on conventional biofuels—especially corn ethanol—could pull the LCFS in the wrong direction, and imperil its prospects for long term success.

LCFS 29-1 cont.

NET GHG EMISSIONS FROM CORN ETHANOL

When assessing a biofuel's net GHG emissions in the context of a given policy, an important—and complicated—component is the carbon release associated with land use changes. Of particular concern is indirect land use change (ILUC), or the amount of land use change that occurs as agricultural markets accommodate new policy-driven demand for biofuel feedstocks, and the amount of soil and plant-carbon that is released into the atmosphere as a consequence of those changes.

[1] California ARB, *Staff Report-Initial Statement of Reasons* (December 30, 2014) at ES-3.

As supply margins for corn and other crops tighten in the face of competition from policy-driven demand for biofuels, the price of foodstuffs increases. The increase in food prices encourages farmers around the world to cultivate previously unfarmed land—a process that results in substantial losses of soil- and plant-carbon to the atmosphere. Accordingly, a biofuel must "pay back" this "carbon debt" (via CO_2 sequestration by subsequent energy crop growth) before it can be credited with any net climate benefits as compared to petroleum-based fuels (which have comparatively insignificant land use-related carbon impacts).

ARB staff have proposed that the ILUC score for corn ethanol should be reduced from the current score of 30 gCO_2/MJ. Adopting the proposed reduction would be wrong, both as a matter of emissions accounting and as a matter of climate mitigation policy. The proposed reduction would make corn ethanol a more viable LCFS compliance strategy. Heavier reliance on corn ethanol would limit the near- and long-term GHG reductions that can be achieved by the LCFS and would undermine the program's innovation-forcing objective—despite corn ethanol's status as an outmoded technology, the significant uncertainty about whether corn delivers any climate benefits, and the concerns about the non-climate environmental damage associated with its production.

LCFS 29-3 cont.

Reducing the ILUC score for corn would be wrong from an emissions accounting perspective because it ignores a host of relevant factors that ARB has not yet been able to effectively quantify in CA GTAP-BIO, but which it knows will raise the ILUC score if/when the factors are correctly incorporated into the model. These factors have been identified by ARB staff[2] and in comments submitted by CATF and other stakeholders.[3] They include:

- The effect of water scarcity constraints on projected crop expansion. Researchers from Purdue University who used GTAP to examine the likely role of water scarcity on crop expansion found that earlier ILUC analyses "likely underestimated induced land use emissions due to ethanol production by more than one quarter."[4] As discussed below, ARB has not yet succeeded in sensitizing CA GTAP-BIO to water constraints, so the effect that such constraints have on LUC patterns and resulting emissions are not fully accounted for.

LCFS 29-5

- GTAP's inability to differentiate commercial forest from non-commercial forests, which means that the model wrongly assumes that markets respond to the conversion of both land types in the same way.

LCFS 29-6

- The yield improvement assumptions in GTAP overlook important differences among crops and growing regions, they fail to incorporate new research on future corn yields in the Midwest United States, and they do not adequately address the climate impact associated with the increased use of nitrogen-based fertilizers to sustain yield growth.

LCFS 29-7

---

[2] John Courtis, Anil Prabhu, Farshid Mojaver, and Kamran Adili. iLUC Analysis for the Low Carbon Fuel Standard (Update), California Air Resources Board, (March 11, 2014).

[3] CATF, Comments on ARB Proposed ILUC Analysis (May 2014) (http://www.catf.us/resources/filings/biofuels/20140519-CATF%20Comments%20on%20ARB%20Proposed%20ILUC%20Analysis.pdf)

[4] Farzad Taheripour, Thomas W. Hertel and Jing Liu. 2013. The Role of Irrigation in Determining the Global Land Use Impacts of Biofuels. ENERGY, SUSTAINABILITY AND SOCIETY.

These issues are described more fully in the appended comments that CATF submitted to ARB in May 2014.

Even if the fundamental concerns described above are put aside for a moment, the proposed ILUC reduction for corn ethanol is problematic because the materials prepared by ARB staff appear to consider two different reduced scores. The first—19.8 gCO_2/MJ—is the unweighted average of the thirty different production scenarios run on CA GTAP-BIO.[5] ARB's potential reliance on this value implies that it believes all thirty scenarios are equally plausible—a position that ARB has not, and cannot, justify. The second score—21.8 gCO_2/MJ—was derived by performing a Monte Carlo simulation (MCS). ARB's Expert Working Group has urged the use of MCS because of its "ability to represent arbitrary input and output distributions, … perform global sensitivity analysis (e.g., contribution to variance) to identify which input parameters contribute most to the variance in the output, and … represent parameter correlations."[6] As between the two scores, the value that was derived from the Monte Carlo simulation—*i.e.*, 21.8 gCO_2/MJ—is superior.

LCFS 29-8

A recent paper by Bruce Babcock and Zabid Iqbal of Iowa State University asserts that ILUC models utilized by ARB and EPA have overestimated land use changes by "attribut[ing] all supply response[s] not captured by increased crop yields to land use conversion on the extensive margin."[7] The paper argues for the use of lower ILUC scores by attempting to prove that "the primary land use change response of the world's farmers from 2004 to 2012 has been to use available land resources more efficiently rather than to expand the amount of land brought into production."[8] The paper has several shortcomings, however:

- Babcock and Iqbal only consider intensification techniques such as double cropping rather than analyzing yield increases over this time period.
- The paper dismisses data on extensive land use changes in Africa on the grounds that the linkage between global food prices and those in rural Africa is weak (implying that biofuel policies in the US and EU have little effect on African food prices and land use change)—even though the authors note a correlation between global food prices and food prices in urban Africa.
- The paper makes overly generous assumptions about the extensiveness of double cropping. As Jeremy Martin of the Union of Concerned Scientists wrote in recent comments to ARB, double cropping is not widely used in Southeast Asia where palm oil plantations have moved into formerly uncultivated areas. Nor is double cropping widely adopted in parts of the Midwest where most U.S. biofuels feedstocks—primarily corn and soybeans—are grown. The Babcock and Iqbal paper also fails to account for increased GHG emissions from increased fertilizer usage where it does assume the use of additional double cropping in response to higher crop prices.

---

[5] California ARB, *Staff Report-Appendix I: Detailed Analysis for Indirect Land Use Change* (December 30, 2014) at I-25.
[6] *Id*. at I-38, I-17.
[7] *See* Bruce A. Babcock and Zabid Iqbal, *Using Recent Land Use Changes to Validate Land Use Change Models* (Staff Report 14-SR 109) (http://www.card.iastate.edu/publications/dbs/pdffiles/14sr109.pdf)
[8] *Id*.

- Finally, the authors assume the "only net contributor to US cropland from 2007 to 2010 was a reduction in [Conservation Reserve Program (CRP)] land," but this too is an inappropriate assumption, because several studies (from South Dakota State University and even U.S. Department of Agriculture Economic Research Service, Farm Service Agency, and Natural Resources Conservation Service data) show that cropland conversions exceeded acres exiting CRP, with huge impacts on GHG emissions.[9]

Reducing the ILUC score for corn ethanol would also be a mistake in terms of climate mitigation policy. The use of highly complex models like CA GTAP-BIO to determine the net emissions associated with biofuels produces values that have the veneer of objective validity. But the modeling outputs are enormously dependent on the data that are fed into the system and on the system's assumptions about how those data affect physical and economic processes.

A recently published paper examines the extent to which subjective decisions about incorporating different assumptions and data into a lifecycle model can affect the outcome.[10] Plevin *et al.* used a Monte Carlo simulation to characterize the parametric uncertainty associated with the two components of the lifecycle analysis that California used to evaluate biofuels: "an economic modeling component that propagates market-mediated changes in commodity production and land use induced by increased demand for biofuel globally, and a carbon accounting component that calculates the GHG emissions associated with (some) of these induced changes."[11]

LCFS 29-9

The authors found that three parameters have particularly strong influences on the uncertainty importance for ILUC emissions intensity:

- Elasticity of crop yield with respect to price (YDEL) (in the economic model);
- Relative productivity of newly converted cropland (in the economic model); and
- Ratio of emissions from cropland-pasture to cropland, as compared to the ratio from converting standard pasture (in the emissions factor model).[12]

Among these factors, "[b]y far, the greatest contributor to variance in the estimate of ILUC

LCFS 29-10

[9] See Christopher K. Wright and Michael C. Wimberly. 2013. *Recent land use change in the Western Corn Belt threatens grasslands and wetlands*. PNAS 4134–4139 (doi: 10.1073/pnas.1215404110) (http://www.pnas.org/content/110/10/4134.abstract); Steven Wallander *et al. The Ethanol Decade: An Expansion of U.S. Corn Production, 2000-09*. Economic Information Bulletin No. EIB-79 (August 2011) (http://www.ers.usda.gov/publications/eib-economic-information-bulletin/eib79.aspx); U.S. Department of Agriculture Farm Service Agency. *Cropland Conversion* (July 31, 2013) (http://www.fsa.usda.gov/FSA/webapp?area=newsroom&subject=landing&topic=foi-er-fri-dtc); U.S. Department of Agriculture Natural Resources Conservation Service and Center for Survey Statistics and Methodology, Iowa State University. *Summary Report: 2010 National Resources Inventory* (September 2013) (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1167354.pdf); see *also* Lark, TJ, Salmon, JM, Gibbs, HK. *Cropland expansion outpaces agricultural and biofuel policies in the United States*. ENVIRONMENTAL RESEARCH LETTERS. Expected Spring 2015.

[10] Richard Plevin, *et al.* 2015. Carbon accounting and economic model uncertainty of emissions from biofuels-induced land use change. ENVIRON. SCI. TECHNOL. (doi: 10.1021/es505481d)

[11] *Id.*

[12] *Id.*

emissions was YDEL, the elasticity of crop yield to price;" in fact, in ILUC analyses for corn ethanol, YDEL accounts for "nearly 50%"of the variance among possible modeling results.[13] ARB currently uses a YDEL value of 0.25 in GTAP-BIO—a subjective decision that is increasingly difficult to justify in light of separate analyses conducted for ARB by Steven Berry and David Locke. Berry reviewed a collection of studies on yield price elasticity (YPE) and, according to an ARB staff report, "concluded that YPE was mostly zero and the largest value that could be used was 0.1."[14] Locke ran a statistical analysis of a similar set of studies and found "that based on methodologically sound analyses, yield price elasticities are generally small to zero."[15] ARB has nonetheless chosen to include YPE values up 0.35 in its ILUC analyses.[16] [[Id. at Attachment 1-6]]

Developing the relevant data and determining which datasets to use (and which to exclude) are highly subjective exercises, as are the processes of choosing and programming the relational assumptions that drive the model. Viewed in this context, the proposal to reduce the corn ethanol ILUC score can be more appropriately understood as the product of a subjective process—one that reflects the current availability of certain data and analyses that would contribute to a lower ILUC score, but fails to account for a host of countervailing factors that ARB does not yet understand how to model.

The Board should recognize these limitations, as well as the necessary role that it and ARB staff play in interpreting and acting upon modeling results. The Board should exercise its best judgment in light of the overarching policy objective of the LCFS, which CATF understands to be a meaningful reduction in GHG emissions from the transportation sector. Because corn ethanol's lifecycle GHG emissions are—at best—only slightly lower than those from gasoline, and because increased reliance on corn ethanol would frustrate the development of more innovative and effective compliance options, the proposal to reduce the ILUC score for corn ethanol undermines the objectives of the LCFS. Accordingly, CATF urges the Board to table the proposal.

LCFS 29-10 cont.

CORN ETHANOL'S IMPACT ON FOOD SECURITY

Another critically important way in which ILUC estimates are the product of subjective decisions (and not just objective calculations) relates to the treatment of food price increases associated with policy-induced demand for biofuels. As Plevin *et al.* (2015) write, "ILUC emission estimates depend on various modeling choices, such as whether a reduction of food consumption resulting from biofuel expansion is treated as a climate benefit."[17] ARB currently chooses to count GHG reductions that result from reduced food consumption when analyzing the lifecycle emissions of biofuels, but that—again—is a subjective decision. (Moreover, doing

LCFS 29-11

[13] *Id*.
[14] California ARB, *Staff Report-Appendix I: Detailed Analysis for Indirect Land Use Change* (December 30, 2014) at Attachment 1-2.
[15] *Id*. at Attachment 1-5.
[16] *Id*. at Attachment 1-6.
[17] Plevin *et al.* (2015), *supra*.

so implies that ARB assumes that national governments would not subsidize food consumption in the face of rising food prices.)

If instead ARB chose to assume that society would limit the extent to which food consumption would decline (especially taking into consideration a growing world population demanding significantly more calories and protein), its ILUC analysis would produce different results. For example, Thomas Hertel *et al.* (2010) found that if food consumption were held constant in GTAP, the estimated emissions from biofuel expansion would increase by 41%.[18]

As with the other factors discussed above, the problematic and highly subjective treatment of reduced food consumption reinforces the point that ARB is not obligated to reduce the ILUC score for corn ethanol on the basis of the most recent—but highly incomplete—modeling results.

More generally, CATF urges ARB to reconsider how it accounts for reduced food consumption within the LCFS context, before the issues erodes the legitimacy of the LCFS program.

LCFS 29-11 cont.

EMISSION REDUCTION OPPORTUNITIES POST-2020

ARB is appropriately interested in using the LCFS to achieve deep, long-term reductions.

> Although post-2020 goals for the LCFS are not part of this proposed rulemaking, continuing these policies beyond 2020 will ensure that fuel carbon intensity continues to decline and that low-carbon alternatives to petroleum are available in sufficient quantities in the long term. Achieving California's mid and long-term greenhouse gas and air quality goals will require a renewable portfolio of transportation fuels—including electricity and hydrogen—well beyond the current policy trajectories. Accordingly, ARB, in a future rulemaking, will consider extending the LCFS with more aggressive targets for 2030.[19]

LCFS 29-12

An unwarranted reduction to the corn ethanol ILUC score would do more than undermine the actual climate benefits that the LCFS can achieve through 2020; it would lower the ceiling on the long-term effectiveness of the program by extending the period in which marginally beneficial technologies can compete with the far better options that will be available to California after 2020. Chief among these better options may be ammonia, a hydrogen-based energy carrier that CATF has previously discussed with ARB management and staff.

The potential benefits associated with ammonia fuel ammonia are enormous, both for the environment and for the prospects of the LCFS:

LCFS 29-4 cont.

[18] TW Hertel, *et al.* 2010. *Effects of US Maize Ethanol on Global Land Use and Greenhouse Gas Emissions: Estimating Market-Mediated Responses*. BIOSCIENCE. 60:223-231(doi: 10.1525/bio.2010.60.3.8).
[19] California ARB, *Staff Report-Initial Statement of Reasons* (December 30, 2014) at ES-1.

- Zero-carbon ammonia can be produced using air, water, and electricity generated by renewable or nuclear power plants, or by fossil fuel-based generating stations equipped with carbon capture and storage systems.
- A wide range of engines and fuel cells can use ammonia to generate electricity or to power vehicles, and can do so without emitting CO_2.
- Substantial global ammonia production and transport infrastructure is already in place. At 150 million metric tons per year, it is the third largest chemical produced globally.
- At $3.27 per gallon (on an energy equivalent basis to gasoline, at current prices) and $1.78 per gallon (when compared against gasoline's 10-year average price), ammonia is affordable. And as a liquid, it can be more easily transported and stored than hydrogen and natural gas.

The steps that need to be taken before a widespread transition to ammonia fuel can occur are significant—but not insurmountable. These include:

- Building awareness among industry, regulators, and other stakeholders about the economic and environmental advantages of using ammonia fuel for power generation and transportation (especially, at the outset, rail and long-haul truck fleets).
- Helping innovators and investors identify small volume/high profit projects to jumpstart the ammonia energy industry.
- Highlighting opportunities to shift ammonia production to zero-carbon processes (*e.g.*, using stranded or otherwise underutilized wind power assets for ammonia synthesis).
- Detailing ammonia's toxicity risk (which is similar to that of LPG), describing how that risk is managed by farmers globally, and outlining protocols for how it can be managed in the power and transportation sectors.
- Developing a long-term roadmap for building up ammonia production and distribution capacity to the scale of a global energy commodity.

LCFS 29-4 cont.

Since CATF briefed ARB on ammonia in July 2014, research in Texas (on ammonia-gasoline blending in internal combustion engines), Toronto (on the use of ammonia to fuel locomotives), and California have continued to validate the concept and develop demonstration projects.

The California project—which involves the University of California at Los Angeles (UCLA), California Energy Commission, and South Coast Air Quality Management District (SCAQMD)—is among the most interesting efforts to date. UCLA is spearheading a comprehensive program to utilize advanced engines from Sturman Industries for a multifuel (gas and ammonia), low NO_x combined-heat-and-power system. The system will be designed, installed, and optimized at a metals foundry in Los Angeles called California Metal-X (CMX). The project goal is to provide power at $0.097/kwh compared to a current base load cost of $0.18/kwh and peak power costs ranging from $0.20-$0.50/kwh from the grid. These cost savings come along with the potential to prove out an ammonia-based, scalable power source that meets the stringent air quality requirements implemented by SCAQMD.

The system will be designed to run in a wide range of modes including pure ammonia as a peak fuel and a variety of combined heat/power modes depending on power pricing, air quality standards, process efficiency, and power export profitability. UCLA, Sturman Industries, and

other project partners will instrument the system to test and optimize ammonia engines, emissions, costs, maintenance, safety and other aspects of these types of operations in the real world. This project is being designed to provide a robust prototype for low cost, clean electricity across the California economy. If successful, the project will provide a technology and engineering basis for installing ammonia power in various markets around the world.

LCFS 29-4 cont.

CONCLUSION

CATF urges ARB to readopt the LCFS through 2020. Although significant challenges remain, the LCFS is the most promising policy tool available for reducing the climate impacts of the transportation sector.

However, that promise is undermined by the proposed adjustment to the lifecycle emissions for corn ethanol, and by the likelihood that regulated entities will increase their reliance on corn ethanol to meet LCFS targets. The proposed adjustment to corn ethanol's lifecycle emissions score rewards corn for its negative impact on global food security. ARB must acknowledge and address this issue before it erodes the legitimacy of the LCFS program.

LCFS 29-3 cont.

An unwarranted reduction to the corn ethanol ILUC score would also lower the ceiling on the long-term effectiveness of the program by extending the period in which marginally beneficial technologies can compete with the far better options that will be available to California after 2020. The prospects for deep reductions in transportation sector GHG emissions are likely to improve significantly after 2020, particularly if liquid ammonia's potential as an affordable low-carbon fuel is proven out.

LCFS 29-11 cont.

LCFS 29-4 cont.

Respectfully submitted,

Jonathan F. Lewis
Senior Counsel
Clean Air Task Force
617.624.0234
jlewis@catf.us
www.catf.us

This page intentionally left blank.

Comment Letter 29_OP_LCFS_CATF Responses

LCFS 29-3 The comment states that the adjustment to corn ethanol's lifecycle emissions score rewards corn for its negative impact on global food security. The adjustments to the CI of corn ethanol, as well as the adjustments for other biofuels, are based on the latest and improved modeling analysis. The model, as currently structured, does not allow a detailed evaluation of the impacts of biofuels on global food security. To evaluate such effects, ARB staff must collect and include in the analysis, among other information, data for calorific content of food and feed production, and the modeling structure needs to be modified accordingly. When these data become available and are collected, future revisions of the model could allow the evaluation of global food security effects and the effect could be incorporated into the iLUC analysis.

LCFS 29-5 The comment states that reducing the iLUC score for corn is wrong because CA GTAP-BIO (GTAP) does not effectively quantify the effect of water scarcity constraints on projected crop expansion. The current approach used by ARB staff is appropriate because it included the most current data and the latest modeling structure. The current ARB Global Trade Analysis Project (GTAP) model does account for water availability throughout the biofuels production system and uses the latest water scarcity data from the World Resources Institute. In previous analysis, Taheripour et al. used an older (2001) database and an older model different than the current ARB model. Also, in their analysis, assumptions related to rainfed and irrigated land is outdated. Furthermore, the older model used by Taheripour et al. does not include current elasticity structures and does not disaggregate crops.

LCFS 29-6 The comment states that reducing the iLUC score for corn is wrong because GTAP does not differentiate commercial forest from non-commercial forest. It is true that the current version of the model does not differentiate between commercially-managed forest and non-commercial forest by region and agro-ecological zone (AEZ). As a result, it is necessary to use the same market response to land conversion both for commercial and non-commercial forests. When additional data to differentiate the two categories of forests and the corresponding market responses become available ARB staff would consider modifying the model to incorporate commercially-managed forest and non-commercial forest by region and AEZ.

LCFS 29-7

The comment states that reducing the iLUC score for corn is wrong because GTAP's yield improvement assumptions overlook important differences among crops and growing regions, GTAP fails to incorporate new research on corn yields, and GTAP does not adequately address the climate impact of nitrogen-based fertilizers. It is true that the current structure of the model does not have the data nor can it differentiate for yield improvements of different crops and for different growing regions. As a result, the model incorporates the same yield improvements for all crops in all regions. Because the current approach applies the same yield improvements, it is possible that in some cases land responses would be overstated and in some others may be understated. When detailed data become available for each crop and for each growing region, they could be incorporated in future model updates.

Regarding the effects of nitrogen-based fertilizers, current ARB methodology accounts for the increased emissions of nitrogen-based fertilizer in the direct analysis of carbon intensity (CI) for biofuels feedstock. When data becomes available for all other crops, ARB staff would evaluate including these impacts in future model updates.

LCFS 29-11

The comment questions the reduction in the corn ethanol score because such a reduction does not adequately consider the effects of reduced food consumption. See response to **LCFS 29-3**.

Comment letter code: 35_OP_LCFS_AAUSA

Commenter: Kelly Stone

Affiliation: ActionAid USA

The following letter was submitted to the LCFS Docket during the 45-day comment period.

This page intentionally left blank.

35_OP_LCFS
_AAUSA

California Environmental Protection Agency
Air Resources Board

Comment Log Display

BELOW IS THE COMMENT YOU SELECTED TO DISPLAY.
COMMENT 35 FOR LOW CARBON FUEL STANDARD 2015 (LCFS2015) - 45 DAY.

First Name: Kelly
Last Name: Stone
Email Address: Kelly.Stone@actionaid.org
Phone Number:
Affiliation: ActionAid USA

Subject: Global Impacts of Rising Biofuel Mandates on Food Security
Comment:
Via Electronic Mail

February 17, 2015

Mary Nichols and Board Members
California Air Resources Board
1001 "I" Street
P.O. Box 2815
Sacramento, CA 95812

Re: Low Carbon Fuel Standard

Dear Chairman Nichols and CARB Board Members:

ActionAid USA, a nonprofit organization working with millions of people around the world and the US to fight the causes of poverty and injustice, applauds the California Air Resources Board's (CARB) proactive approach to climate change mitigation. However, as the Board considers re-adoption of the Low Carbon Fuel Standard (LCFS), we strongly urge it not to lower the indirect land use change (ILUC) score for corn ethanol. — Summary

Attached you will find a working paper by Timothy A. Wise and Emily Cole of the Global Development and Environment Institute at Tufts University, "Mandating Food Insecurity: The Global Impacts of Rising Biofuel Mandates and Targets." This paper studies the impact of government biofuel mandates and estimates that mandates will drive a 43% growth in demand for biofuels over the next decade. This level of growth has extremely concerning implications for food security, as well as land and water use. Further incentivizing the use of corn ethanol, which undermines food security and has questionable environmental benefits, would be step in the wrong direction. — LCFS 35-1

Crop-based biofuels, particularly corn ethanol, undermine food security around the world by driving up food prices and increasing price volatility.

This not only true for corn products people consume directly; corn is one of the most popular feeds for animals, so an increase in the — LCFS 35-2

price of corn also increases the price of meat and dairy products. A 2012 study published by ActionAid estimated that US ethanol expansion cost net corn importing countries $11.6 billion between 2006 and 2011. $6.8 billion of this additional cost was born by developing countries. In fact, during fiscal year 2011, the U.S. spent as much on food aid to Guatemala as the additional money Guatemala paid to import corn at the increased prices.

LCFS 35-2 cont.

Corn ethanol also presents environmental concerns. In addition to the emissions from direct and indirect land use change, corn ethanol undermines water quality. The nitrogen, phosphorous and other chemicals applied to corn crops are washed from those crops into drainage, local water supplies, rivers and eventually oceans. This poisons the water, and in the case of nitrogen, creates algae blooms that reduce the oxygen levels in the water. The resulting dead zones kill fish and aquatic life or force them to move elsewhere. In 2014, the dead zone in the Gulf of Mexico was 5,052 square miles. The impact of biofuel expansion on water quantity should not be ignored. Corn uses more irrigated water than any other crop in the US, even though the overwhelming majority of corn is currently rain-fed. In recent years, irrigated corn crops increased with the growth in corn production. Perhaps not surprisingly, 87% of irrigated corn crops are grown in areas already showing extremely high water stress. Considering the water demands of growing corn and the strain current corn production is placing on water levels, policy makers should be cautious about policies that encourage further demand.

LCFS 35-3

One other lesson to take from "Mandating Food Insecurity," is that government policies continue to profoundly shape the biofuels industry. Government mandates have and will continue to drive demand growth for first-generation biofuels, such as corn ethanol, that undermine food security and hurt the environment. I strongly urge the Board to ensure that the LCFS does not further incentivize corn ethanol expansion.

LCFS 35-4

Thank you for your consideration and please do not hesitate to contact us should you need additional information.

Sincerely,

Kelly Stone
Biofuels Policy Analyst
ActionAid USA
Kelly.Stone@actionaid.org

"Fueling the Food Crisis: The Cost to Developing Countries of US Corn Ethanol Expansion." ActionAid USA. October 2012.

http://water.epa.gov/type/watersheds/named/msbasin/zone.cfm

http://voices.nationalgeographic.com/2015/02/10/corn-remains-king-in-usda-irrigation-

Attachment: www.arb.ca.gov/lists/com-attach/37-lcfs2015-VjtQNwRrUmUFYgZy.pdf

Original File Name: Mandating Food Insecurity_The GLobal Impacts of Rising Biofuel Mandates and Targets.pdf

Date and Time Comment Was Submitted: 2015-02-17 15:04:28

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

GLOBAL DEVELOPMENT AND ENVIRONMENT INSTITUTE
WORKING PAPER NO. 15-01

Mandating Food Insecurity:

The Global Impacts of Rising Biofuel Mandates and Targets

Timothy A. Wise and Emily Cole
February 2015

Tufts University
Medford MA 02155, USA
http://ase.tufts.edu/gdae

Abstract

Expanding demand for biofuels, fed significantly by government policies mandating rising levels of consumption in transportation fuel, has been strongly implicated in food price increases and food price volatility most recently seen in 2008 and 2011-2012. First-generation biofuels, made from agricultural crops, divert food directly to fuel markets and divert land, water and other food-producing resources from their current or potential uses for production of feed for animals and food for human consumption. A key policy driver of biofuel consumption is government mandates to increase or maintain rates or levels of biofuel blends in transportation fuel, the U.S. Renewable Fuel Standard and the E.U. Renewable Energy Directive being the most prominent cases. In this paper we assess the spread of such mandates and targets, finding that at least 64 countries now have such policies. We estimate the consumption increases implied by full implementation of such mandates in the seven countries/regions with the highest biofuel consumption, suggesting a 43% increase in first-generation biofuel consumption in 2025 over current levels. We compare this to even higher estimates from international agencies. We assess the likelihood of implementation in key countries and regions, which suggests that with reform, particularly in OECD countries, consumption growth could be slowed. We conclude with policy recommendations to reduce the mandate-driven expansion of first-generation biofuels and mitigate their negative social and environmental impacts.

Keywords: biofuels, agriculture, food policy, hunger, land use.

Mandating Food Insecurity:
The Global Impacts of Rising Biofuel Mandates and Targets

Timothy A. Wise and Emily Cole*

Executive Summary

Expanding demand for biofuels, fed significantly by government policies mandating rising levels of consumption in transportation fuel, has been strongly implicated in food price increases and food price volatility most recently seen in 2008 and 2011-2012. First-generation biofuels, made from agricultural crops, divert food directly to fuel markets and divert land, water and other food-producing resources from their current or potential uses for production of feed for animals and food for human consumption.

A wide range of international bodies, including the World Bank, the United Nation's Committee on World Food Security, and a landmark report prepared by G20 countries, has called for reforms to government policies that encourage the continued expansion of first-generation biofuel production. Unlike second-generation biofuels, which are less likely to compete with food crops for land and other resources, first-generation biofuels such as corn ethanol, soy and palm biodiesel, and sugarcane ethanol dominate the current global biofuels market.

In this paper, we document the global spread of the most widespread government support policies for biofuels: consumption mandates, with a particular focus on first-generation biofuels. These policies generally mandate the incorporation over time of a rising share or volume of biofuel into a country's transportation fuel. The U.S. Renewable Fuel Standard (RFS) is one such example, as is the European Union's (EU) Renewable Energy Directive (RED). Sixty-four countries now have biofuel mandates that reflect a wide range of ambition but that all encourage the use and usually the expansion of biofuel use.[1]

We show the current national and regional mandates (focusing on first-generation biofuels mandates) in place at this writing, assess the extent of their implementation based on available data, and estimate to the extent possible the implications of likely implementation. Using a range of projections from international agencies for comparison, we gauge the extent to which current mandates will expand future levels of biofuel consumption and production by 2025.

We find that the projected expansion of biofuels, and the resulting demands on food, land, and water, is indeed worrisome. Today we live in a world where two[2] to three[3] percent of transportation fuel is accounted for by biofuels (depending on the source one uses). Biofuels in the largest biofuel-producing countries, such as the United States and Brazil, comprise approximately 9% and 22% of gasoline and diesel blends consumed in each country, respectively, while most other countries' fuel supplies contain smaller percentages of ethanol and biodiesel.

* Timothy A. Wise is the Director of Policy Research and Emily Cole is a Researcher with the Global Development and Environment Institute at Tufts University. They would like to thank Sheila Karpf for her invaluable editorial assistance. The paper benefited from review by several experts, who remain nameless here. All errors are, of course, the responsibility of the authors.

The most commonly cited scenario from the International Energy Agency (IEA) projects a 150% increase in first-generation biofuel use by 2035. The agency estimates that 8% of transportation fuel (by volume) would come from biofuels,[4] with four-fifths of this expected to come from first-generation sources and just one-fifth from the assumed development of cellulosic ethanol and other second-generation biofuels produced from feedstocks that result in less competition for food and land.[5] IEA thus estimates that roughly 6% of transportation fuel would come from first-generation biofuels in 2035.[6]

Other international agencies estimate lower rates of expansion, and those are more consistent with our estimates based on current mandates and targets. The Organization for Economic Cooperation and Development and the UN Food and Agriculture Organization (OECD/FAO), for example, suggest a 50-60% increase in ethanol and biodiesel consumption over the next ten years.[7]

According to our estimates of global mandates for seven major biofuel-consuming countries (the United States, EU, Brazil, Argentina, China, India, and Indonesia), first-generation biofuel consumption could be expected to grow 43% over its current levels if existing mandates are fully implemented. This means the world would be blending 3-5% of first-generation biofuels into domestic fuel supplies by 2025.

These estimates are indeed worrisome, though they fall well short of the IEA estimates of a world with 8% of transportation fuel being derived from biofuels. This should bring little comfort to those concerned with the food, feed, land, and water demands of continued first-generation biofuel development. A 43% increase over current levels would likely require 13-17 million hectares more land than we are currently already devoting to biofuel production and approximately 145 billion more liters of water (assuming biofuels production requires roughly the same amount as current U.S. corn ethanol production).[8] A more detailed quantitative assessment of these impacts is much-needed to evaluate the specific impacts in different regions and countries under different scenarios.

What's more, the policies (and data) remain uncertain in several large developing countries, most notably China and India. We have good reason to believe that both will experience relatively limited expansion of first-generation biofuel use, but any large-scale commitment to first-generation biofuel development in these countries would have a dramatic and devastating impact, whether the feedstocks or fuel are sourced domestically or imported.

In addition, we find:

Mandates Are Key Drivers

- The number of countries with consumption mandates has risen to 64 and is continuing to grow.
- OECD mandates will continue to be the real drivers of biofuels demand, with the United States and the European Union projected to account for roughly 60% of global biofuel consumption in 2025, and nearly 50% of projected new biofuel consumption.
- Most mandates are based on percentage shares of consumption, rather than volumes as in the United States. The mere growth in demand for transportation fuels, due to economic growth

and the rise in the prevalence of private automobiles, particularly in large, fast-growing developing countries, can be expected to account for a 16% rise in biofuel consumption over current levels.

- An oversupply of palm oil production in supplier countries like Indonesia, partially caused by EU mandates, has contributed to more ambitious consumption mandates in Indonesia.[9] Indonesia shows the most ambitious targets and the most dramatic growth in first-generation biofuel consumption among developing countries, contributing to an already-serious deforestation problem.
- Full implementation of mandates is by no means certain. In India, for example, ethanol targets were recently scaled back from 20% to 5% because the country has lagged in sugar production to provide the necessary feedstock. India is now blending only about 2% ethanol into its transportation fuel supply. India also has a 20% biodiesel target, but there is good reason to doubt it will meet such a goal.[10]

Trade is a Major Driver

- Brazil is a major producer and consumer. Economic growth will drive rises in domestic consumption, but ethanol exports are also expected to increase depending on market and trade conditions. The United States is also seeking to expand its ethanol exports.
- Mandates are driving growing ethanol trade, in perverse ways. Brazilian sugar ethanol is imported by the United States to fulfill its mandates for advanced biofuels, while the United States has sometimes exported corn ethanol to Brazil to make up for losses to the Brazilian domestic market.
- Prior to Dec. 2011 when the U.S. ethanol tax credit and tariff were eliminated, Caribbean Basin Initiative (CBI) countries received preferential treatment in the U.S. ethanol market. The Central American Free Trade Agreement allowed Brazilian ethanol to be dehydrated in CBI countries and then exported to the United States.[11]

Significant Technological and Policy Uncertainty

- China is the biggest wild card in these projections. With a mandate that covers just nine provinces now, China is blending only 1.1% biofuel into its transportation fuels, and that is not expected to grow appreciably. The government has been sensitive to the food-fuel competition in its policies to date, but the country's demand for transportation fuel is projected to grow dramatically, creating strong incentives for the government to promote consumption. Any expansion of China's biofuel consumption would have global repercussions, particularly if China relies on imported feedstock or fuel to meet such mandates.
- The emergence of potentially more sustainable non-food-based, second-generation biofuels and implementation of sustainability standards could alter these estimates considerably if the technology and commercial applications proceed more quickly than currently projected. Public research and incentives for second-generation biofuels may help jumpstart the industry beyond its current small scale, but much is still unknown.
- Second-generation biofuels could be no better than first-generation fuels if they displace land or other resources from other productive uses.

Recommendations

Our analysis suggests the need for governments to cease the implementation and expansion of current food-based biofuels consumption mandates and to forgo the creation of new mandates. Mandates prop up demand for biofuels, particularly at times when oil prices are relatively low. Governments and international bodies should also eliminate perverse incentives such as biofuels subsidies for first-generation biofuels that impact the food supply.

Proposed reforms to U.S. and EU mandates are welcome and needed. The EU proposal to limit first-generation biofuels to 7%, within the EU's 10% mandate, would reduce the EU's contribution to global biofuel expansion by 50%.

The United States would do well to consider similar reforms. The United States is expected to remain by far the largest global consumer of first-generation biofuels in 2025, contribute the most to global consumption, and do so using the feedstock – corn – that provides the fewest environmental benefits and most directly competes with food and feed markets. Even a modest reform, such as that proposed by the Environmental Protection Agency in 2013 to scale back the mandate, would reduce projected consumption growth in 2022 by one-third.

Mandates must be scaled back further, and strict sustainability criteria must be applied to mandates for both first and second-generation biofuels. Otherwise, governments are mandating not just biofuel consumption but hunger and unsustainable resource use.

The full paper is available at:
http://www.ase.tufts.edu/gdae/policy_research/BiofuelMandates.html

I. Introduction

Expanded demand for biofuels, fed significantly by government policies mandating rising levels of consumption in transportation fuel, has been strongly implicated in the recent rise and volatility in global food and feed prices.[12] First-generation biofuels, made from agricultural crops, divert food directly to fuel markets and divert land, water and other food-producing resources from their current or potential uses for production of feed for animals and food for human consumption. First-generation biofuels produced from input-intensive and food-based crops have been tied to food and feed price increases, increased greenhouse gas (GHG) emissions for certain fuels, land rights disputes in developing countries, conversion of native grasslands and wetlands to biofuels crops, and other unintended consequences.[13]

Unlike some second-generation biofuels, which are less likely to compete with food crops for land and other resources, first-generation biofuels such as corn ethanol, soy and palm biodiesel, and sugarcane ethanol dominate the current global biofuels market. When the biofuels industry was in its infancy, its proponents promised that second-generation biofuels would come on line in a few years and food versus fuel concerns would wane as perennial grasses, agricultural residues (such as corn stalks or cobs), and wood residues would be used for cellulosic ethanol production.[14] However, cellulosic ethanol production is failing to reach large-scale commercial production, and hence, biofuels produced around the world are failing to meet high levels of GHG emissions reductions that were once promised. New estimates suggest, for instance, that corn ethanol production in the United States may actually contribute to greater carbon emissions than gasoline.[15]

The biofuels industry seeks additional expansion of both first- and second-generation biofuels production. Agribusinesses and biofuels lobbying organizations have pushed for biofuels expansion in countries that currently have large biofuels mandates – most notably Brazil, the European Union (EU), and the United States – and in others where biofuels mandates have yet to be filled or greatly scaled up such as in India and China.[16]

In this paper, we document the global spread of the most widespread government support policies for biofuels, consumption mandates. Sixty-four countries now have biofuel mandates that reflect a wide range of ambition but that all encourage the use and usually the expansion of biofuels.[17] These generally mandate the incorporation over time of a rising share or volume of biofuel into a country's transportation fuel.

The three largest mandates include the U.S. RFS, Brazil's ethanol and biodiesel mandates, and the EU's RED. U.S. demand for ethanol has expanded drastically since 2007, partially a result of subsidies and the RFS mandate but also its use as an oxygenate additive as a replacement for lead. The mandate rose from 11BL a decade ago to nearly 53BL today. Brazil, a country with the oldest global ethanol mandate of 25% ethanol (E25), consumed 24BL of ethanol in 2014.[18] Responding to recent concerns about food vs. fuel, the EU proposed a cap on the amount of biofuels that can be derived from food crops at 7%, out of its 10% biofuels mandate, by 2020. The EU currently consumes about 19BL of biofuels, and most member states will expand consumption further to meet both the 7% proposed food-based biofuels cap and the 10% overall mandate.

We show these and other national and regional mandates in place at this writing, assess the extent of their implementation and likelihood of fulfillment based on available data, and estimate to the extent possible the implications of implementation on global land availability and water use. Using a range of projections from international agencies for comparison, we gauge the extent to which current mandates will expand future levels of biofuel consumption and production by 2025.

Today we live in a world where two[19] to three[20] percent of transportation fuel (depending on the source one uses) is comprised of biofuels. Biofuels in the largest biofuel-producing countries, such as the United States and Brazil, comprise approximately 9% and 22% of gasoline and diesel blends consumed in each country, respectively, while most other countries' fuel supplies contain a smaller percentage of ethanol and biodiesel.

The most widely cited scenario from the International Energy Agency (IEA) suggests a 150% increase in first-generation biofuel use by 2035, with 80% derived from non-cellulosic fuel.[21] This demand increase would mean that the world's transportation fuel supply would be comprised of 8% biofuels in 2035, with 6% from first-generation biofuels.[22]

Other international agencies estimate lower rates of expansion, which are in line with our estimates of demand growth. The Organization for Economic Cooperation and Development and the United Nation's (UN) Food and Agriculture Organization (OECD/FAO), for example, suggest a 50-60% increase in ethanol and biodiesel consumption over the next ten years.[23] Considering current levels of implementation of existing mandates and projections from these and other institutions, it is clear, even with the most conservative estimates, that first-generation biofuels production and consumption will grow significantly over the next one to two decades with significant implications for the environment, food prices, and the livelihoods of people around the world.

II. Background

Biofuels include all fuels made from organic matter. In this paper, we focus on biofuels that can be used for transport, specifically ethanol and biodiesel, and more specifically so-called first-generation biofuels, which are made from food or feed crops. While many of the concerns presented in this paper are equally true of biomass used for electricity production, biomass has not been explicitly included in our estimates and analysis.

A biofuels feedstock is the organic material that is used to make the ethanol or biodiesel. Different countries produce and consume biofuels from different feedstocks with different environmental and social impacts. The principal feedstock in the United States is corn for ethanol. In the EU it is biodiesel made from vegetable oils such as palm oil. Brazil relies on sugar for ethanol. While every feedstock may have an appropriate use, at high volumes they all can have unintended consequences, especially those that are in limited supply. For example, used cooking oil is a feedstock for European biodiesel, which would otherwise go to waste. But heavy demand for used cooking oil is increasing demand for virgin cooking oil such as from African palm, in effect feeding a competition between fuel and food.

Biofuels: Defining Terms

The terms "first- and second-generation biofuels," "conventional ethanol," "advanced biofuels," and "cellulosic ethanol" are used throughout this paper. Below is a definition of each as it is used here:

First-generation biofuels: ethanol and biodiesel produced from crops such as corn and sugarcane (for ethanol) and palm oil, soybean oil, rapeseed oil, used cooking oil, and other vegetable oils (for biodiesel), which are largely also used as food and feed crops. These biofuels have been produced for decades, especially in the case of Brazil with sugarcane ethanol and the United States with corn ethanol.

Second-generation biofuels: ethanol or biodiesel produced from largely non-food feedstocks such as perennial grasses, wood and agricultural residues, algae, etc. While these could potentially result in less competition with the food supply, second-generation biofuels have yet to be produced at large commercial scales so their effects on land use, water supplies, food security, and GHG emissions are still little known.

U.S. Renewable Fuel Standard categories: The U.S. RFS, enacted in 2005 but expanded in 2007, mandates that the U.S. fuel supply contain 138 billion liters (BL) of biofuels from three different biofuels categories by 2022. Note that these categories differ from those of first- and second-generation biofuels listed above, meaning that even though our analysis focuses on first-generation biofuels, the United States considers some first-generation biofuels such as sugarcane ethanol to qualify as an "advanced" biofuel. Terms used in the U.S. case include the following:

- **Conventional ethanol:** the "renewable fuel/conventional ethanol" category in the RFS requires ethanol to meet a 20% GHG reduction threshold although most facilities were grandfathered into this category, meaning they may actually *increase* GHG emissions; conventional ethanol is mostly comprised of corn ethanol.
- **Advanced biofuels:** biofuels that meet a 50% GHG reduction threshold; types of approved advanced biofuels include soy biodiesel, biodiesel from other vegetable oils and animal fats, cellulosic ethanol (see below), and sugarcane ethanol.
- **Cellulosic ethanol:** cellulosic biofuels that meet a 60% GHG reduction threshold and are derived from cellulosic feedstocks such as perennial grasses and wood or agricultural residues.

In 2011, the global biofuels market was worth $83 billion—roughly the size of the world coffee market.[24] The global biofuels market tripled between 2000 and 2007.[25] More recently, between 2009 and 2011 the market doubled again.[26] Today 2-3% of global transportation fuel is from biofuels.[27] A global commodity, biofuels is heavily traded across the globe with some countries both exporting and importing biofuels.

Social and Environmental Costs

Sizeable percentages of food crops are diverted to biofuels production now and will continue to be diverted in the future, with implications for food security. According to FAO-OECD projections, by 2023, 12% of maize and other coarse grains will go to biofuel production, while 14% of global vegetable oils will be used to produce biodiesel; for sugar, 28% will go into the production of transportation fuels.[28] During the recent 2008 food price crisis, 20-40% of the food price increases were attributed to biofuels.[29]

An October 2012 GDAE/ActionAid report found that corn-importing countries paid $11.6 billion in higher corn prices due to U.S. ethanol expansion from 2006 until 2011, $6.6 billion of which was borne by developing nations where much of the population already spends 60-80% of their income on food.[30] A May 2012 GDAE/ActionAid report estimated additional import costs to Mexico in particular, in the form of higher corn prices due to U.S. ethanol expansion, of at least $1.5 billion since 2004. Increased corn prices reduce purchasing power for consumers and can offset international aid dollars sent to developing countries for food and agricultural programs.[31]

Many international agencies have called for reforms to government policies that encourage the continued expansion of first-generation biofuel production. In 2008, the former head of the World Bank, Robert Zoellick, called on countries to reform biofuels mandates due to negative impacts on food security.[32] In 2011, a report commissioned by G20 agricultural ministers, recommended that countries "remove provisions of current national policies that subsidize (or mandate) biofuels production or consumption," acknowledging that biofuels production was a significant factor in increased food prices and food price volatility.[33] And in 2013, the UN Committee on World Food Security's (CFS) High Level Panel of Experts report on biofuels noted that "biofuels and more generally bioenergy compete for land and water with food production"; it recommended an additional set of guidelines be created to evaluate the viability of national biofuels policies based on the impact of said policies on access to land and on international food security.[34]

The environmental benefits of biofuels have also been called into question. Land used to grow biofuels crops is often converted from non-food uses, such as forests, adding to the environmental issues associated with deforestation. In Indonesia, for example, overall forest losses (due partly to palm oil expansion) have been projected as high as 6 million hectares from 2000 to 2012.[35] A recent study from the journal *Nature Climate Change*, estimated that by 2012 Indonesia was losing primary forests at a rate of 840,000 hectares per year, higher than losses in Brazil. (The Indonesian government, however, has reported significantly lower rates of deforestation to the UN – approximately 400,000 hectares annually between 2009 and 2011.)[36] As the World Resources Institute notes, "although the evidence of destruction is mounting, the picture has been muddied by conflicting data, disinformation, claim and counterclaim."[37] The Rainforest Action Network reports that Indonesia is the "third largest emitter of global warming emissions after China and the United States, with 85% of its emissions profile coming from deforestation and drainage of peatlands [of which palm oil is a major driver]."[38]

Two of the original goals for biofuel development in the EU and United States in particular were to increase energy independence and to reduce GHG emissions in the transportation sector. The

case for each has gotten weaker over time. As one IEA study puts it, "It is increasingly understood that 1st–generation biofuels (produced primarily from food crops such as grains, sugar beet and oil seeds) are limited in their ability to achieve targets for oil-product substitution, climate change mitigation, and economic growth."[39] In 2011, the National Academies of Science concluded that first-generation biofuels such as corn ethanol are failing to significantly reduce GHG emissions in part due to indirect land use change, and that cellulosic ethanol production in the United States is unlikely to reach a large commercial scale due to technological and economic challenges.[40]

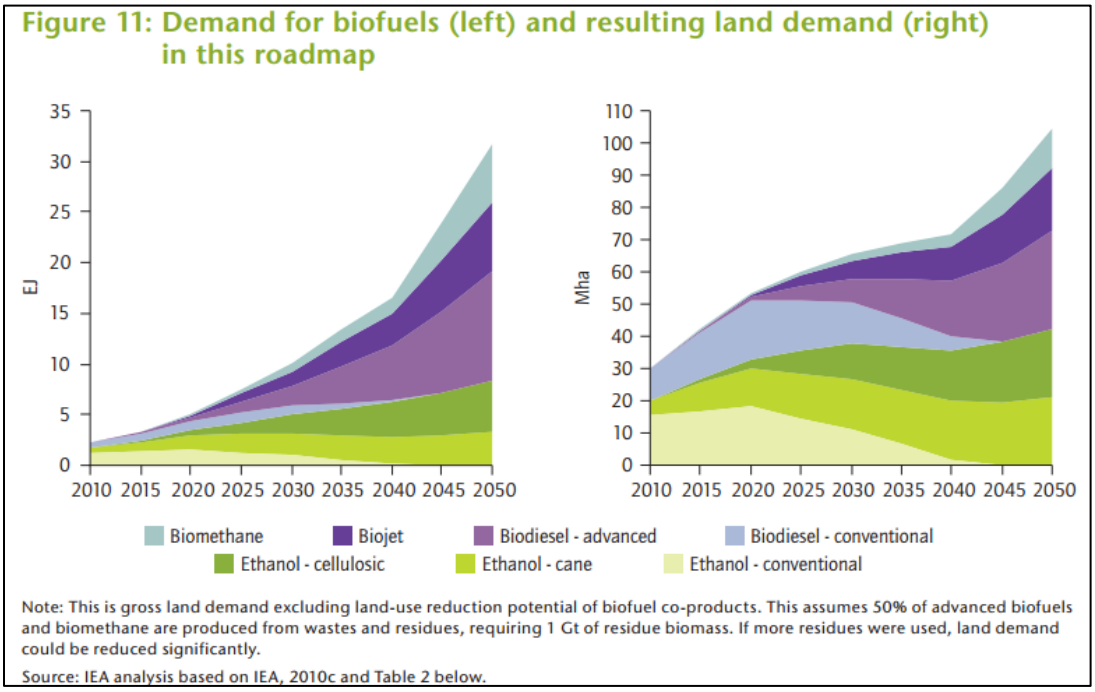
Other first-generation biofuels may result in GHG emission reductions, but figures vary primarily due to different calculations of emissions from indirect land use change. For instance, when corn in the United States is diverted from the feed supply to biofuel production, for instance, additional feed crops must be produced elsewhere which can lead to farmers tearing up native grassland and draining wetlands to create more arable farmland. Cropland dedicated to other food and feed crops (oats, barley, alfalfa, etc.) has decreased in countries such as the United States, Guatemala, and Brazil as demand for corn, sugar, and soybean cropland rose over the past several years.[41]

Cellulosic biofuels, a specific type of second generation biofuel, may offer significant GHG benefits and could have more limited impact on land use. Cellulosic biofuels are also expected to lead to fewer food-versus-fuel impacts associated with first-generation biofuels. However, some next-generation biofuels recently proposed in the United States, such as corn biobutanol, would still be produced from food-based crops. Second-generation technologies are under development, and they are not expected to be commercially viable in a significant way by 2025.[42]

Even organizations that are bullish on the use of biofuels, such as the IEA, recognize the land demands for their future biofuels scenarios. Each exajoule (EJ, 10^{18} joules, a unit of energy used at the industrial production level) of energy created requires about 10 million hectares of land. (See Figure 1)[43] It is worth noting that the land-intensity estimates even for second-generation biofuels remains significant (about 3 million ha/EJ), raising questions about their sustainability.

Estimates vary, but according to the FAO, an estimated 2-3% of arable land is devoted to biofuels production.[44] FAO estimates "an equivalent of 20.4 million [hectares (ha)] of sugar cane, or 38.5 million ha of corn, or, if it were biodiesel, 58.8 million ha of rapeseed" are now used in biofuels production worldwide.[45] In the developed world and emerging economies, the energy and land use investments in biofuels vary dramatically. For example, in the United States, 37% of the corn crop is diverted to ethanol production (but one-third of this corn ends up as livestock feed via a by-product called distiller's grain).[46] In the UK in 2011, 1.8% of all farmland was dedicated to growing crops for ethanol,[47] but it also relied upon imported biofuels and biofuel feedstocks from other countries to meet its mandate.

Figure 1[48]



In developed countries and in emerging economies, biofuels production may cause relatively little social disruption, environmental and land use implications aside. In the developing world, however, the demands of biofuels production are much more likely to disrupt the local population and economy.[49] In some countries, such as India and Thailand, there is already great pressure on cropland. Expanding biofuels production in these countries, from any feedstock, would have additional impacts on land use. Countries such as Brazil have systems in place to reduce direct and indirect land use change.[50] However, these systems have not necessarily been effective since soybeans have instead been planted in areas with restrictions on new sugar plantations.

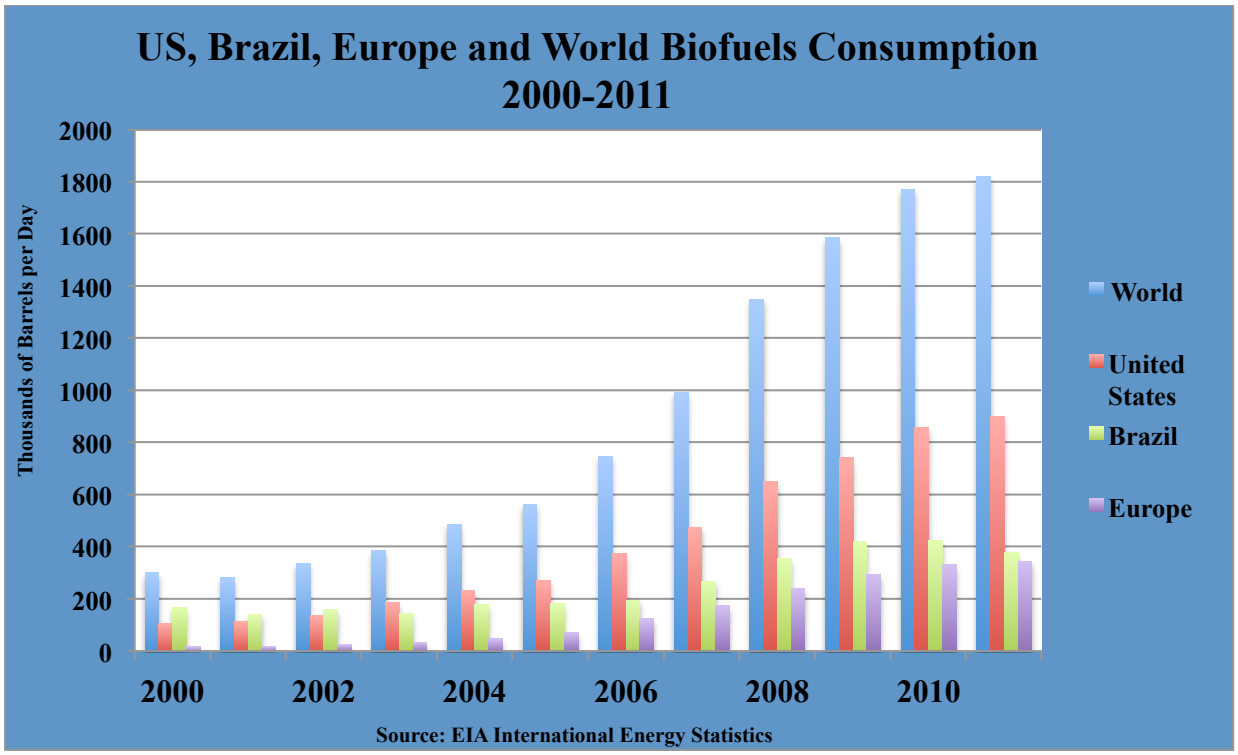
In other countries such as Ethiopia where there are already large-scale land acquisitions and significant displacements of people due to foreign investments in land projects and "villagization," large-scale biofuels projects are yet another threat to rural communities' livelihoods, food security, and human rights. (See Appendix C for list of existing and planned biofuels projects in Ethiopia). In other African countries such as Tanzania, the land rush for biofuels and other agricultural production has resulted in vast tracts of land being sold or leased to commercial interests, many of which are large multinational biofuels companies or agribusinesses aiming to export biofuels to the EU and other countries with large biofuels mandates. Local communities lose land previously used for farming, animal grazing, fishing and gathering wild foods, as well as for wood and water collection, when land deals prioritize investors and outside interests over local livelihoods.

Key Players

While 64 countries have biofuels mandates or targets, global production and consumption of biofuels is driven principally by a few countries. The United States is responsible for 43% of global production of biofuels.[51] Brazil, the second largest producer, provides 26% of global production.[52] Germany (4.9%), France (3.9%), and Spain (2%) round out the top five biofuel producers.[53]

OECD countries are the largest consumers of biofuels and drive biofuels production within their own borders and across the world.[54] As Figure 2 shows, biofuels consumption has increased dramatically since 2000. By 2011, world use had increased 500% with the largest increases coming in the United States.

Figure 2[55]



Focus on Mandates

While subsidies have also played a large part in the development of biofuels industries, the primary focus of this paper is biofuels mandates, as they are the primary government support across countries. Mandates provide security for investors knowing a market for their goods will continue over their investment period, and they drive the development of fuel distribution networks, such as the blending of ethanol into gasoline and its storage and dispensing at fueling stations.

Mandates can take one of two forms. The first, a consumption mandate, requires a certain volume of biofuels to be blended with gasoline and diesel each year. This is the type of mandate

that exists in the U.S. RFS.[56] The more common form of mandate requires that a certain percentage of transport fuel consist of ethanol or biodiesel. This is the form of mandate used in the EU[57] and most other countries.

Countries have pursued biofuels policies for many seemingly worthwhile goals:

- Promoting energy security
- Reducing dependence on fossil fuels
- Supporting rural communities, smallholder farmers and rural development
- Reducing GHG emissions and accessing a low-carbon transportation fuel (particularly the EU)
- Improving the nation's trade balance or balance of payments by reducing oil imports
- Promoting national self-sufficiency

In the OECD, these policies were mainly crafted in the early 2000s. In hindsight, mandates were overly optimistic with respect to technical, infrastructure, and market challenges. It is now apparent that biofuels mandates failed to predict future negative impacts on land use, GHG emissions, food security, and rural communities. GHG emissions reductions have been found to be more limited than first thought, indirect land use changes are now understood to be significant, and with high crop prices in 2011-2012 farmers and consumers alike have dealt with higher and more volatile crop and food prices. In the EU and United States in particular, these changes have led to recent proposed policy reforms and ongoing debate over the value of biofuels use.

In other countries, the motivating factors above remain strong. For some countries, such as South Korea, the world's fifth largest oil importer, the pressure to diversify its energy mix for security and economic reasons may outweigh the higher cost and social and environmental impacts of biofuels consumption.[58] Indonesia is a similar story.

Many developing countries have followed the OECD's lead in instituting biofuels mandates. These countries have pursued biofuels policies to show their commitment to fighting climate change and advancing energy security, but also to spur rural development, support the agricultural sector, and move up the agricultural value chain. In addition these policies provide subsidies for particular industries (sugar in India, for example). In Southeast Asia, Malaysia and Indonesia have recently increased domestic biofuels mandates to counteract deteriorating export opportunities as a result of anti-deforestation policies taken by buyers such as the EU. Utilizing more palm oil for biofuels increases demand for the feedstock, increases farm-gate prices, and reduces the amount of diesel that must be imported for consumers. Countries have looked to biofuels both to reduce their dependence on expensive foreign oil but also to create an export industry that could help provide a source of foreign exchange.

The notable exception to this typology is Brazil, the country with the oldest and most fully developed biofuels sector. In the 1970s, Brazil invested heavily in producing ethanol from sugar cane in response to high international oil prices, leading to its position as a leader in the biofuels market, particularly for ethanol.[59]

From biofuels producers to large landholders, every country producing biofuels has much at stake if biofuels mandates are reduced or eliminated, although some biofuels would still be

blended (for use as an oxygenate, for instance). This is widely seen as one of the reasons biofuels policies have been so slow to respond to high crop prices and social and environmental concerns.

Government Supports for Biofuels

Major biofuel-producing countries – including Brazil and the United States - have relied on mandates and subsidies to build their biofuels industries. These incentives span the supply chain, from feedstock production to final blending of biofuels with gasoline or diesel. European biodiesel is also subsidized, and cost-competitive because of the significantly higher cost of gasoline in the EU. In France, the estimated cost of biofuels subsidies for 2011 only was between €170 million and €210 million for ethanol and almost three times that amount for biodiesel—between €612 million and €800 million.[60] But it is also the case that in other markets like Indonesia, the drain on national budgets from fossil fuel subsidies makes the mobilization of homegrown feedstocks – in this case, palm oil – a more attractive proposition. Fossil fuel subsidies themselves distort markets, and layering biofuels subsidies on top of them creates large national expenditures and several unintended consequences as certain fuels are prioritized over others.

As the IEA has noted about the rise of biofuels, "The rapid growth of the biofuels industry would not have been possible without government subsidies because many biofuel producers, especially in developed countries, are not cost competitive."[61] The story of biofuels expansion is, therefore, a story of subsidies and mandates. Using the United States as an example, its ethanol and biodiesel industries were propelled by decades of subsidies for production and blending with gasoline and diesel, import tariffs, and the RFS mandate which was enacted in 2005 but greatly expanded in 2007. While the largest tax credits for ethanol and biodiesel have expired, the biodiesel and cellulosic tax credits and other credits such as those for biofuel infrastructure investments are routinely extended, and other smaller supports in various government agency programs continue to prop up the industry.

III. International Biofuels Production and Consumption Estimates

Before presenting our assessment of current mandates and what they would mean for global biofuel demand, we present some of the most important projections from international organizations. They vary in their assumptions, methodologies, and time horizons, but all confirm that we are likely to see significant expansion in biofuel consumption for at least the next ten years. The estimates range from a low of 50-60% growth in demand by 2023, to a high of 150% by 2035. Below, we examine estimates from the International Energy Agency (IEA), the OECD/FAO's Agricultural Outlook, and the U.S. Energy Information Agency (EIA).

Each agency makes assumptions about the key drivers of biofuel demand, both in terms of government policies and market-based factors. All attempt to incorporate announced government policies, though it is difficult to keep up with the ever-changing policy environment. Any projections of 10-20 years into the future will be sensitive to assumed growth rates in key drivers, and such differences in assumptions explain the variation in these estimates.

Transportation fuel demand will be a primary driver of biofuels consumption, especially in fast-growing developing countries such as China and India, but also in areas with mandates for biofuels blending by percentage of transportation fuel. (The blending percentage can stay the same but the effective demand increases with the growth in the market unless fuel efficiency increases, thus reducing the level of fuel demand.) This consumption will be driven by:

- *Population Growth*: with economic growth and economic growth, population growth, especially in emerging markets, will be a key driver of transportation fuel demand.

- *Economic Growth (world, nation, per capita)*: as countries become more affluent, they drive more, demanding more transportation fuel.

- *Number of Miles Driven*: While the United States does not serve as a good model for the rest of the world, recent reductions in number of miles driven show the uncertainty in predicting future patterns of consumption.

- *Fuel Efficiency Standards and Vehicle Technological Change*: changes in transportation technology such as hybrid cars, electric cars, E15- and E85-ready cars and increased fuel efficiency standards will also affect demand. Radical, global change in fuel efficiency could temper demand growth. Consumer uptake of E15, E85, and other higher ethanol blends, stations offering higher blends of ethanol, and availability of flex fuel vehicles also affects consumption, particularly in the United States

- *Broader Energy Markets:* decisions made about broader transportation planning affect demand, including reliance on electrification, commitments to mass transit, and alternative forms of transport.

Other key drivers of biofuels demand include:

- *Oil Prices*: when deciding whether or not to substitute some petroleum consumption with biofuels, the relative prices of these goods is paramount. As petroleum prices are notoriously difficult to predict, oil prices in particular may pose a problem for complex modelers looking several years in the future. In addition, petroleum is an input for first generation biofuel feedstock that is grown with petroleum-based fertilizers. As an input, as oil prices increase, the price of biofuels may also rise. The effect on their relative prices will be a key biofuels demand driver, factoring in subsidies and mandates, which affect prices.

- *Food and Fiber Prices*: like oil prices, the prices of food and fiber will determine whether or not biofuels consumption is economically viable. First generation biofuels are not only competing with food and fiber for land, fertilizer and water, but are produced from food and feed products themselves.

- *GHG Emissions Pricing Schemes*: in the estimates cited here from the IEA, EIA and OECD/FAO, carbon markets and the assumption of a carbon savings from biofuels are key to their continued expansion.

- *Speed of Technological Change in Biofuels*: technological changes and commercial adoption of these technologies are built into IEA and other models projecting increased demand. For years, the biofuels industry promised cellulosic fuels would be commercially viable, but they have been slow to develop due to technological and economic challenges. In the U.S. 2007 energy bill, for instance, policymakers mandated 6.65BL of cellulosic ethanol to be blended with gasoline in 2014, but only 65 million liters (barely 1% of the mandate) are expected to be produced. Whether and how quickly such industries develop will determine a great deal about first-generation biofuel growth.

International Energy Agency Projections

The International Energy Agency (IEA) makes several energy consumption estimates in its *World Energy Outlook* each year. The estimates below are drawn from its 2013 report. The IEA uses three policy scenarios to make its projections.

1. *New Policies Scenario*: this is the most commonly cited set of global projected-demand numbers in research and policy circles. It models "cautious implementation of existing policies," meaning it accounts for policies that are currently in place and assumes the implementation of announced policies. [62] It is the scenario IEA believes reflects the most likely future.

2. *Current Policies Scenario*: this very conservative scenario considers only policies that were in place by mid-2013.

3. *450 Scenario*: the 450 Scenario considers "an energy pathway compatible with a 50% chance of limiting the long-term increase in average global temperature to 2 degrees Celsius."[63]

Biofuels consumption is assumed to increase based on economic and population growth, reductions in fossil fuels subsidies, and a modest increase in petroleum prices. In addition, all three scenarios assume a GHG benefit from biofuels use, although the importance given to GHG reductions as a demand parameter is different in each scenario. In these models, biofuels would have an added economic benefit in carbon trading schemes or with the enactment of a carbon tax making them significantly more price competitive with fossil fuels, although actual GHG emission reductions seen on the ground may differ from projections.

New Policies Scenario

The New Policies Scenario assumes an average rate of GDP growth of 3.6% per year until 2035.[64] It also assumes non-OECD GDP will surpass OECD GDP as early as next year,[65] with strong growth rates for China (5.7%)[66] and India (6.3%)[67] through 2035. Moreover, IEA assumes world population will reach 8.7 billion by 2035 and that 62% of the population will live in urban areas.[68] At the same time, this scenario assumes only modest increases in oil prices from $110/barrel in 2011, $113/barrel in 2020 and $128/barrel in 2035.[69] More than 175 countries currently have fossil fuel subsidies, which the IEA sees declining in the next 20 years, making biofuels more economically competitive.[70] IEA also assumes that China will stick to its goal of

reducing its dependence on coal and that India will meet its current 5% ethanol mandate and continue to blend 5% ethanol even as gasoline demand increases.

In line with industry and other academic and governmental predictions, IEA finds "the U.S., Brazil, EU and China make up more than 80% of biofuels demand."[71] By 2035, OECD countries will make up a little under half of biofuels consumption.[72] IEA predicts China will drive growth in biofuels until 2020 when consumption will be driven by India, whose population will be surpassing China and Southeast Asian countries.

The New Policies Scenario assumes an initial increase in energy demand of 1.6% per year, which slows after 2020 to an average of 1%.[73] In this scenario, therefore, there will be a 33% increase in total energy demand by 2035.[74] Energy demanded for "transport grows at an average rate of 1.3% per year over the projection period," with the majority of growth coming from non-OECD countries.[75]

Bioenergy investments are expected to outpace energy demand in aggregate and are thus expected to represent a larger share of total transport-sector demand by 2035. Specifically, IEA predicts a 1.5% annual increase in investments in bioenergy—both biofuels and biomass.[76] This growth is small compared to other renewables (7.3%),[77] but represents a dramatic and persistent increase in production. IEA expects biofuels production to account for only 5% of the increased investment in renewables.[78] However, projections on investment as opposed to production are highly speculative.

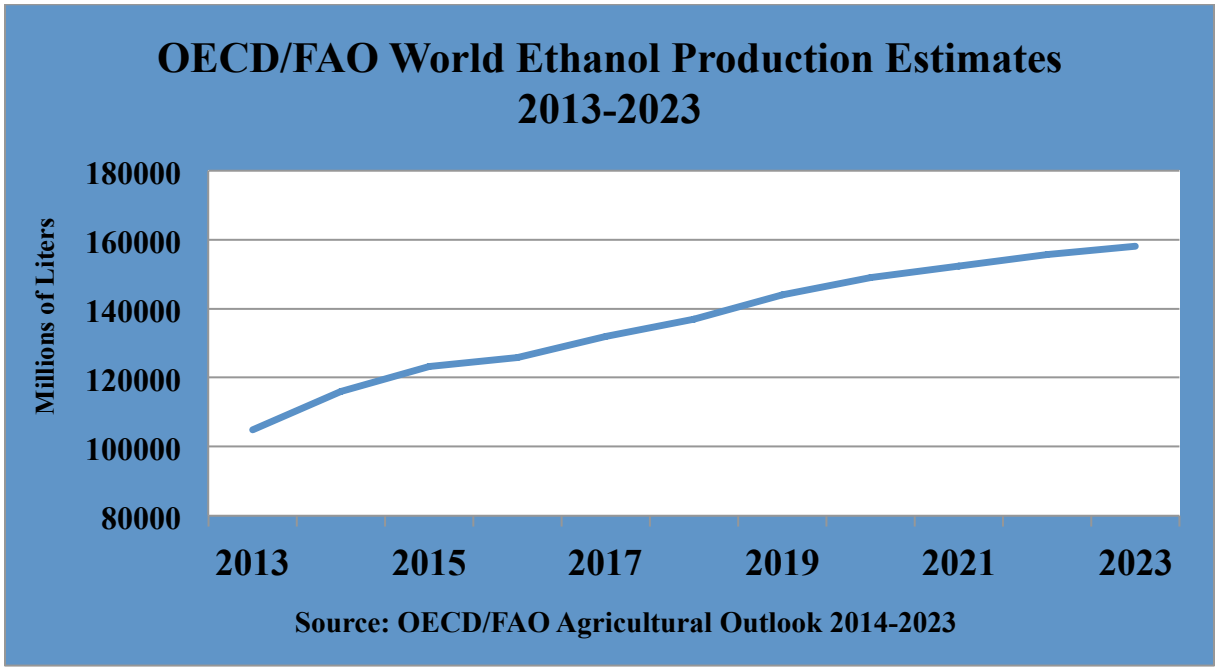
In terms of volumes, IEA predicts consumption of biofuels will increase from 1.3mboe/d in 2011 to 4.1mboe/d in 2035.[79] This aggressive projection predicts 8% of road-transport fuel demand in 2035 will come from biofuels.[80] Yet, they predict that*, even in 2035,* 80% of that fuel will still come from first-generation biofuels, with just 20% coming from cellulosic or other advanced fuels.[81] (Note that the IEA definition of "advanced" may not align with the RFS definition as IEA does not consider sugar ethanol to be advanced).

OECD/FAO Projections

The OECD, established in 1961 to "promote policies that will improve the economic and social well-being of people around the world," predicts an overall increase in global biofuels production but a smaller share in percentage terms represented by demand in OECD countries.[82] OECD countries include the world's richest and the top two biofuels producers in the world – the United States and EU – but also emerging countries like Mexico, Chile and Turkey. The OECD also works closely with emerging economies such as Brazil and those that may greatly influence biofuels markets in the future – China and India.[83]

The OECD, in its annual *Agricultural Outlook* report with the FAO, projects a 50% increase in world ethanol production between 2013 and 2023 with production jumping from 105BL to 158BL.[84] It also finds biodiesel consumption will rise from 26BL in 2013 to 40BL in 2023—a 54% increase over 2013 consumption.[85] The projected expansion in world ethanol production is shown below.

Figure 3[86]



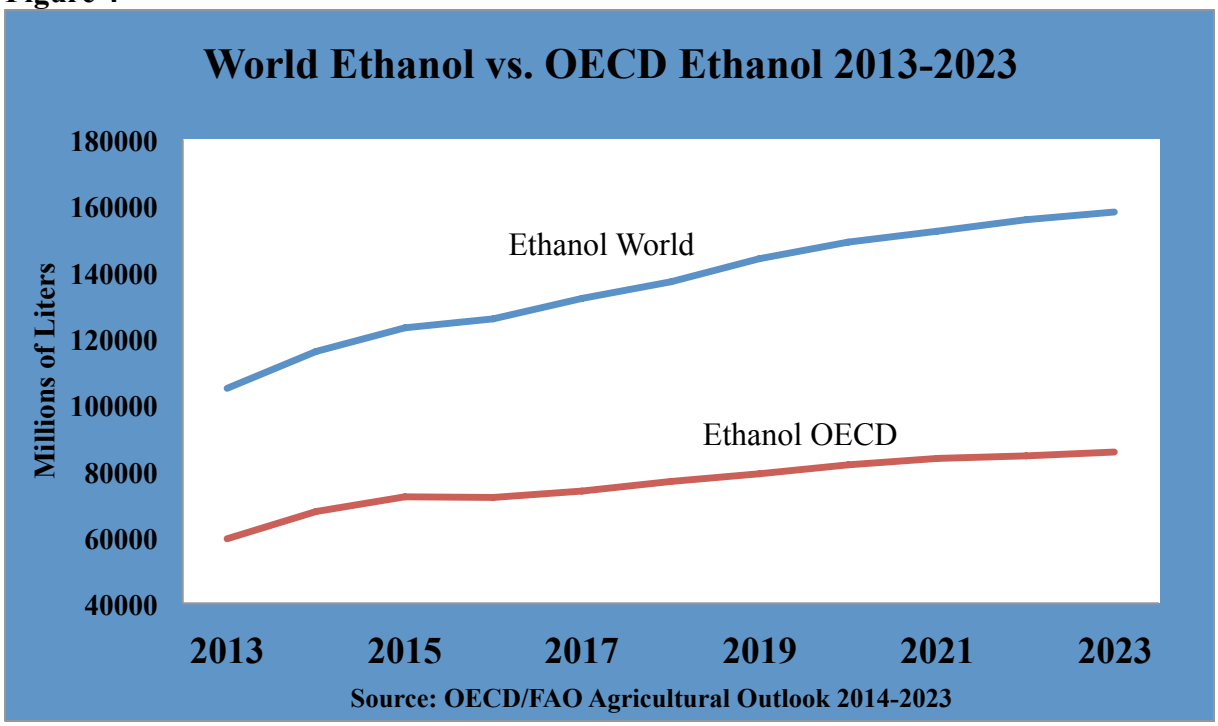
In addition, OECD/FAO predicts, "By 2023, 12%, 28% and 14% of world coarse grains, sugar cane, and vegetable oil production, respectively, are expected to be used to produce biofuels."[87]

While OECD countries dominate biofuels consumption today, the OECD/FAO report finds member states will play a less dominant role in the world biofuels market, as illustrated in the graph below. Brazil currently accounts for most consumption in Latin America, but it is Asia where OECD/FAO predicts biofuels will see the greatest growth, particularly in China and India.[88] Overall, OECD/FAO predicts that growth in ethanol production among developing countries from 45BL in 2013 to 71BL in 2023, will be mostly be driven by Brazil and its 25% ethanol mandate.[89]

OECD/FAO predicts U.S. ethanol use will be significantly restricted by the blend wall and will grow only marginally in terms of percentage consumption.[90] They assume only 12% of the U.S. cellulosic mandate will be implemented by 2023.[91] In addition, OECD/FAO considered political factors in its estimates, including the assumption that the biodiesel blender tax credit will not be renewed.[92] This political analysis is important in bringing predictions in line with political changes instead of assuming a continuation of current policy, although the biodiesel tax credit has typically been renewed.[93]

OECD/FAO's analysis of European demand assumes that current mandates will be fulfilled and carried forward at least through 2023. OECD/FAO finds further that the EU RED fulfillment percentage will be 8.5% accounting for allowable double-counting of GHG-reducing fuels (out of its mandate for 10% of transportation fuels coming from biofuels by 2020).[94]

Figure 4[95]



U.S. Energy Information Agency Projections

The U.S. Energy Information Administration (EIA) has arrived at very different projections from those of the OECD/FAO and IEA. EIA finds that world biofuels production will increase from 1.5 million barrels of oil equivalent per day (Mboe/d) in 2011 to 1.7Mboe/d in 2020, 2.7Mboe/d in 2035 and 3Mboe/d in 2040.[96] Similar to the other models, EIA sees OECD countries dominating production in the short term and non-OECD countries overtaking OECD output in the long term. The timeline for this change is much slower than the other models, however. In 2011 EIA has OECD countries producing 1.0Mboe/d and non-OECD countries producing only 0.5Mboe/d.[97] In this model, OECD and non-OECD countries do not produce equivalent amounts of biofuel (1.2Mboe/d) until 2030, and by 2040 non-OECD countries only lead OECD countries by 1.6Mboe/d to 1.3Mboe/d.[98]

Unlike the other two models, EIA does not see rapid growth in either China or India. While it predicts an annual percent change of 7.8% in India—a significant year over year increase—they find that India will not even produce 0.1Mboe/d by 2040.[99] EIA finds China will produce only 0.1Mboe/d by 2020, 0.3Mboe/d in 2035 and 0.4Mboe/d in 2040, but this growth still translates to a 300% growth rate from 2020 to 2040.[100]

IV. Country Mandates and Main Findings

Sixty-four countries now have biofuels mandates or targets.[101] The level of implementation varies dramatically among these countries, from fully implemented to just announced. Some countries have only begun to create a legal framework for biofuels blending (Mozambique),

while others have been producing and consuming biofuels for decades (Brazil). While the background information underlying our analysis is static, our findings show a great deal of movement within biofuels targets and mandates with many countries recently readjusting their mandates or targets both up and down based on price and availability of ethanol and biodiesel in their markets as well as in response to other political, social, and economic objectives.

Mandates and targets range from a high of 25% ethanol blend in Brazil and Paraguay to a low of a 1% biodiesel mandate in Taiwan. The EU's RED has a 10% blending mandate by 2020, but if reforms are approved only 7% is expected to be derived from food-based feedstocks due to recent proposals in the EU to cap the use of crop-based biofuels. The United States has a volume-based mandate that is effectively 10% currently because only up to 10% ethanol can currently be blended into the existing vehicle fleet; the U.S. Environmental Protection Agency (EPA) has approved a 15% ethanol blend (E15) for newer vehicles, but consumers are unlikely to use E15 soon due to due to its incompatibility with older vehicles and small engines, in addition to engine warranty and liability concerns.

In Latin America and East Asia, mandates are much more likely to be tied to levels of production, while mandates in Sub-Saharan Africa and South Asia are largely aspirational. For example, India recently scaled back its 20% ethanol target to 5% and is likely to be at just 2.5% in 2015. India initially hoped to support local sugar production, but faced several hurdles in implementing its plan. An outlier is Zimbabwe, which has invested heavily in biofuels and has a 15% ethanol mandate because it faces economic and trade sanctions, leading to ethanol being more economical than regular gasoline.

With the notable exception of Brazil, countries such as the United States and members of the EU were some of the first countries to implement biofuels mandates. Today, many countries in the developing world, especially biofuels producers, also have biofuels mandates. Our research finds that countries in the developed world are much more likely to have implemented their biofuels mandates or have come close to meeting biofuels targets/mandates (United States, Canada, and Germany) than countries in the developing world (India, Nigeria, and Ethiopia). This reflects both the time countries have had to meet these mandates and secure supply, but also the difficulties of starting a biofuels blending program.

This developed-developing world divide masks, however, the important differences between countries with established and functioning biofuels production and those without. Even in the developing world—especially emerging-market countries—countries where biofuels production has already taken root are consistently meeting their current mandates (Colombia and Ecuador). For countries without the buying power of the OECD, the driving factor behind the implementation of their mandates is the success or failure of domestic production (Panama and Zimbabwe).

In many cases mandates attempt to track biofuels availability and domestic consumption. Indonesia's palm oil biofuels industry is the best example of this trend. It currently has a 5% biofuels mandate, with a target of 15% ethanol and 20% biodiesel by 2025, not only to support domestic production, but also to absorb local demand in part due to the EU proposing to cap food-based biofuels at 7% of volume.[102] In Colombia, the ethanol mandate is explicitly reliant on

ethanol stocks and is either 8% or 10% depending on availability. This would also be true from a different angle in the United States if the EPA elected to waive the RFS mandate downward to reflect lower production of cellulosic ethanol.

Overall, there is great variety in mandates, with producers with excess capacity looking to expand their mandates and export biofuels, and importing and OECD countries leveling off their mandates either in terms of volumes or as a percentage of their total consumption due to various food-price, land-use, or environmental concerns.

Methodology

In the summary table below and in the more expansive tables in the appendices, we strive to present the most up-to-date information on whether biofuels volume mandates have been met and the primary feedstock being produced and/or consumed in these countries. As discussed later, there is very good data on biofuels production and consumption in OECD countries, but data are less complete in parts of the developing world and in countries that have recently adopted mandates.

Information has been compiled from industry, international and country reports, and U.S. Department of Agriculture (USDA) country reports. We have privileged the most up-to-date information in our search, but some of this information is a few years old. We have included information we were able to access through regular desk research methods. All of the information below and in the appendices is publically available.

The full list of countries and regions with biofuels mandates can be found in Appendix B. For purposes of analysis we divided the countries in the appendix into several categories, each of which has large consumers in the summary table:

- **OECD**, or developed countries such as the United States and EU, which mostly have 10% ethanol mandates and which mostly are moving toward those goals.

- **High-production countries meeting high mandates**, most notably Brazil and Argentina but also several other countries, such as Colombia and the Philippines.

- **High-production countries failing to meet high mandates or targets,** such as China, India, and Indonesia but also several other Asian countries such as Malaysia, Thailand, and Vietnam.

- Other **countries with aspirational mandates** or targets, with varying degrees of likelihood that they will meet them, such as Chile, Nigeria, and South Africa.

The majority of countries in the world do not have biofuel mandates or targets, and these include several large consumers. Most notable are large petroleum-producing countries such as Russia, Venezuela and the Persian and Arabian Gulf countries, although some of them import biofuels from countries such as Brazil and the United States. The United Arab Emirates is one of the

largest importers of U.S. ethanol, for instance.[103] They see little need or value in developing domestic biofuel industries.

As the summary table of selected biofuels consumption mandates shows (Table 1), full implementation of existing mandates and targets would represent a 43% expansion of first-generation biofuels demand over current levels. We present the seven most important biofuels consumers, their mandates and/or targets, their current consumption levels as both volume and as a share of transportation fuel, the additional volume and share implied by full implementation, and the total volume adding in anticipated demand growth for transportation fuels. Added transportation demand contributes significantly (20% of the overall increase in demand) to the total projected biofuels volumes in the countries in which the mandates/targets are a percentage of fuel, but the United States is the notable exception here. (A version of the summary table, with additional notes on sources, can be found in Appendix A.)

Growth pathways could increase further if full mandates/targets are fulfilled, not just those for first-generation biofuels. For instance, we assume: (1) India fails to meet its 20% biodiesel target, which is unlikely in the short-run; and (2) the United States meets mandates for first-generation biofuels but not for cellulosic biofuels, meaning just over half of the mandate is included in this analysis. We assume the United States uses 76BL of first-generation biofuels (such as corn ethanol, soy biodiesel, and sugarcane ethanol) in its fuel supply by 2025, out of a total of 137BL required by the RFS in 2022.[†]

Other assumptions in the summary table analysis include the following:

- EU estimate includes double-counting for advanced fuels, so the effective demand increase from its 10% mandate is 8.6%.[104]
- Consumption numbers for Brazil are calculated based on its 25% ethanol mandate, the latest figures available.
- Argentina's transportation demand is calculated differently because USDA estimates a change in ratio of gasoline to diesel. Separate demand increases were calculated for gasoline and diesel, which have implications for ethanol and biodiesel use.
- China has both a 10% mandate and a 15% target, but only for nine provinces. We assumed China would meet its 15% target because past targets have systematically been met. China's transportation fuel demand growth rate in affected provinces is assumed to be the same as China's overall growth rate. Where uncertainty in current implementation of mandates exists, the midpoint of the range was used for calculations (e.g. China 8-12% current ethanol blend was calculated at 10%).

[†] We assume the U.S. meets its 57BL mandate for corn starch ethanol, 3.8BL mandate for biodiesel (which could be increased by the U.S. EPA), and that the remaining 15BL are met by imported sugarcane ethanol (total of 76BL). We assume the remaining 61BL, mandated to be filled with cellulosic ethanol, a second-generation biofuel, are not produced due to technological and economic challenges, and that EPA waives down this mandate, leaving just 76BL of the mandate to be fulfilled. However, this volume could increase further if the U.S. Congress or EPA alters biofuels mandates to allow more food-based biofuels (such as corn biobutanol and corn oil biodiesel) to count toward its "advanced biofuels" mandate since cellulosic ethanol production has failed to materialize as policymakers projected in 2007.

- We only considered India's 5% ethanol mandate to be binding, so we did not assume the country's 20% ethanol and 20% biodiesel targets would be filled.
- Indonesia currently has a 5% mandate for biofuels, but also has more aggressive targets of 15% ethanol and 20% biodiesel by 2025. The higher targets are used in this analysis.
- All transportation growth is annualized on a linear basis from IEA and USDA growth rates.

Table 1: Selected Biofuel-Consuming Country Mandates through 2025
(in billions of liters)

Country	Mandate/target			Current Consumption		Mandated Increase	Transport Fuel Demand Growth through 2025	Added Volume, Full Mandate+ Demand Growth	Projected Demand 2025	
	Timeframe	Ethanol	Diesel	vol	% fuel supply	%	%	vol	vol	% increase
United States	2022	72 BL	3.8 BL	62.9		21%	N/A	13.1	**76.0**	**21%**
European Union	2020	10.0%		18.7	5.0%	72%	-8%	12.1	**30.8**	**64%**
Brazil	2014	25.0%	7%	29.0	27.5%	0%	36%	12.2	**41.2**	**36%**
Argentina	2014	5%	10%	2.0	7.6%	25%	57%	1.3	**3.2**	**64%**
China*	2020	15%	-	3.6	8-12%	50%	59%	3.9	**7.5**	**109%**
India	2014	5%	-	2.3	2.1%	42%	47%	2.0	**4.3**	**89%**
Indonesia	2025	15%	20%	0.8	3.0%	795%	65%	7.1	**8.0**	**860%**
Total Selected				**119.2**				**51.6**	**170.9**	**43%**

Sources:
All current volumes are taken from the most recent US Department of Agriculture (USDA) GAIN reports unless otherwise noted.
Transport fuel demand growth rates are calculated from IEA's New Policies Scenario except for Indonesia and Argentina.
Ethanol and diesel demand estimates for Argentina, for 2015-2024, are taken from USDA's GAIN Report for Argentina, 2014.
Ethanol and diesel demand estimates for Indonesia, for 2015-2024, are taken from USDA's GAIN Report for Indonesia, 2014.
Diesel consumption for India is derived from USDA's GAIN Report for India, 2013.
Current volumes for the US are the Environmental Protection Agency's (EPA) 2013 mandated biofuels volumes.
*China's mandate is for nine provinces only, representing just 1.1% of current fuel use and a projected 1.3% in 2025.

Full Implementation of Existing Mandates

As the table shows, most large consuming countries with mandates or targets have only partially implemented them, Brazil being the most notable exception. The United States is close to fulfilling its mandate for first-generation ethanol (13BL away from its 76BL mandate of first-generation biofuels). The EU is about 12BL away from its overall 10% mandate, though there is wide variation among member countries in their progress.

OECD countries drive current consumption and account for about half of the growth in projected biofuels demand by 2025. This would be considerably lower if the United States and the EU reformed their mandates. As noted earlier, the EU is currently considering capping the use of crop-based biofuels at 7%. (Here we estimate implementation based on the full 10% mandate, adjusting for double-counting.)

Mandates and targets in key large emerging economies have important implications for future growth in biofuel consumption and production. Information is less reliable, and policy goals are under revision. Still, we present the likely mandates/targets of major biofuel-producing countries and their implications.

Brazil is a large producer and consumer, with high mandates that have been filled. The projected 36% increase in its consumption comes solely from fast-growing demand for transportation fuels, a high percentage of which are biofuels. While the pie may be getting bigger, biofuels' share of the transportation fuel supply is expected to stay relatively flat. Argentina is a much smaller consumer with lower mandates, but increased transportation demand, in addition to increased mandates, are expected to lead to a 64% increase in consumption by 2025.

Two of the least certain mandates include those in China and India. China currently has a 10% mandate in nine provinces only, which it has reached, with a target of 15%, suggesting 50% growth in demand from the target alone. Given anticipated high growth rates in demand for transportation fuels in addition to increased biofuels targets, the projected growth rate is 109% through 2025. This represents an increase of only 3.9BL despite the high percentage increase because the mandate is limited to nine provinces. Future Chinese biofuels policies are expected to continue to be mindful of food vs. fuel concerns (which began after food price spikes in 2008) and future analyses of demand for agricultural commodities. Nationally, biofuels now account for just 1.1% of transportation fuels and that share would grow to just 1.3% in 2025.

India is only halfway to meeting its 5% ethanol mandate, recently scaled back from 20%. Its 20% biodiesel target has not been reduced, but we do not include it here as it is not a binding mandate and, as we explain below, there is good reason to believe India will have to reduce it. Still, even without added biodiesel, we expect India's biofuel production to increase 89% to 4.3BL by 2025.

Indonesia presents the largest planned growth on a percentage basis (860%) as it moves from its current 5% biofuel mandates to aggressive 15% and 20% targets for ethanol and biodiesel, respectively. With high anticipated transportation fuel demand growth, such targets would make Indonesia one of the most significant sources of new demand for biofuels between now and 2025 – 8.0BL – with the bulk of the feedstock expected to come from palm oil.

Overall, these countries account for the large majority of current biofuel production. Assuming they continue to account for such a proportion, the impact of full implementation of their mandates and targets would have huge impacts on land use, water quality and quantity, food prices, and GHG emissions. Our figures suggest a 43% increase in first-generation biofuels consumption over current levels. This world in which 3-5% of the global fuel supply is comprised of first-generation biofuels is close to projections offered by the OECD/FAO scenario. However, growth rates could increase to 115% if second-generation biofuels mandates are met and if other countries such as India meet their lofty biofuels targets. This would result in a world in which 4-7% of the world fuel supply is comprised of biofuels, which is closer to IEA estimates.

For a full list of country mandates please see Appendix B.

Limits to Full Implementation

There is good reason to believe that many countries will be unable to fulfill their current mandates. For some, such as countries in the EU, a likely future 7% cap on food-based biofuels (out of a 10% mandate) leaves a 3% gap to be filled with non-food-based biofuels that have been slow to come to full commercialization. Many countries have yet to meet even the proposed 7% cap. For the United States, the blend wall currently prevents the full implementation of the RFS, and since cellulosic biofuels are required to meet nearly half of the 137BL mandate, policy reforms will be required to bring the mandate more in line with realistic production volumes. For others, such as India, access to feedstock (sugar) is proving difficult to secure.

There are, of course, risks that additional mandates in key countries could add to biofuel demand in ways not anticipated here. As is often the case, China and India are the two most important wild cards for such estimates.

Below we analyze the likelihood of implementation, recent calls for reform, and present the key factors guiding the development of biofuels policies, consumption, and production in selected countries and regions. We find that if recently-proposed policy reforms are implemented (such as in the United States and EU), we can expect lower first-generation biofuel growth, but overall global demand is still expected to increase significantly.

United States

The United States is the world's largest biofuels producer and consumer.[105] The twin pillars of U.S. biofuels policy have included a mandate as well as an intertwined set of subsidies focused at the dominant feedstock (corn), as well as refining and blending facilities (some of which have expired). While the largest tax credit for ethanol production, the Volumetric Ethanol Excise Tax Credit (VEETC), ended in 2011, the biodiesel blenders and cellulosic ethanol production tax credits are routinely extended. State incentives and other federal government programs have also contributed to establishing the required infrastructure to make biofuels production economically viable.

The RFS mandates 137BL of conventional ethanol (mainly corn ethanol), advanced biofuels, and cellulosic biofuels to be blended into the U.S. fuel supply by 2022. In the U.S. mandate, definitions of these different types of biofuels are based primarily on their contributions to reducing life-cycle GHG emissions, as estimated by EPA. In our analysis, we assume the corn ethanol, biodiesel (biomass-based diesel), and a portion of the advanced biofuels mandates will be met (totaling 80BL of the full 137BL mandate), but importantly, we do not assume the 61BL cellulosic ethanol mandate is met since production is just beginning to come on line and experts estimate the mandate will not be filled by 2022. The gap that exists between the advanced biofuels and cellulosic ethanol mandates creates an incentive for additional production/importation of food-based biofuels such as imports of sugarcane ethanol from Brazil and production of other food-based biofuels such as soy biodiesel and corn biobutanol.

U.S. Renewable Fuel Standard Definitions

The RFS mandates increasing levels of the following types of biofuels by 2022:

- **Corn starch ethanol:** the mandate for corn starch ethanol is 57BL by 2015, and this mandated level continues throughout the life of the full RFS. This category is required to meet a 20% GHG reduction threshold (as compared to U.S. gasoline), although several corn ethanol facilities were grandfathered into the law, meaning they were not required to reduce GHG emissions.

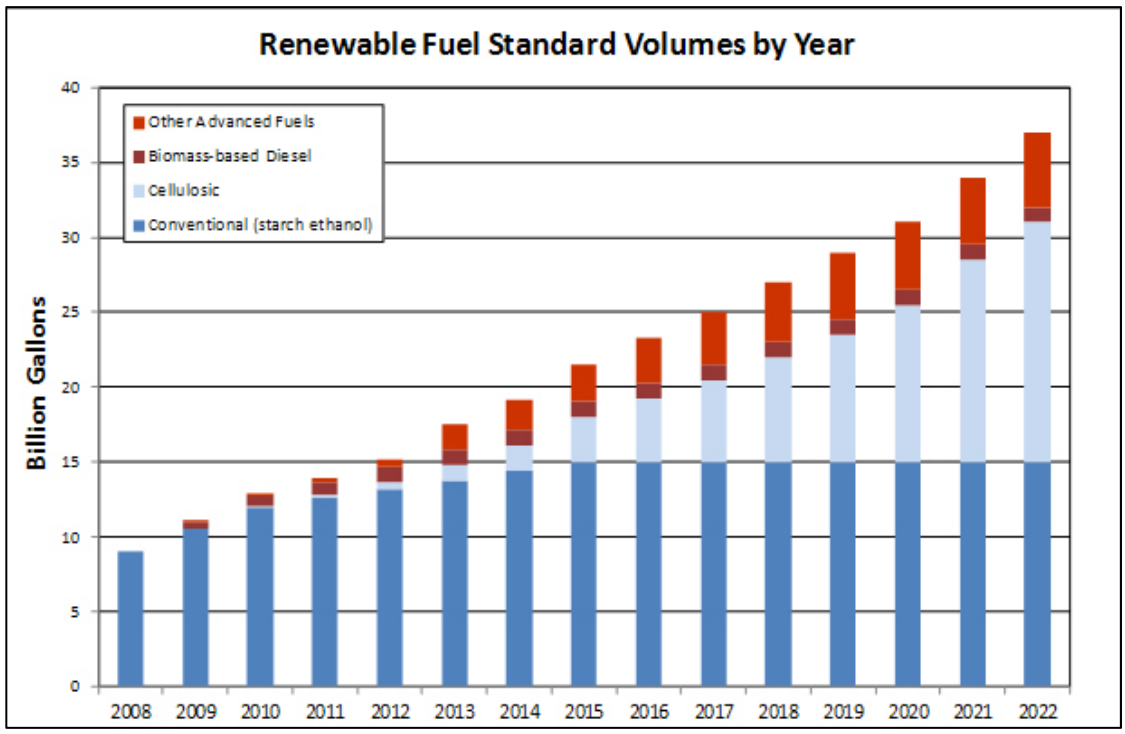
- **Advanced biofuels:** Rising to 80BL by 2022, the advanced biofuel mandate may include biofuels such as sugarcane ethanol, biomass-based diesel (such as biodiesel derived from animal fats, soy, or other vegetable oils), cellulosic ethanol (see below), and other advanced biofuels. These are required to meet a 50% GHG reduction threshold set by the U.S. EPA. The EPA is currently considering whether to treat corn biobutanol, a fuel that does not face the same fueling infrastructure challenges as corn ethanol, as an advanced biofuel, meaning that food-based biofuels may still be considered advanced biofuels in the United States

- **Cellulosic ethanol:** Rising to 61BL by 2022, the cellulosic ethanol mandate may include ethanol derived from cellulosic sources such as perennial grasses and wood and agricultural residues. This category is required to meet a 60% GHG reduction threshold. However, cellulosic ethanol is not produced at a large commercial scale yet, so in our analysis, we do not assume the United States meets its 61BL cellulosic mandate by 2022 (or 2025), leaving a gap of 19BL of advanced biofuels to be filled with fuels such as sugarcane ethanol and soy biodiesel (identified as "other advanced biofuels" in Figure 8).

Figure 5 details the scheduled increase in RFS mandated biofuels volumes, with corn ethanol leveling off at 57BL in 2015 and years thereafter, and cellulosic biofuels mandated to grow steadily after 2010.

Approximately 10% of U.S. gasoline supply currently comes from ethanol—primarily corn ethanol, while biodiesel blends are much lower. Growth projections are relatively flat though, given the issue of the E10 blend wall. The most recent EIA estimates project that biofuels will account for only 11% of U.S. transportation fuel in 2040, although its previous energy projections have estimated significantly higher volumes of biofuels.[106] As a comparison, the RFS mandate requires approximately 25% of the United States fuel supply be comprised of biofuels by 2022, the majority from cellulosic or advanced feedstocks.

Figure 5 [107]



Three key issues have led to the U.S. biofuels market expanding at a significantly slower rate than initially thought. First, Americans are driving less. The Great Recession led to large reductions in driving and this behavior change has not rebounded at the same rate as the economy. The EIA also projects that there will be fewer drivers per capita in the future.[108]

Second, Americans are driving more fuel-efficient cars. Higher Corporate Average Fuel Economy (CAFE) standards are lowering fuel demand. So are American preferences for cars with better fuel economy. Trading large vehicles for smaller cars and hybrids is leading to demand far lower than the EIA anticipated 10 years ago.

Third, the United States has hit the blend wall, or the maximum amount of ethanol deemed safe to blend into the U.S. fuel supply. Gasoline blended with 15% ethanol (E15) is now allowed in cars manufactured after 2001, but it is not available in most areas and issues with engine warranties and negative effects on older vehicles and small engines have prevented its widespread adoption. In addition, for the reasons cited earlier, unlike Brazil there is little indication the United States will significantly increase adoption of flex-fuel vehicles in the near future. If either of those occurred, the U.S. fuel supply could accommodate significantly higher levels of biofuels.

Each year, the Environmental Protection Agency (EPA) is able to revise RFS mandates based on the commercial availability of cellulosic biofuels. In recent years, the EPA has reduced cellulosic ethanol mandates by more than 95% because each year less cellulosic fuel is available than the RFS originally mandated. In 2015, EPA will consider waiving the *entire* RFS downward for

calendar year 2014, for the first time in history, due to these lower cellulosic volumes and the ethanol blend wall.[109]

Such reforms can make a large difference in global biofuel demand. If EPA finalized 2014 biofuel volumes in line with those proposed in late 2013 (one way to reform the RFS) and maintained these lower mandates throughout the rest of the RFS, the United States would contribute 4.6BL less to global first-generation biofuel demand, leading to a 14% demand increase instead of a 21% increase by 2022.

EPA is also able to waive RFS mandates downward based on petitions tying biofuels mandates to "severe economic harm." While several petitions have been submitted to EPA in recent years by U.S. states negatively affected by high crop and food prices, EPA rejected these citing other demand factors playing a larger role in higher food prices. In addition to administrative action, several legislative proposals have been introduced in the U.S. Congress to either eliminate or significantly reform biofuels mandates due to their impacts on food and feed prices and negative effects on the environment. If implemented, reform proposals would bring biofuels mandates more in line with current production volumes.

The arrival of the blend wall and the failure of cellulosic ethanol to come to large commercial production have resulted in numerous unintended consequences of the RFS. Combined with low feedstock (corn) prices, ethanol production in the United States is beginning to exceed the amount of ethanol that can be used in the current domestic vehicle fleet. Hence, U.S. ethanol exports are expected to increase to record levels in 2015 due to this confluence of factors. The RFS has also created a particular market for Brazilian sugarcane ethanol in the United States since cellulosic ethanol has failed to meet advanced biofuels mandates. Hence, in addition to soy biodiesel, sugarcane ethanol from Brazil is a major source of advanced biofuels, with imports of 7.7BL in 2013.[110] OECD projects that by 2023 Brazil could supply up to 38BL to the United States while the United States ships 19BL of corn-based ethanol to Brazil.[111] Others consider this level of bilateral ethanol trade unlikely.

Because Brazil has no restrictions in its own mandates or laws on GHG impacts, corn ethanol can substitute freely in the Brazilian market for some of the sugarcane ethanol exported to the United States The net effect leads to expansion of less beneficial corn-based ethanol fuel beyond its RFS mandate, while the mandate for advanced biofuels is met with additional food-based biofuel. However, these trade flows are highly dependent on volumes that the U.S. EPA finalizes, since the agency can lower advanced and cellulosic biofuels mandates if production is insufficient. Furthermore, the advanced biofuels gap at most is 19BL, with some of this likely being filled with soy biodiesel, so these projections are highly speculative.

The RFS provides a prime example of how domestic mandates interact with existing trade flows and lead to unexpected outcomes, and ones that frequently undermine the political purposes for which a domestic biofuel mandate was originally passed. And since the RFS has primarily been filled with corn ethanol, the RFS has failed to significantly reduce GHG emissions.[112]

European Union

In 2009, the European Commission (EC) established a minimum target of deriving 10% of transportation fuels from biofuels in each member state by 2020. Countries submitted their energy action plans to the Commission by June 2010.[113] During that time, civil society became concerned about both the environmental and social ramifications of this decision. As more evidence became available about indirect land use change due to biofuels, biofuels' effect on food prices, and the human and land rights issues associated with the production of biofuels in some countries around the world, advocates mobilized to change the law. In part, advocates were able to point to the sustainability criteria laid out in Articles 17, 18, and 19 of Directive 2009/28/EC.[114] These GHG and land use sustainability criteria have been in effect since December 2010.

As a result of these intense educational efforts, in October 2012, the EC proposed limiting food-based biofuels to 7% of the 10% renewable energy target in the RED.[115] While it does not go far enough, three-percentage points less in first-generation biofuel represents 11BL in avoided production (assuming the remaining 3% would be difficult to meet with non-food-based feedstocks). This reform would reduce the EU's projected growth rate in first-generation biofuel volume from 64% to 33%, (which also factors in a drop in transportation demand growth through 2025). Because this reform has not yet been implemented, the higher 10% biofuels mandate has been used in our analysis.

OECD/FAO reports 65% of European vegetable oil is being used for biodiesel.[116] In addition, several companies based in EU countries have acquired land in African countries to produce biofuel feedstocks, some of these resulting in land grabs which deprive local communities of land once used for food production, housing, burial grounds, forestry, etc.

The following table shows the origin of biofuels consumed in the EU.

Figure 6[117]

Origin of final biofuels consumed in the EU in 2010[17]

	Biodiesel			Bioethanol	
	Volume (ktoe)	Share		Volume (ktoe)	Share
EU	8,270	83.2%	EU	2,243	80.1%
Argentina	1,003	10.1%	Brazil	234	8.4%
Indonesia	285	2.9%	U.S.	121	4.3%
Malaysia	123	1.2%	Peru	26	0.9%
China	67	0.7%	Kazakhstan	24	0.8%
U.S.	61	0.6%	Bolivia	20	0.7%
Other countries	129	1.3%	Egypt	15	0.5%
			S.Korea	16	0.6%
			Other countries	101	3.6%
Total	9938			2800	

Source: EUROSTAT, COMTRADE.

Figure 7 shows the origin of the feedstocks of biofuels consumed in the EU, showing the EU's dependence on imports of feedstocks.

Figure 7[118]

Origin of all biofuel feedstock consumed in the EU in 2010

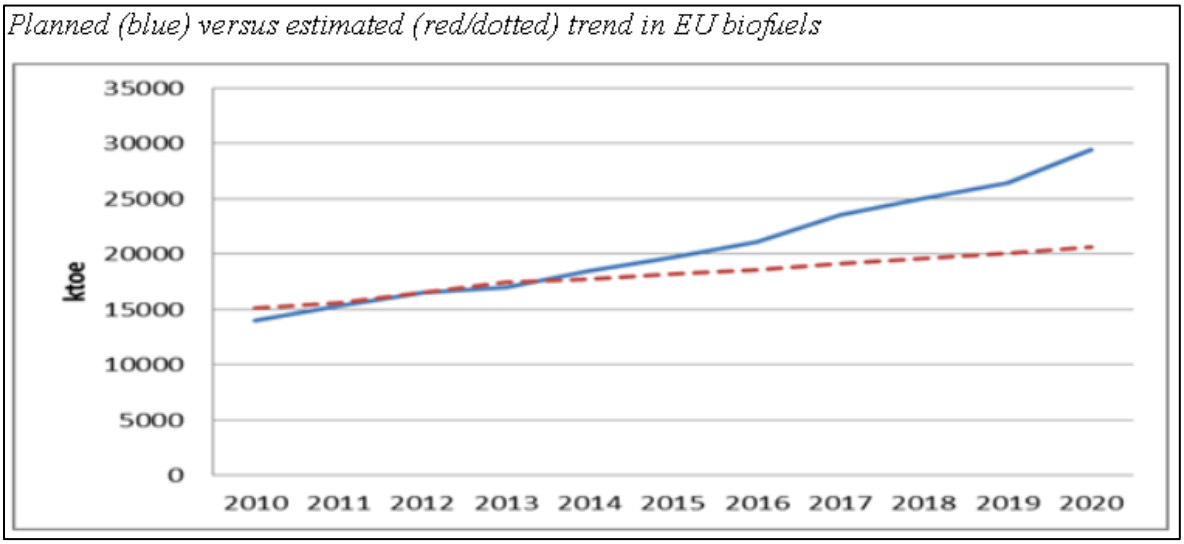
EU	Argentina	Indonesia	Brazil	U.S.	Canada	Ukraine	Malaysia	Paraguay	Other
63.9%	9.7%	6.6%	5.3%	3.0%	2.4%	2.3%	1.7%	1.5%	1.3%

Russia	China	Switzerland	Peru	Bolivia	Peru	Egypt	Guatemala
1.0%	0.5%	0.2%	0.2%	0.2%	0.2%	0.1%	0.1%

Overall, progress toward the 10% mandate has been uneven, leaving the EU as a whole unlikely to reach that goal, although added consumption is still projected to be an important driver of global biofuels demand. According to the EC, biofuel use in 2020, the end of the mandate period, is expected to be just two-thirds of the planned total.[119] (See Figure 8.)

Some European countries are already well on their way to meeting the 10% target, with Sweden already blending 10% biofuel into its transportation fuel. However, other countries such as the UK and Spain have yet to meet the newly proposed 7% cap on food-based biofuels, meaning there is still room to expand current blending levels. And since production of non-food-based biofuels has been slow due to technological and economic challenges, meeting the overall 10% targets will be difficult. Despite these constraints, recently proposed reforms, and concerns about biofuels' environmental and social impacts, the EU biofuel market is expected to continue to grow.

Figure 8[120]



Brazil

A dominant force in biofuels markets, Brazil has the longest running biofuels mandates in the world, a large flex-fuel vehicle fleet (which can operate on Brazil's 25% ethanol blend mandate) as well as tax incentives for biofuels production. Brazil's production and consumption of biofuels continue to increase. Ethanol production in 2015 is projected to be up 5% over 2014 at 26.9BL.[121] The Brazilian Senate passed a measure to increase the ethanol mandate to 27.5% from 25% and to cap biodiesel blending at 6%, but the proposal has yet to be approved by the

President.[122] In any case, the mandates in Brazil are seen more as a reflection of the market than a driver, in part because it affects only a small share of ethanol used in the country's vehicle fleet.

In addition to its domestic consumption, Brazil was also the world's largest ethanol exporter in 2013, although exports were down significantly in 2014.[123] In this interconnected market, Brazil exports sugarcane ethanol to the United States while the United States sometimes exports corn ethanol to Brazil to make up for losses. The United States is also its largest importer and accounts for 70% of Brazil's exports of ethanol.[124] Brazil's exports are projected to drop 46% in 2014 to 1.5BL as the United States considers scaling back its mandates for advanced biofuels, although previous estimates from the OECD/FAO projected increased ethanol trade over the next ten years.[125]

Even outside of the U.S.-Brazil relationship, Brazil has been a significant supply-side driver of the global biofuels market. It has used its technical expertise in ethanol as a source of soft power toward other emerging and developing countries to increase biofuels use, although this has leveled off in recent years.[126] For example, Brazil has invested in land, entered into "cooperative agreements," and provided biofuels technology to other countries, including many in Africa and countries in the Western Hemisphere.[127] Brazil and the U.S. signed a Memorandum of Understanding (MOU) in 2007 aimed at increasing agricultural and biofuels investments in developing countries such as Honduras, Nicaragua, Costa Rica, Panama, the Dominican Republic and Haiti, which the governments termed "ethanol diplomacy" at the time.[128] As a Committee on Foreign Relations (CFR) brief wrote in 2007, "Ethanol ha[d] become Lula's [Luiz Inacio Lula da Silva, the former President of Brazil] best diplomatic lever in Latin America…"[129]

Despite its influence, the domestic Brazilian ethanol industry has recently seen setbacks, including a reduction of gasoline taxes resulting in relatively cheaper gasoline and the country's discovery of new oil deposits, which may decrease domestic oil prices – the opposite reason biofuels mandates were first enacted in Brazil.

Argentina

Behind only Brazil in biofuels production and consumption in Latin America, Argentina has invested heavily in both ethanol and biodiesel production. A 10% biodiesel mandate and an ethanol blend rate of 7.6%--even higher than its 5% mandate—are driving Argentina's consumption of biofuels.

Argentina's biofuels production and consumption have expanded rapidly over the last few years. In 2010, Argentina's ethanol blend rate was only 2% but it is expected to rise to 7.5% in 2014.[130] As ethanol demand rises, Argentina is adding additional refining capacity, creating the infrastructure for future production. In the past year a new ethanol plant has brought annual production capacity up to 840 million liters.[131]

Its biodiesel blend rate is expected to double to 8% in 2014, from 4% in 2010. [132] In 2014, its biodiesel consumption and production were projected to be 1.4BL and 2.6BL, respectively, leaving room for biodiesel exports.[133] [134]

Peoples Republic of China

China initially embarked on a biofuels policy to absorb excess grain stores in the early 2000s. It switched course when the 2008 food price spikes led to concerns about shortages if this food was converted to fuel. Since then, China has invested in so-called advanced biofuels that can be grown on marginal land.[135] It has also involved its national oil companies in some biofuels production, showing its interest in developing biofuels for national energy security.[136]

When China makes investments, an entire market can move. The second largest economy in the world and home to one-sixth of the world's people, China has included biofuels in its current five-year energy plan. The U.S. EIA reports China produced 2.6BL of ethanol and 966 million liters of biodiesel in 2013.[137] Compared to the production of the United States or Brazil, these volumes are small. China has mandated 10% ethanol blends in gasoline in nine of its provinces, but this mandate is set to increase to a 15% target in 2020.[138] China is such a large market that these mandates and other infrastructure investments are worth particular attention.

China's investments in biofuels reflect their general approach to energy investing, ensuring the country is investing in all industries and that they are prepared for technological gain in any particular one. If, for example, cellulosic biofuel were to become commercially viable, it is likely China would be an early investor and adopter of this fuel. China is a large net importer of transportation fuel and depends on fuel for its continued economic growth. Considering China's investments in overseas oil fields, its investment in biofuels is modest indeed.

The quick reversal of policy in 2008 demonstrates that China is not wedded to biofuels production for ideological reasons and is likely to be sensitive to biofuels' competition with food crops to the extent that it affects food prices. Without powerful interest groups promoting biofuels, it is better able to adjust quickly to changes in the market either expanding or contracting its production. China has also recently announced it will remove or dial back other policy supports for ethanol. In 2015, it will remove the 17% value-added tax rebate at the same time it is adding a 5% tax on food-based biofuels.[139]

Based on China's stated intentions and recent actions on biofuels, it seems unlikely the government will increase its 15% biofuels target in the near future. Nor is it likely to extend the target to other parts of the country. As demand rises, of course, its consumption of biofuels will rise even with the same target in place. But its limited mandate means that presently only 1.1% of China's transportation fuel comes from biofuels, and even with anticipated growth that percentage would rise to just 1.3%.

If China were to choose to increase dramatically its biofuels production or consumption, it could dwarf production and consumption of many OECD countries. Any move to take the nine-province mandates national would have dramatic impacts, as would policies to import large quantities of biofuels. The environmental and human impacts could be overwhelming. In all models of future biofuels production and consumption, China, and to a lesser extent India, are wild cards, although China has a history of being an innovator in biogas and other homegrown bioenergy sectors.

India

The world's largest democracy embarked on a national biofuels policy in 2009.[140] Like China, India is a major transportation fuel importer and is hoping to improve its trade balance, support local agriculture and agricultural processing, and insulate itself from international oil markets by making non-petroleum energy investments. With a declared non-binding target of a 20% biofuel and biodiesel blend in transport fuels by 2017, India has publicly committed to scaling up biofuels production, but in practice it has done far less.[141]

In 2012, India's Cabinet Committee of Economic Affairs recommended its ethanol *target* be scaled back and changed to a 5% blending *mandate*. The country is currently blending only 2.1% ethanol into its transportation supply.[142] This is mainly due to limited supplies of sugarcane, especially after poor harvests in the past few years. Even with this dramatic reduction in its blending goals, India is projected to produce 2BL of ethanol in 2014.[143]

India's biodiesel target of 20% remains in place, but it is non-binding and it has not been replaced with a binding mandate (as was done with ethanol). The biodiesel industry has also failed to develop, with production in 2013 of just 115 million liters. The primary feedstock was intended to be jatropha, but the government and other countries are now searching for alternatives given its potential to become an invasive feedstock and its high water usage. Meeting the 20% biodiesel target would raise the country's biofuel use to more than 20BL, making it one of the world's largest biofuel consumers.

The Indian government set these initial targets in response to the country's impressive economic growth rate, fluctuating international oil prices, and a desire to be more energy secure.[144] In its own biofuels policy document it makes clear that its policy, unlike those of other countries, will not come into conflict with its food security goals and that biofuels will be derived from non-food feedstocks.[145] India is, however, unlikely to take food security concerns of other countries into consideration in its own biofuels import policies. Moreover, if a fully functioning, large-scale biofuels industry comes online, it is unclear if and how the Indian government would reverse its policy decisions to protect food security.

Despite significant targets and the outsized power of large sugar producers in India, it is unlikely that India will end up blending nearly as much ethanol and/or biodiesel by percentage into its transportation supply as Brazil. India's commitment to food security and its stated goal of prioritizing food security over biofuels development also makes it likely that its program will not grow significantly in the future. These qualifications aside, India's continued economic growth and increased energy demand coupled with its growing population could drive very high biofuels consumption even with its current blend rate. In terms of volume, India's demand could expand dramatically in the coming decade without changing its percentage mandate.

Indonesia

In 2011, Indonesia was the sixth largest producer of biodiesel.[146] Over the past several years, Indonesia has cleared huge tracks of land for its main biodiesel feedstock - palm oil – intended both for export and domestic consumption. Since the EU's adoption of a biofuels mandate,

Europe has become a significant consumer of Indonesian palm oil. A new proposal to limit biofuels from food-based feedstocks to 7% in the EU RED, in addition to broader concerns about unsustainable production of palm oil, has slowed exports to Europe.[147]

Indonesia is now using domestic mandates to drive local consumption as it continues to support production for both domestic and export markets through production subsidies and tax incentives.[148] It is too early to say if Indonesia's aggressive 2025 targets—15% for ethanol and 20% for biodiesel—will be met.[149] It currently has a 5% biofuel mandate, but is blending only 4.5% biodiesel and a marginal volume of ethanol.[150] Nevertheless, such dramatic growth in mandates and targets, especially as the country experiences economic growth and increased energy demand, would have huge environmental and social implications unless the government adopts smallholder-led palm oil development strategies and works to close the "productivity gap" with Malaysia.

Indonesia's biofuels expansion and other palm oil demand drivers have resulted in numerous negative impacts, including deforestation, large GHG emissions, and land and human rights issues. Groups such as the Rainforest Alliance, World Wildlife Fund, and Girl Scouts U.S.A. have raised issues of negative consequences of increased palm oil production in Indonesia such as "land-grabbing," forced displacement of communities, poor labor standards, large GHG emissions, and destruction of wildlife habitat. [151]

African Nations

Several African countries have enacted ethanol mandates or targets. Many of these mandates are new and were created in anticipation of domestic biofuels industries. It is too early to tell whether these mandates and targets will drive demand and help support these nascent industries.

South Africa, the most developed of the Sub-Saharan nations, has only begun its biofuels mandate, which is relatively low in any case – 2% ethanol and 5% biodiesel starting in 2015. Significant restrictions on water and land availability in the country make the development of a large domestic biofuels sector unlikely.[152] Moreover, South Africa has excluded maize use for biofuels because of food security concerns, and has also excluded jatropha for fears of it becoming invasive.[153] Despite these restrictions, there were four bioenergy projects operating in 2010 with four more in the pipeline,[154] and South Africa has begun to export ethanol to the EU.[155]

Countries from Senegal in West Africa to Tanzania in East Africa have been the sites of biofuels related land-grabs and failed biofuels projects as international companies seek new land to produce feedstocks in developing countries. Developed country biofuels mandates drive investment in not only biofuel feedstock production (such as sugar) but also biofuel refining facilities. Business setbacks as well as local unrest over forced displacement and other human rights abuses have been raised as reasons why governments should reconsider biofuels mandates, targets, and other incentives and investments in biofuels. Malawi and Zimbabwe are exceptions, being two of the only major producers of ethanol in Southern Africa. Zimbabwe, for instance, is currently blending 15% ethanol.[156]

It is unclear how African countries will approach biofuels moving forward. This is particularly true of countries and regions with recent discoveries of oil and gas. While countries like Angola and Nigeria have put biofuels mandates on the books, it seems unlikely that these large oil producers will follow through on these mandates. The lower domestic price of oil, especially with oil subsidies, makes biofuels particularly uncompetitive in these countries. Like oil producers in Northern Africa where no biofuels mandates exist, Sub-Saharan producers are unlikely sources of high biofuels consumption irrespective of the biofuels mandates they have on the books.

If OECD countries continue to demand biofuels, African production of biofuels is likely to expand in the coming years to meet at least part of this expanded demand. This is especially true in countries such as Ethiopia and Tanzania, which have prioritized large-scale commercial agriculture and foreign direct investment in the sector.

V. Conclusions

Our review of government biofuels mandates suggests consumption of first-generation biofuels in selected major biofuel-producing countries would increase about 43% by 2025 if most of these countries' mandates and targets were fully implemented. This analysis does not include mandates and targets that have little chance of implementation such as India's biodiesel target. The figure would be somewhat lower if existing mandates prove too difficult to achieve, and in some countries that is likely to be the case. First-generation biofuels consumption could be much higher by 2025 if the 64 current governments with mandates/targets continue expanding mandates/targets or if additional countries enact and actively pursue implementation of domestic biofuels mandates or targets.

Over the next ten years, OECD countries will continue to account for nearly two-thirds of first-generation biofuel consumption, and the fulfillment of their mandates would contribute to 50% of added first-generation biofuel use between now and 2025. The United States would be the largest contributor of new biofuels demand, adding 13BL, while the EU would add 12BL by 2025 to meet first-generation biofuel mandates. The United States would remain by far the largest consumer in 2025, with 76BL of first-generation biofuel consumption, which is projected to increase 21% in the coming years barring major policy reforms.

However, if recently proposed EU reforms (to cap food-based biofuels at 7% of the fuel supply) and U.S. EPA reforms (to limit the growth of biofuels expansion) were implemented, the EU and United States would contribute 11BL less to global first-generation biofuels demand in 2025; this would reduce mandate-driven global expansion from 43% to 38%. While these reforms do not go far enough, this demonstrates the impact that short-term policy reforms can have on global biofuels expansion.

Brazil will continue to be a major producer and consumer of biofuels, remaining the second largest consumer in 2025 after the United States with 41BL of consumption. Its consumption is projected to expand 36% if biofuel blending levels are maintained due to increasing demand for transportation fuel as a result of economic growth. The country is expected to continue to be a

net exporter, helping other countries fulfill their mandates. This has historically included the export of first-generation biofuel (sugarcane ethanol) to the United States for its advanced biofuel mandate in exchange for the import of another (corn ethanol). However, the economics of fuel blending could change if Brazil expands its oil industry, with the recent discovery of offshore oil, which is expected to increase its proven reserves and double its production capacity by 2020.[157]

China and India present the biggest sources of uncertainty. Any significant moves toward expanded biofuel consumption, over today's comparatively low levels, would have huge impacts for the environment, food prices, and agricultural markets. Based on current mandates and policies, however, the two are projected to contribute an additional 6BL to global consumption, barely half the consumption added by the United States. China's projected blend rate in 2025 is just 1.3%, moderation which keeps the country's large transportation sector from driving biofuel demand to even more unsustainable levels.

Indonesia, on the other hand, has the most aggressive targets, which it is moving to implement. Full implementation would add 7BL to global biofuel demand. This would only deepen the negative environmental and social impacts caused by the country's expanded production. In part, the EU biofuels mandate was responsible for Indonesia's large-scale planting of palm oil, in addition to other demand factors for palm oil and the government's intent to prop up domestic palm oil prices. The government's current mandates have responded to reduced demand by increasing domestic biofuel demand to absorb the excess feedstocks.

Given this increased demand for biofuels, the implications for land and water use and food security are huge. A 43% increase in biofuel production by 2025 would continue to divert food and feed crops into fuel markets. At current land-use rates, it would divert an additional 13-17 million hectares more land than we are currently already devoting to biofuel production and approximately 145 billion more liters of water at rates currently used in corn ethanol production. This is an important area for further research, with the implications depending significantly on the feedstocks used.

If the IEA's projections, which predict full implementation of global biofuels mandates, are accurate, however, our findings would represent only a portion of increased biofuels demand over the next two decades. Importantly, IEA includes second-generation biofuels mandates in addition to those for first-generation biofuels, suggesting that by 2035, the world fuel supply would be comprised of 8% biofuels by volume, with 80% of the biofuels still derived from food crop sources instead of second-generation, non-food feedstocks such as agricultural residues or perennial grasses. Meeting first-generation biofuels estimates would result in consistent growth rates to reach a world with 6% of transportation fuel comprised of biofuels by 2035, in line with our projections if full (first- and second-generation) mandates are met.

Policy Implications

This analysis suggests the need for governments to cease the implementation, expansion, and creation of new food-based biofuels consumption mandates. While recently proposed reforms to U.S. and EU mandates are welcome, even if they are implemented these OECD countries will

still account for about one-third of new biofuel demand over the next ten years. Percentage-based mandates, which prevail in most countries, will require additional demand for biofuels as demand for transportation fuels is expected to grow about 16% by 2025; many countries that maintain and enforce such mandates will contribute added demand for biofuels even if they don't increase their mandates.

Governments need to scale back their mandates further, enforce strict sustainability criteria, and ensure that so-called "advanced" biofuel mandates are not feeding further first-generation production or continued production of food-based and land-intensive biofuels.

Other policy recommendations that flow from this analysis include:

- *Remove Food-Based Mandates.* The United States should eliminate food-based biofuels mandates and ensure that future biofuels don't compete heavily with land used for food production.
- *Stop and Do Not Adopt New Food-Based Mandates.* Other countries should eliminate and forgo adoption of food-based and land-intensive biofuels mandates and other incentives working at cross-purposes with food security, biodiversity preservation, land tenure rights, and GHG reduction goals. Governments should work toward international cooperation on these issues in international policymaking venues such as the G7, G20, UN Framework Convention on Climate Change (UNFCCC), UN Committee on Food Security, UN Convention on Biological Diversity, post-2015 development agenda, etc.
- *Continue Research with a Focus on Sustainability.* Research and development of second-generation biofuels should increase but with strong attention to sustainability criteria that can be widely and consistently implemented. Given the volumes required to meet global biofuel demand, even seemingly benign feedstocks can prove unsustainable at large scale.
- *Feedstocks Matter*.[158] As policymakers rethink their biofuels mandates, it is important to pay particular attention to feedstocks and to volumes. If countries are able to produce commercially competitive biofuels from non-food feedstocks in the next ten years, this would transform the current biofuels market; however, as many experts have pointed out, there is a low likelihood of second-generation biofuels being produced in significant quantities soon. Current biofuels production has resulted in large social and environmental externalities, and these will only worsen if first-generation biofuels production continues to increase as expected or if second-generation biofuels result in the same food vs. fuel and other negative impacts as first-generation biofuels. Biofuels are not created equal, and they should not be treated the same.
- *Volumes Are Key*. The United States producing a few billion liters to replace lead in gasoline as an oxygenate may have been warranted, but decades of subsidies and aggressive mandates for approximately 76BL of food-based biofuels continuing on auto-pilot regardless of food or crop prices has led to numerous unintended consequences.

Policymakers now have a choice. Given all we have learned over the past decade about the impacts of biofuels use, it is time to rethink mandates, targets and other subsidies for biofuels, especially those made from crop-based feedstocks or from other sources with large land-use impacts.

Appendix A: Summary Table with Notes

Table 1: Selected Biofuel-Consuming Country Mandates through 2025

(in billions of liters)

Country	Mandate/target			Current Consumption		Mandated Increase	Transport Fuel Demand Growth through 2025	Added Volume, Full Mandate+ Demand Growth	Projected Demand 2025	
	Timeframe	Ethanol	Diesel	vol	% fuel supply	%	%	vol	vol	% increase
United States	2022	72 BL	3.8 BL	62.9		21%	N/A	13.1	**76.0**	**21%**
European Union	2020	10.0%		18.7	5.0%	72%	-8%	12.1	**30.8**	**64%**
Brazil	2014	25.0%	7%	29.0	27.5%	0%	36%	12.2	**41.2**	**36%**
Argentina	2014	5%	10%	2.0	7.6%	25%	57%	1.3	**3.2**	**64%**
China*	2020	15%	-	3.6	8-12%	50%	59%	3.9	**7.5**	**109%**
India	2014	5%	-	2.3	2.1%	42%	47%	2.0	**4.3**	**89%**
Indonesia	2025	15%	20%	0.8	3.0%	795%	65%	7.1	**8.0**	**860%**
Total Selected				**119.2**				**51.6**	**170.9**	**43%**

Sources:

All current volumes are taken from the most recent US Department of Agriculture (USDA) GAIN reports unless otherwise noted.
Transport fuel demand growth rates are calculated from IEA's New Policies Scenario except for Indonesia and Argentina.
Ethanol and diesel demand estimates for Argentina, for 2015-2024, are taken from USDA's GAIN Report for Argentina, 2014.
Ethanol and diesel demand estimates for Indonesia, for 2015-2024, are taken from USDA's GAIN Report for Indonesia, 2014.
Diesel consumption for India is derived from USDA's GAIN Report for India, 2013.
Current volumes for the US are the Environmental Protection Agency's (EPA) 2013 mandated biofuels volumes.
*China's mandate is for nine provinces only, representing just 1.1% of current fuel use and a projected 1.3% in 2025.

Notes/Assumptions:

(1) The US is assumed to meet slightly over half (20 billion gallons) of its 36 billion gallon Renewable Fuel Standard (RFS) mandate by 2022 (and 2025 for this analysis). We assume the US meets its 15 billion gallon mandate for corn starch ethanol, 1 billion gallon mandate for biodiesel (which could be increased by US EPA), and that the remaining 4 billion gallons are met by imported sugarcane ethanol (total of 20 billion gallons). Again, the biodiesel target could be increased by EPA, leading to less imported sugarcane ethanol, but both are considered first-generation biofuels in this analysis. We assume the remaining 16 billion gallons, mandated to be filled with cellulosic ethanol, a second-generation biofuel, are not produced due to technological and economic challenges, and that EPA waives down this mandate, leaving just 20 billion gallons of the mandate to be fulfilled.

(2) EU estimate for "mandated increase" assumes that adjusting for double-counting for advanced fuels the effective mandate would be 8.6%. At this writing,, the proposed reform to 7% from crop-based sources had not been approved.

(3) Consumption numbers for Brazil are calculated based on the 25% ethanol mandate, the latest figures available. Mandate applies to only a small portion of ethanol market, but we estimate total projected demand for all biofuels driven not by mandate but by demand growth including all biofuel types.

(4) Calculated Argentina's transportation demand differently because USDA estimates a change in ratios of gasoline to diesel. Calculated separate demand increases for gasoline and diesel, which has implications for ethanol and biodiesel use.

(5) China has a 10% mandate and a 15% target but for only nine provinces. We assumed China would not expand beyond the nine provinces and would meet its 15% target (and used this as its mandate) because past targets have systematically been met. China's transportation fuel demand growth rate in affected provinces is assumed to be the same as China's overall growth rate. Where uncertainty in current implementation of mandates exists, the midpoint of the range was used for calculations (e.g. China 8-12% current ethanol blend was calculated at 10%).

(6) Only considered India's 5% bioethanol mandate to be binding, so we did not assume the country's 20% bioethanol and 20% biodiesel targets would be filled.

(7) Indonesia currently has a 5% mandate for biofuels, but also has more aggressive targets of E15 and B20 by 2025. The higher targets are used in this analysis.

(8) All transportation growth is annualized on a linear basis from IEA and USDA growth rates.

(9) The growth rate for Chinese transportation fuel demand is for the entire country though the mandate covers only nine provinces.

Appendix B: Global Biofuel Mandates

OECD

Country/ Region	Mandate/Target	Level of Implementation	Anticipated Growth to Reach Mandate (%)	Primary Feedstock
OECD	**Various**	**Implemented, or on track to be fully implemented by target dates.**	**Various**	**Various. Both domestically produced and imported.**
United States	137BL of biofuels by 2022 divided into requirements for first generation, advanced and cellulosic fuels.[159]		21% growth to meet non-cellulosic mandate by 2022. Current production of 58BL of ethanol (corn and sugar) and 5BL of biodiesel.	Corn, soy, animal fat, sugar cane (imported).
Canada	5% national bioethanol mandate; 2% national biodiesel mandate; up to 8.5% bioethanol mandates in four provinces.	Fully implemented.	None.	Corn, wheat, canola oil.[160]
European Union	10% of transportation fuels from renewables by 2020 but proposal for only 7% from food-based feedstocks. Projected volumes for full implementation would be around 30,000ktoe.[161]	In 2012, most countries were on track to meet the 2020 targets. Projections show the EU will fall short of its 2020 goal by approximately 1/3 using around 20,000ktoe in 2020.[162]	92% increase required to meet 10% mandate, which accounts for a drop in transportation demand.	Varies from country to country.
Germany		7-8% of transportation fuel from bioethanol in 2009.[163] 2.6 billion tonnes of biodiesel in 2010; insolvency in companies is leading to lower numbers in recent years.[164]	2-3% from EU 2020 target.	Vegetable oil.[165]
United Kingdom		3.45% of transport fuel from bioethanol.[166]	6.55% from EU 2020 target.	Wheat and sugar beets.[167]

Country/ Region	Mandate/Target	Level of Implementation	Anticipated Growth to Reach Mandate (%)	Primary Feedstock
Spain	Revised targets down to 4.1% for all bioenergy and 3/9% for bioethanol in 2013.[168]	Biodiesel blending has not been enforced since 2010. Revised targets were met in 2013.[169]	6.1% from EU 2020 target.	Domestic oil seeds, imported palm, and animal fat.[170]
France	Current target of 7%.[171]	5.78% from bioethanol and 7.07% from biodiesel.[172]	4.28% from EU 2020 target.	Corn and sugar beets.[173]
Italy		4% of transport fuel from bioethanol in 2009.[174]	6% from EU 2020 target.	Rapeseed, soy, palm, cereal and wine byproducts.[175]
Sweden		Reached target of 10% biofuels in transport fuels.[176]	Met EU 2020 target.	Rapeseed and wood pellets.[177]
Australia	New South Wales 5% ethanol mandate and 2% biodiesel mandate.[178]	Implemented. 6% ethanol mandate adjusted down to 5% until more local supplies are available.[179]	None.	
New Zealand	Biofuel mandate allowed to expire.[180]	The bioethanol excise exemption remains, but other subsidies have been allowed to expire.[181]	N/A.	
South Korea	2% biodiesel mandate.[182]	Since 2010, held production at 400,00kL/year.[183]	None.	
Mexico	2% ethanol mandates in two provinces.	Not fully implemented.	Unclear.	
Chile	5% ethanol and biodiesel target.	Target not met.	Unclear.	Import dependent. No significant domestic production.
Turkey	6% ethanol mandate and 1% biodiesel mandate.[184]	Implemented. Biodiesel blend rate exceeded.[185]	Ethanol usage must double.[186]	Waste cooking oil and sugar beets.[187]

Producers Meeting High Mandates

Country/ Region	Mandate/Target	Level of Implementation	Anticipated Growth to Reach Mandate (%)	Primary Feedstock
	Greater than or equal to 10% ethanol or biodiesel.	**Fully implemented or close to full implementation.**	**Various.**	**Various.**
Argentina	10% biodiesel mandate, 5% ethanol mandate.[188]	Implemented, average national ethanol blend of 7.6% in 2013 (600 million liters).[189]	64% increase to meet current mandates in 2025, which includes increased transport demand.	Soy, sugarcane.[190]
Brazil	25% ethanol blend mandate, 7% biodiesel mandate.[191]	Fully implemented.	36% increase required to maintain current blend level with increased transport demand by 2025.	Sugarcane and soy.
Colombia	8% or 10% ethanol mandate depending on stocks.	Fully implemented.	None.	Sugar cane and palm.[192]
Ecuador	5% biodiesel mandate to increase to 10%; 10% ethanol mandate.[193]	Mandates were being filled as of 2012.[194]	None.	Palm, sugar cane, jatropha.[195]
Paraguay	25% ethanol mandate, but the Senate has passed an increase to 27.5%; 1% biodiesel mandate.[196]	Fully implemented.	None.	Sugarcane.
Peru	7.8% ethanol mandate; 5% biodiesel mandate.[197]	Implemented.	None.	Primarily importing Argentine biodiesel.[198]
Philippines	10% ethanol mandate; 2% biodiesel mandate.[199]	Implemented, but difficulty reaching the 10% ethanol mandate,[200] planned expansion to 5% biodiesel is not yet implemented.	None. 3% for proposed biodiesel expansion.	Palm and coconut oil.
Zimbabwe	15% ethanol mandate (recently up from 5%).[201]	Forced to scale back 20% mandate due to lower production.[202]	None for adjusted mandate.	

Producers Proposing High Mandates

Country/ Region	Mandate/Target	Level of Implementation	Anticipated Growth to Reach Mandate (%)	Primary Feedstock
	Mandates over 5%.	**Not yet fully implemented or level of future implementation is unclear.**	**Various.**	**Various.**
Costa Rica	7% ethanol mandate; 20% biodiesel mandate.[203]	Unclear: seemingly not fully implemented.[204]	Unclear.	Jatropha,[205] palm, sugar cane.[206]
Panama	Currently 5% ethanol mandate to rise to 10% by 2016.	Unlikely to reach 10% by 2016 due to lack of capacity.[207]	5%.	Sugarcane.
China (PRC)	10% biofuels mandate by 2020; 15% biofuels target by 2020.[208]	E10 required and implemented in 9 provinces.[209] Actual blend rate reported between 8 and 12%.[210]	109% increase required to meet 15% biofuels target, which includes expected increased transport demand.	Grain, waste cooking oil, investing in sorghum, cassava and other food crops that can be grown on marginal land.[211]
India	5% ethanol mandate (reduced from 20% target); 20% biodiesel target.[212]	Projected at 2.1% in 2014 and 2.5% in 2015.[213]	89% increase to meet 5% ethanol mandate only by 2025, which includes expected increased transport demand.	Sugarcane, multiple feedstocks for biodiesel moving from jatropha to tree nuts.[214]
Indonesia	5% biofuel mandate; 15% ethanol target and 20% biodiesel target by 2025[215]	4.5% of biodiesel mandate met, but 0% for ethanol.	945% increase to meet full targets and future projected demand for transport fuel.	Palm.
Malaysia	5% biodiesel mandate[216]	Not yet fully implemented throughout the country. Target of this year for implementation in all locations.[217]	Unclear. None if goal is met this year.	Palm.
Thailand	10% biodiesel target by 2019.[218]	Level of implementation depends on palm oil supplies.	Unclear.	Palm.
Vietnam	5% ethanol mandate to go into effect at the end of 2014.[219]	Has not yet begun.	N/A	

Country/ Region	Mandate/Target	Level of Implementation	Anticipated Growth to Reach Mandate (%)	Primary Feedstock
Malawi	10% ethanol mandate.[220]	Only major producer of ethanol in Southern Africa. No readily available data on steps it has taken to meet the mandate.	Unclear.	Jatropha[221] and sugarcane.

All Other Mandates

Country/ Region	Mandate/Target	Level of Implementation	Anticipated Growth to Reach Mandate (%)	Primary Feedstock
Jamaica	10% ethanol mandate[222]	Unclear.	Unclear.	
Uruguay	2% biodiesel mandate from domestic biodiesel; thought will move to 5% ethanol mandate.[223]	Unclear.	Unclear.	Soy, tallow, sugarcane.[224]
Fiji	Voluntary 10% ethanol blend, 5% biodiesel blend.[225]	Unclear.	Unclear.	Unclear.
Taiwan	1% biodiesel mandate.[226]		None.	
Angola	10% ethanol mandate.[227]		Unclear.	Sugar.[228]
Ethiopia	5% ethanol mandate.[229]	Some biofuels plants online, the majority are pre-implementation.[230]	Unclear.	Sugar and jatropha.[231]
Kenya	Kisumu has a 10% ethanol mandate.[232]	Not implemented. Mandate remains a target.	Unclear (close to 10%)	Jatropha.[233]
Mozambique	10% ethanol mandate.[234]	Have created a legal framework, but not fully implemented.[235] 36MnL/year average 2010-2012.[236]	Unclear (close to 10%)	
Nigeria	10% ethanol target.[237]	Not implemented.[238]	Unclear (close to 10%)	
South Africa	Planned 2% ethanol targets and 5% biodiesel targets to begin in 2015.[239]	367MnL/year ethanol production average 2010-2012.[240]	N/A	Sugar cane, sugar beet, sweet sorghum, soybeans, sunflower seed, canola oil and vegetable oil.[241]
Sudan	5% ethanol mandate.[242]	Plans for expanded production. No indication have reached 5%.	Unclear.	Jatropha.

Appendix C: Biofuels Projects in Ethiopia[243]

Table 2: List of biofuel projects in Ethiopia as of December 2012

Feedstock	Project	Investment Type (Public, domestic private, foreign private)	Area (ha)	Location	Current Status of implementation
Sugar cane [3]	Fincha Sugar Factory	Public	21,000	Oromiya	Operational
	Metahara Sugar Factory	Public		Oromiya	Operational
	WONJI / SHOA SUGAR FACTORY	Public	16,000	Oromiya	Operational
	Tendaho Sugar Development Project	Public	50,000	Afar	Implementation
	Wolkaiyt Sugar Development Project	Public	45,000	Tigray	Implementation
	Kuraz Sugar Development Project	Public	175,000	SNNPR	Implementation
	Kessem Sugar Development Project	Public	20,000	Oromiya	Implementation
	Belles Sugar Development Project	Public	75,000	Amhara	Implementation
	BDFC Ethiopia Industry P.L.C	Foreign	18,000	Amhara	Pre - implementation
Castor	Acazis Ethiopia PLC	Foreign	15,000	Oromiya	Operational
	Global Energy Ethiopia	Foreign	2,700	SNNPR	Implementation
	HUSEYIN POLAT	Foreign		Oromiya	Implementation
Jatropha	Sun Biofuels Ethiopia/National Biodiesel Corporation	Foreign	80,000	Benishangul Gumuz	Pre - implementation
	Ambasel Jatropha Project	Domestic	20,000	Benishangul Gumuz	Pre - implementation
	Agro peace bio Ethiopia	Foreign	80,000	Multiregional	Pre - implementation
	African Climate Exchange PLC	Foreign	100,000	Multiregional	Pre - implementation
	Energy seeds Ethiopia PLC	Foreign	2	Multiregional	Pre - implementation
	Africa Ethiopia Biomass Energy PLC	Foreign	NK	SNNPR	Pre - implementation
	Ertale Bio Diesel PLC	Foreign	NK	Multiregional	Pre - implementation
	2H 2S International Business PLC	Domestic	100,000	SNNPR	Pre - implementation
	Ethiopia Bio Power PLC	Domestic	NK	SNNPR	Pre - implementation
	Green Energy plc	Domestic	50,000	SNNPR	Pre - implementation
	National Energy PLC	Foreign	NK	Oromiya	Pre - implementation
	OBM Ethio Renewable Energies PLC	Foreign	50,000	Oromiya	Pre - implementation
	F.E.P.E.Amaro Bio-Oil PLC	Foreign	50,000	SNNPR	Pre - implementation
	J.M.B.O Bio Fuel Production PLC	Foreign	2,000	Oromiya	Pre - implementation
	Paul Morrell	Foreign	1,000	Oromiya	Pre - implementation
	Soubra Abdallah Khalid	Foreign	10,000	Oromiya	Pre - implementation
	The Giving Tree Nursery PLC	Foreign	200	Oromiya	Pre - implementation
	Ardent Energy Group,INC.	Foreign	NK	Multiregional	Pre - implementation
	FB BIODIESEL PLC	Foreign	NK	Amhara	Pre - implementation
	Slishi Atile Dessta	Domestic	NK	Addis Ababa	Pre - implementation
	Sayo Biofuel plc	Domestic	NK	Tigray	Pre - implementation

Source: EIA and MoA, Jan 2013
Note: NK - not known

[3] Note that the primary product from sugarcane production is sugar. Ethanol is a by-product made through processing of the molasses.

Endnotes

[1] Jim Lane, "Biofuels Mandates Around the World: 2014 : Biofuels Digest," December 31, 2013,
[2] Ivetta Gerasimchuk et al., *State of Play on Biofuel Subsidies: Are Policies Ready to Shift?* (International Institute for Sustainable Development, June 2012), 10, http://www.iisd.org/gsi/biofuel-subsidies/biofuels-state-play-2012.
[3] Daryl Brown, "IEA's World Energy Outlook 2013: Renewables and Natural Gas to Surge Through 2035," *Power* 158, no. 1 (January 2014): 204.
[4] Ibid., 197.
[5] Ibid.
[6] Ibid.
[7] *OECD-FAO Agricultural Outlook 2014-2023: Biofuels* (OECD/FAO), accessed August 2, 2014, http://stats.oecd.org/Index.aspx?datasetcode=HIGH_AGLINK_2014. 119.
[8] http://web.extension.illinois.edu/ethanol/wateruse.cfm
[9] R. Thomson Wright and I Edy Wiyono, *Indonesia Biofuels Annual* (USDA Foreign Agricultural Service: Global Agricultural Information Network, July 1, 2014), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Jakarta_Indonesia_6-27-2014.pdf.
[10] Amit Aradhey, *India Biofuels Annual* (USDA Foreign Agricultural Service: Global Agricultural Information Network, July 1, 2013), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_New%20Delhi_India_7-1-2014.pdf.
[11] http://www.iatp.org/files/451_2_73253.pdf
[12] http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE_Reports/HLPE-Report-5_Biofuels_and_food_security.pdf
[13] http://www.ewg.org/research/going-going-gone; https://www.cbo.gov/publication/41173; http://www.oaklandinstitute.org/land-deals-africa-tanzania
[14] http://smarterfuelfuture.org/resource-center/details/cellulosic-ethanol-just-around-the-corner-since-2007
[15] http://www.nap.edu/catalog.php?record_id=13105
[16] http://www.ethanolrfa.org/exchange/entry/rfa-president-speaks-at-cellulosic-biofuels-summit/
[17] Jim Lane, "Biofuels Mandates Around the World."
[18] Sergio Barros, *Brazil Biofuels Annual* (USDA Foreign Agricultural Service: Global Agricultural Information Network, July 25, 2014), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Sao%20Paulo%20ATO_Brazil_7-25-2014.pdf.
[19] Ivetta Gerasimchuk et al., *State of Play on Biofuel Subsidies: Are Policies Ready to Shift?*, 10.
[20] Brown, "IEA's World Energy Outlook 2013," 204.
[21] Ibid., 197.
[22] Ibid.
[23] *OECD-FAO Agricultural Outlook 2014-2023: Biofuels*. 119.
[24] Ivetta Gerasimchuk et al., *State of Play on Biofuel Subsidies: Are Policies Ready to Shift?*, 6.
[25] Ralph Sims et al., "From 1st to 2nd Generation Biofuels: An Overview of Current Industry and RD&D Activities," 2008, 1, http://www.iea.org/papers/2008/2nd_Biofuel_Gen.pdf.
[26] Brown, "IEA's World Energy Outlook 2013," 197.
[27] Ivetta Gerasimchuk et al., *State of Play on Biofuel Subsidies: Are Policies Ready to Shift?*, 10.
[28] http://www.bmel.de/SharedDocs/Downloads/Landwirtschaft/Welternaehrung/OECD-FAO-AgriculturalOutlook.pdf?__blob=publicationFile
[29] http://www.cbo.gov/publication/45477; http://www.nap.edu/catalog.php?record_id=1310
[30] http://www.ase.tufts.edu/gdae/Pubs/rp/ActionAid_Fueling_Food_Crisis.pdf
[31] http://www.actionaidusa.org/sites/files/actionaid/biofueling_hunger_aausa.pdf
[32] http://www.biofuelsdigest.com/bdigest/2011/04/19/world-bank-chief-calls-for-relaxation-of-biofuels-mandates-to-ease-food-price-pressure/
[33] http://www.actionaidusa.org/eu/2012/07/g20-and-biofuels#sthash.U3oxrEAp.dpuf, http://unctad.org/en/docs/2011_G20_FoodPriceVolatility_en.pdf
[34] http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE_Reports/HLPE-Report-5_Biofuels_and_food_security.pdf
[35] http://www.nature.com/nclimate/journal/v4/n8/full/nclimate2277.html
[36] http://www.scientificamerican.com/article/deforestation-in-indonesia-is-double-the-government-s-official-rate/

[37] http://www.wri.org/sites/default/files/pdf/indoforest_full.pdf
[38]https://d3n8a8pro7vhmx.cloudfront.net/rainforestactionnetwork/pages/2911/attachments/original/1417555307/BWPT_Investor_Warning_DEC2014.pdf?1417555307
[39] Sims et al., "From 1st to 2nd Generation Biofuels: An Overview of Current Industry and RD&D Activities," 1.
[40] http://www.nap.edu/catalog.php?record_id=13105; http://www.cbo.gov/publication/45477]
[41] http://www.actionaid.org/sites/files/actionaid/biofuels_energy_hunger.pdf
[42] http://www.cbo.gov/publication/45477; http://www.nap.edu/catalog.php?record_id=13105
[43] *Technology Roadmap: Biofuels for Transport* (Paris, France: International Energy Agency, 2011), 27, http://www.iea.org/publications/freepublications/publication/biofuels_roadmap.pdf.
[44] High Level Panel of Experts, *Biofuels and Food Security* (Rome: Committee on World Food Security, June 2013), http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE_Reports/HLPE-Report-5_Biofuels_and_food_security.pdf.
[45] Ibid.
[46] United States Department of Agriculture Economic Research Service, "Feed Grains Database," July 16, 2014, http://www.ers.usda.gov/data-products/feed-grains-database/feed-grains-custom-query.aspx#ResultsPanel.
[47] Erin Voegele, "DEFRA Releases UK Biofuel Feedstock Production Statistics," *Ethanol Producer Magazine*, February 20, 2013, http://ethanolproducer.com/articles/9588/defra-releases-uk-biofuel-feedstock-production-statistics.
[48] *Ibid.*
[49] Anselm Eisentraut, *Sustainable Production of Second-Generation Biofuels: Potential and Perspectives in Major Economies and Developing Countries* (Paris, France: International Energy Agency, February 2010), 13, http://www.iea.org/publications/freepublications/publication/second_generation_biofuels.pdf.
[50] Ibid., 14.
[51] Ivetta Gerasimchuk et al., *State of Play on Biofuel Subsidies: Are Policies Ready to Shift?*, 6.
[52] Ibid.
[53] Ibid.
[54] Anselm Eisentraut, *Sustainable Production of Second-Generation Biofuels: Potential and Perspectives in Major Economies and Developing Countries*, 17.
[55] *OECD-FAO Agricultural Outlook 2014-2023: Biofuels*.
[56] United States Environmental Protection Agency, "Renewable Fuel Standard (RFS)," *Fuels and Fuel Additives*, December 10, 2013, http://www.epa.gov/otaq/fuels/renewablefuels/.
[57] United States Environmental Protection Agency, "Renewable Fuel Standard (RFS)," *Fuels and Fuel Additives*, December 10, 2013, http://www.epa.gov/otaq/fuels/renewablefuels/.
[58] Gilmar Masiero, *Ethanol and Biodiesel: The Role of Brazil and South Korea in the Emerging Alternative-Energy Market* (Korea Economic Institute, December 2008), 1, http://kki.org/sites/default/files/publications/APSMasiero.pdf.
[59] Ibid.
[60] Chris Charles, Marius Keller, and Tom Moerenhout, *Biofuels--At What Cost?: A Review of Costs and Benefits of France's Biofuel Policies* (Global Subsidies Initiative of the International Institute for Sustainable Development, September 2013), 1, http://www.transportenvironment.org/sites/te/files/publications/bf_costeffectiveness_france.pdf.
[61] Ivetta Gerasimchuk et al., *State of Play on Biofuel Subsidies: Are Policies Ready to Shift?*, 9.
[62] Jack Peckham, "IEA World Energy Outlook to 2035: Diesel Growth Outruns Everything," *Global Refining & Fuels Report* 16, no. 24 (November 27, 2012): 56.
[63] Ibid.
[64] Ibid., 35.
[65] Ibid., 39.
[66] Ibid.
[67] Ibid., 40.
[68] Ibid., 37.
[69] Ibid., 35.
[70] Ibid., 44; http://www.imf.org/external/np/pp/eng/2013/012813.pdf
[71] Peckham, "IEA World Energy Outlook to 2035," 197.
[72] Ibid.
[73] Ibid., 59.
[74] Ibid.

[75] Ibid., 71.
[76] International Energy Agency, *World Energy Investment Report*, Special Report (Paris, France: OECD/IEA, 2014), 24, http://www.iea.org/publications/freepublications/publication/WEIO2014.pdf.
[77] Ibid.
[78] Peckham, "IEA World Energy Outlook to 2035," 197.
[79] Ibid.
[80] Ibid.
[81] Ibid.
[82] "About the OECD," *OECD: Better Policies for Better Lives*, n.d., http://www.oecd.org/about/.
[83] "Members and Partners," *OECD: Better Policies for Better Lives*, accessed November 28, 2014, http://www.oecd.org/about/membersandpartners/#d.en.194378.
[84] *OECD-FAO Agricultural Outlook 2014-2023: Biofuels*. 117.
[85] *Ibid.* 119.
[86] *Ibid.*
[87] *Ibid.* 110.
[88] International Energy Agency, *World Energy Investment Report*, 29.
[89] *OECD-FAO Agricultural Outlook 2014-2023: Biofuels*. 117.
[90] *Ibid.* 110.
[91] *Ibid.* 110.
[92] *Ibid.* 114.
[93] http://dailycaller.com/2013/01/04/biodiesel-tax-credit-extension-will-pay-industry-for-fuels-produced-while-it-was-expired/
[94] *OECD-FAO Agricultural Outlook 2014-2023: Biofuels*. 114.
[95] *Ibid.*
[96] *International Energy Outlook 2014* (Washington, DC: EIA, September 9, 2014), 33, http://www.eia.gov/forecasts/ieo/.
[97] Ibid.
[98] Ibid.
[99] Ibid.
[100] Ibid.
[101] Jim Lane, "Biofuels Mandates Around the World."
[102] R. Thomson Wright and I Edy Wiyono, *Indonesia Biofuels Annual*.
[103] "Petroleum & Other Liquids," *EIA Independent Statistics & Analysis*, November 26, 2014, http://www.eia.gov/dnav/pet/pet_move_expc_a_EPOOXE_EEX_mbbl_a.htm.
[104] Laborde, David, "Assessing the Land Use Change Consequences of European Biofuel Policies," European Commission, 2011. http://www.ifpri.org/sites/default/files/publications/biofuelsreportec2011.pdf
[105] "Major Biofuel Producers by Region," *Biofuels: The Fuel of the Future*, accessed November 28, 2014, http://biofuel.org.uk/major-producers-by-region.html.
[106] *Annual Energy Outlook 2014 with Projections to 2040* (Washington, DC: EIA, April 2014), 15, http://www.eia.gov/forecasts/aeo/pdf/0383%282014%29.pdf.
[107] "Renewable Fuel Standard," *Alternative Fuels Data Center, U.S. Department of Energy: Energy Efficiency & Renewable Energy*, accessed November 28, 2014, http://www.afdc.energy.gov/laws/RFS.
[108] *Annual Energy Outlook 2014 with Projections to 2040*, 15.
[109] "Renewable Fuels: Regulations & Standards," *EPA: Fuels and Fuel Additives*, November 21, 2014, http://www.epa.gov/otaq/fuels/renewablefuels/regulations.htm.
[110] "Petroleum & Other Liquids."
[111] *OECD-FAO Agricultural Outlook 2014-2023: Biofuels*. 121.
[112] http://www.nap.edu/catalog/13105/renewable-fuel-standard-potential-economic-and-environmental-effects-of-us
[113] European Commission: Energy, "Renewable Energy: Action Plans & Forecasts," accessed July 30, 2014, http://ec.europa.eu/energy/renewables/action_plan_en.htm.
[114] Official Journal of the European Union, *Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the Promotion of the Use of Energy from Renewable Sources and Amending and Subsequently Repealing Directives 2001/77/EC and 2003/30/EC*.
[115] European Commission: Energy, "Renewable Energy: Targets by 2020," accessed July 30, 2014, http://ec.europa.eu/energy/renewables/targets_en.htm.

[116] *OECD-FAO Agricultural Outlook 2014-2023: Biofuels*. 88.
[117] *Report from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions: Renewable Energy Progress Report* (Brussels, Belgium: European Commission, March 27, 2013), 11, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013DC0175&from=EN.
[118] *Report from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions: Renewable Energy Progress Report*, 11.
[119] Ibid., 6.
[120] Ibid.
[121] Sergio Barros, *Brazil Biofuels Annual*.
[122] "Brazil's Senate Approves Bill Raising Biodiesel, Ethanol Blends," *Platss*, September 2, 2014, http://www.platts.com/latest-news/agriculture/riodejaneiro/brazils-senate-approves-bill-raising-biodiesel-21166276.
[123] "U.S. Ethanol Imports from Brazil down in 2013," *EIA Today in Energy*, May 5, 2014, http://www.eia.gov/todayinenergy/detail.cfm?id=16131. and Sergio Barros, *Brazil Biofuels Annual*.
[124] Lucia Kassai, "Brazil Ethanol Exports to Drop to 11-Year Low, Dreyfus Unit Says," *Bloomberg*, April 28, 2014, http://www.bloomberg.com/news/2014-04-28/brazil-ethanol-exports-to-drop-to-11-year-low-dreyfus-unit-says.html.
[125] Ibid.
[126] http://pdba.georgetown.edu/CLAS%20RESEARCH/Working%20Papers/WP18.pdf, http://fpc.state.gov/documents/organization/93476.pdf
[127] Kai Thaler, "Brazil, Biofuels, and Food Security in Mozambique," in *Agricultural Development and Food Security in Africa: The Impact of Chinese, Indian and Brazilian Investments* (London: Zed Books, 2013), 145–58, http://scholar.harvard.edu/files/kaithaler/files/chapter_8_thaler-brazil_and_mozambique_revised_draft_0.pdf. and Stephanie Hanson, "Brazil's Ethanol Diplomacy," *Council on Foreign Relations*, July 9, 2007, http://www.cfr.org/renewable-energy/brazils-ethanol-diplomacy/p13721.
[128]Wilson Almeida, *Ethanol Diplomacy: Brazil and U.S. in Search of Renewable Energy* (Georgetown University Center for Latin American Studies, April 15, 2009), http://pdba.georgetown.edu/CLAS%20RESEARCH/Working%20Papers/WP18.pdf., and http://fpc.state.gov/documents/organization/93476.pdf
[129] Hanson, "Brazil's Ethanol Diplomacy."
[130] Ken Joseph, *Argentina: Biofuels Annual 2013* (USDA Foreign Agricultural Service: Global Agricultural Information Network, June 28, 2013), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Buenos%20Aires_Argentina_6-28-2013.pdf.
[131] Ibid.
[132] Ibid.
[133] Ibid., 10.
[134] Ken Joseph, *Argentina: Biofuels Annual 2013*.
[135] Ryan Scott and Jiang Junyang, *Peoples Republic of China Biofuels Annual* (USDA Foreign Agricultural Service: Global Agricultural Information Network, September 9, 2013), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Beijing_China%20-%20Peoples%20Republic%20of_9-9-2013.pdf.
[136] "Global Biofuels-an Overview," *European Biofuels Technology Platform: Accelerating Deployment of Advanced Biofuels in Europe*, July 28, 2014, http://www.biofuelstp.eu/global_overview.html.
[137] Ryan Scott and Jiang Junyang, *Peoples Republic of China Biofuels Annual*.
[138] Ibid.
[139] Ibid.
[140] Aradhey, *India Biofuels Annual*.
[141] "Biofuels Mandates Around the World: 2012," *Biofuels Digest*, accessed November 28, 2014, http://www.biofuelsdigest.com/bdigest/2012/11/22/biofuels-mandates-around-the-world-2012/.
[142]Amit Aradhey, *India Biofuels Annual*.
[143]Ibid.
[144] *National Policy on Biofuels* (New Delhi: Government of India Ministry of New & Renewable Energy), accessed November 28, 2014, http://mnre.gov.in/file-manager/UserFiles/biofuel_policy.pdf.
[145] Ibid., 3.

[146] "International Energy Statistics," *EIA Independent Statistics & Analysis*, accessed November 28, 2014, http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=79&pid=81&aid=1&cid=all,&syid=2007&eyid=2011&unit=TBPD.
[147] Jim Lane, "Biofuels Mandates Around the World."
[148] R. Thomson Wright and I Edy Wiyono, *Indonesia Biofuels Annual*.
[149] Ibid.
[150] Ibid.
[151] "The Rainforest Alliance and Palm Oil," *Rainforest Alliance*, 2015, http://www.rainforest-alliance.org/work/agriculture/palm-oil. Tara Kelly, "Girl Scouts Win U.N. Award For Efforts To Save Orangutans By Eliminating Palm Oil From Cookies," *Huffington Post*, February 9, 2012, http://www.huffingtonpost.com/2012/02/09/girl-scouts-win-award-united-nations_n_1265843.html. "WWF - Palm Oil," *WWF International*, accessed January 12, 2015, http://wwf.panda.org/what_we_do/footprint/agriculture/palm_oil/.
[152] Gisela Prasad, *Bioenergy, Rural Development and Poverty Alleviation in Southern Africa* (Energy Research Centre, University of Cape Town: Global Network on Energy for Sustainable Development, September 2010), http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CCkQFjAB&url=http%3A%2F%2Fwww.gnesd.org%2F~%2Fmedia%2FSites%2FGNESD%2FPublication%2520pdfs%2FBioenergy_PotentialForDevelopment_SPM.ashx&ei=jTN5VLDLHNTesATsvIHoAg&usg=AFQjCNETKkxjTK4Y754qDibg7Y3R6LfmfQ&sig2=cGOOQFz9hAdVUZK5DQ2tAA&bvm=bv.80642063,d.cWc.
[153] Richard Kunz, "Bioenergy in Water Scarce Countries: Experiences from South Africa," November 25, 2011, http://ieabioenergytask43.org/wp-content/uploads/2013/09/1120-Kunz.pdf.
[154] *South Africa BEFS Country Brief*, Bioenergy and Food Security Projects (FAO, 2013), http://www.fao.org/energy/36348-06e268a674f478f0d7a2f17c362ff140.pdf.
[155] *OECD-FAO Agricultural Outlook 2014-2023: Biofuels*.
[156] Meghan Sapp, "Zimbabwe to Stay With E15," *BiofuelsDigest*, June 23, 2014, http://www.biofuelsdigest.com/bdigest/2014/06/23/zimbabwe-to-stay-with-e15/.
[157] *Sustainable Brazil: An Outlook on the Oil, Ethanol and Gas Markets* (Ernst & Young Terco), accessed November 28, 2014, http://www.ey.com/Publication/vwLUAssets/Sustainable_Brazil_-_Oil_and_Gas/$FILE/Sustainable_Brazil_Oil_and_Gas.pdf.
[158] Pete Harrison et al., *Wasted: Europe's Untapped Resource: An Assessment of Advanced Biofuels from Wastes & Residues* (ECF, February 26, 2014), http://www.theicct.org/sites/default/files/publications/WASTED-final.pdf.
[159] http://www.ewg.org/research/will-real-ethanol-beneficiaries-please-stand
[160] "Plant Locations," *Canadian Renewable Fuels Association*, 2010, http://www.greenfuels.org/en/industry-information/plants.aspx.
[161] *Report from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions: Renewable Energy Progress Report*, 6.
[162] Ibid.
[163] Ivetta Gerasimchuk et al., *State of Play on Biofuel Subsidies: Are Policies Ready to Shift?*, 11.
[164] Anna Rauch and Michael Thone, *Biofuels--At What Cost: Mandating Ethanol and Biodiesel Consumption in Germany* (Global Subsidies Initiative and International Institute for Sustainable Development, January 2012), http://www.iisd.org/gsi/sites/default/files/bf_awc_germany.pdf.
[165] Ibid.
[166] *Renewable Transport Fuel Obligation Statistics, Obligation Period 6 2013/14, Report 3* (Department of Transport, May 1, 2014), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/306399/rtfo-2013-14-year-6-report-3.pdf.
[167] Erin Voegele, "DEFRA Releases UK Biofuel Feedstock Production Statistics."
[168]Marta Guerrero, *Spain Biodiesel Standing Report* (USDA Foreign Agricultural Service: Global Agricultural Information Network, December 10, 2013), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biodiesel%20Standing%20Report_Madrid_Spain_11-26-2013.pdf.
[169]Ibid.
[170]Ibid.
[171]Chris Charles, Marius Keller, and Tom Moerenhout, *Biofuels--At What Cost?: A Review of Costs and Benefits of France's Biofuel Policies*, 4.

[172]Ibid., 2.
[173]Ibid., 3.
[174] Ivetta Gerasimchuk et al., *State of Play on Biofuel Subsidies: Are Policies Ready to Shift?*, 11.
[175]Ornella Bettini, *Italy: Biofuels Overview 2014* (USDA Foreign Agricultural Service: Global Agricultural Information Network, April 9, 2014), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Overview%202014_Rome_Italy_4-9-2014.pdf.
[176] *Energy Policy Highlights* (Paris, France: International Energy Agency, 2014), 20, http://www.iea.org/publications/freepublications/publication/energy_policy_highlights_2013.pdf.
[177]Aziz Elbehri, Anna Segerstedt, and Pascal Liu, *Biofuels and the Sustainability Challenge: A Global Assessment of Sustainability Issues, Trends and Policies for Biofuels and Related Feedstocks* (Rome: FAO, 2013), http://www.fao.org/docrep/017/i3126e/i3126e.pdf.
[178] "Biofuels in NSW," *NSW Government: Trade & Investment Resources & Energy*, accessed November 26, 2014, http://www.resourcesandenergy.nsw.gov.au/energy-consumers/sustainable-energy/office-of-biofuels/biofuels-in-nsw.
[179] Ibid.
[180] Jim Lane, "Biofuels Mandates Around the World."
[181] Ibid.
[182] Ibid.
[183] Task 39 IEA Bioenergy, "Commercializing Liquid Biofuels from Biomass," September 2012, 6, http://task39.org/files/2013/05/IEA-Bioenergy-Task-39-Newsletter-Issue-31-Korea-September-2012.pdf.
[184] Gulden Boluk and A. Ali Koc, "The Implications of Biofuel Policy in Turkey," *International Journal of Energy Economics and Policy* 3 (2013): 14–22.
[185] Ibid., 18.
[186] Ibid.
[187] Ibid., 17.
[188] "Renewable Fuel Standard," *Alternative Fuels Data Center, U.S. Department of Energy: Energy Efficiency & Renewable Energy*, accessed November 28, 2014, http://www.afdc.energy.gov/laws/RFS.
[189] Ken Joseph, *Argentina: Biofuels Annual 2013*.
[190] Ibid.
[191] Sergio Barros, *Brazil Biofuels Annual*.
[192] Leonardo Pinzon, *Colombia Biofuels Annual* (USDA Foreign Agricultural Service: Global Agricultural Information Network, June 26, 2014), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Bogota_Colombia_6-26-2014.pdf.
[193] Jim Lane, "Biofuels Mandates Around the World."
[194] Henry Vega, *Ecuador Biofuel Industry, Ethanol, Biodiesel, Production, Forecast 2012*, Ecuador Biofuels Annual (USDA Foreign Agricultural Service: Global Agricultural Information Network, June 28, 2012), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Quito_Ecuador_6-28-2012.pdf.
[195] Ibid.
[196] Ken Joseph, *Paraguay Biofuels Annual* (USDA Foreign Agricultural Service: Global Agricultural Information Network, July 21, 2014), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Buenos%20Aires_Paraguay_7-21-2014.pdf.
[197] Gaspar E. Nolte and Mariano J. Beillard, *Peru's Ethanol Production Up, Biodiesel However Tumbles* (USDA Foreign Agricultural Service: Global Agricultural Information Network, June 30, 2014), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Lima_Peru_7-1-2014.pdf.
[198] Ibid.
[199] Jim Lane, "Biofuels Mandates Around the World."
[200] http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Manila_Philippines_10-22-2014.pdf
[201] Jim Lane, "Biofuels Mandates Around the World."
[202] Sapp, "Zimbabwe to Stay With E15."
[203] Jim Lane, "Biofuels Mandates Around the World."
[204] "Costa Rica May at Last Implement E10 Policy : Biofuels Digest," accessed August 3, 2014, http://www.biofuelsdigest.com/bdigest/2012/09/11/costa-rica-may-at-last-implement-e10-policy/.

[205] "Alternative Fuels Americas, Inc. (AFAI) Nears Completion of Costa Rican Biofuel Production Infrastructure, Secures 2M Gallons Worth of Feedstock | The Quality Stocks Daily Blog for Micro-Cap and Small-Cap Companies," accessed August 3, 2014, http://blog.qualitystocks.net/stocks-to-watch/alternative-fuels-americas-inc-afai-nears-completion-of-costa-rican-biofuel-production-infrastructure-secures-2m-gallons-worth-of-feedstock/.
[206] Carlos Murillo R., *Biofuels Trade and Sustainable Development: The Case of Costa Rica* (International Institute for Environment and Development, December 2007), http://www.globalbioenergy.org/uploads/media/0712_IIED_-_Biofuels_trade_and_sustainable_development_the_case_of_Costa_Rica.pdf.
[207] Maria Guardia, *Panama Continues Looking for Biofuel Opportunities* (USDA Foreign Agricultural Service: Global Agricultural Information Network, January 22, 2014), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Panama%20Continues%20Looking%20for%20Biofuel%20Opportunities_Panama_Panama_1-22-2014.pdf.
[208] Jim Lane, "Biofuels Mandates Around the World."
[209] Ibid.
[210] Ryan Scott and Jiang Junyang, *Peoples Republic of China Biofuels Annual*.
[211] "Global Biofuels-an Overview."
[212] Aziz Elbehri, Anna Segerstedt, and Pascal Liu, *Biofuels and the Sustainability Challenge: A Global Assessment of Sustainability Issues, Trends and Policies for Biofuels and Related Feedstocks*, 27 and 43.
[213] Amit Aradhey, *India Biofuels Annual*.
[214] Ibid.
[215] R. Thomson Wright and I Edy Wiyono, *Indonesia Biofuels Annual*.
[216] Jim Lane, "Biofuels Mandates Around the World."
[217] Abdul Ghani Wahab, *Malaysia Biofuels Annual 2014* (USDA Foreign Agricultural Service: Global Agricultural Information Network, June 25, 2014), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Kuala%20Lumpur_Malaysia_6-25-2014.pdf.
[218] "Thailand Plans to Raise Biodiesel Output Target to 7.3 Mil Liters/d by 2021: Source," *Platts*, August 13, 2013, http://www.platts.com/latest-news/oil/singapore/thailand-plans-to-raise-biodiesel-output-target-27287876.
[219] Jim Lane, "Biofuels Mandates Around the World."
[220] Ibid.
[221] *Jatropha as Biofuel for Lighting* (NL Agency Ministry of Foreign Affairs, 2011), http://english.rvo.nl/sites/default/files/2013/12/Biofuel%20production%20-%20Malawi%20-%20TNT%20N.V..pdf.
[222] Jim Lane, "Biofuels Mandates Around the World."
[223] Ibid.
[224] Ken Joseph, *Uruguay Biofuels Annual* (USDA Foreign Agricultural Service: Global Agricultural Information Network, June 4, 2009), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/General%20Report_Buenos%20Aires_Uruguay_6-4-2009.pdf.
[225] Jim Lane, "Biofuels Mandates Around the World."
[226] Ibid.
[227] Ibid.
[228] Olatomiwa Bifarin, "Angola's Biocom Project to Begin Ethanol and Sugar Production in 2014," *Advanced Biofuels USA*, July 9, 2014, http://advancedbiofuelsusa.info/angolas-biocom-project-to-begin-ethanol-and-sugar-production-in-2014.
[229] Jim Lane, "Biofuels Mandates Around the World."
[230] Dawit Alemu, *Scoping Report on the Status of Biofuel Development in Ethiopia* (Overseas Development Institute, February 26, 2013), 4–5, http://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8795.pdf.
[231] Ibid., 2–3.
[232] Jim Lane, "Biofuels Mandates Around the World."
[233] Souleymane Diaby, *Kenya's Draft National Biofuel Policy* (Nairobi, Kenya: USDA Foreign Agricultural Service: Global Agricultural Information Network, March 30, 2011), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Kenya%E2%80%99s%20Draft%20National%20Biofuel%20Policy_Nairobi_Kenya_3-30-2011.pdf.
[234] Souleymane Diaby, *Kenya's Draft National Biofuel Policy* (Nairobi, Kenya: USDA Foreign Agricultural Service: Global Agricultural Information Network, March 30, 2011),

http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Kenya%E2%80%99s%20Draft%20National%20Biofuel%20Policy_Nairobi_Kenya_3-30-2011.pdf.

[235] *Operationalizing and Implementing the Biofuel Sustainability Framework for Mozambique* (Wageningen University: NL Agency, September 2012), http://english.rvo.nl/sites/default/files/2014/03/Operationaliziog%20Biofuel%20Sustainability%20Framework%20in%20Mozambique%20-%20sept%202012.pdf.

[236] *OECD-FAO Agricultural Outlook 2014-2023: Biofuels*.

[237] Jim Lane, "Biofuels Mandates Around the World."

[238] *Official Gazette of the Nigerian Bio-Fuel Policy and Incentives* (Federal Republi of Nigeria), accessed November 26, 2014, http://www.sunbirdbioenergy.com/docs/Nigeria_E10_POLICY_GAZETTED.pdf.

[239] Jim Lane, "Biofuels Mandates Around the World."

[240] *OECD-FAO Agricultural Outlook 2014-2023: Biofuels*.

[241] *South Africa BEFS Country Brief*.

[242] Jim Lane, "Biofuels Mandates Around the World."

[243] Dawit Alemu, *Scoping Report on the Status of Biofuel Development in Ethiopia*, 5–6.

Comment Letter 35_OP_LCFS_AAUSA Responses

LCFS 35-2 The comment notes the potential for crop-based biofuels to affect food security by driving up food prices and increasing price volatility. The EA addresses these concerns. As shown in Table 2-3 of the Draft EA, corn ethanol used for blending with California Reformulated Gasoline Blendstock for Oxygenate Blending (CARBOB) is anticipated to decrease in demand through 2020. Issues related to displacement of existing cropland are discussed in the EA under Impact 2.b: Agricultural and Forest Resource Impacts Related to Feedstock Cultivation; Impact 4.b: Effects on Biological Resources Associated with Land Use Changes; Impact 10.b: Long-Term Effects on Hydrology and Water Quality Related to Changes in Land Use; Impact 11.a: Short-Term Construction-Related Impacts Related to New or Modified Facilities; and Impact 11.b: Long-Term Operational Impacts on Land Use Related to Feedstock Production.

LCFS 35-3 The comment states that corn ethanol presents environmental concerns associated with contaminated runoff that could affect biological species. The EA analyzes these issues. As shown in Table 2-3 of the Draft EA, corn ethanol used for blending with CARBOB is anticipated to decrease in demand through 2020. As described in Impact 11.b: Long-Term Operational Impacts on Land Use Related to Feedstock Production, "…demands for biofuel crops can incur both direct and indirect land use changes at both the national and international level resulting in the displacement of existing agriculture or natural habitats (page 87 of the Draft EA)." Impact 4.b: Effects on Biological Resources Associated with Land Use Changes, discusses potential impacts to biological resources, and concludes that potentially significant impacts could result. Impact 10.b: Long-Term Effects on Hydrology and Water Quality Related to Changes in Land Use discusses water pollutants that could result from farming practices. Impacts on water quality are considered by this EA to be potentially significant. Mitigation Measure 4.b and 10.b would reduce these impacts to a less-than-significant level; however, the impact is considered by this EA to be potentially significant and unavoidable because ARB does not have the ability to determine project-level impacts or the authority to require project-level mitigation when it adopts the regulations.

This page intentionally left blank.

Comment letter code: 40_OP_LCFS_WSPA

Commenter: Catherine Reheis-Boyd

Affiliation: Western States Petroleum Association

The following letter was submitted to the LCFS Docket during the 45-day comment period.

This page intentionally left blank.

40_OP_LCFS
_WSPA

Western States Petroleum Association
Credible Solutions • Responsive Service • Since 1907

Catherine H. Reheis-Boyd
President

February 17, 2015

Clerk of the Board, Air Resources Board,
1001 I Street,
Sacramento, CA 95814
http://www.arb.ca.gov/lispub/comm/bclist.php

Re: **Public Hearing to Consider a Low Carbon Fuel Standard (LCFS) – Board Agenda Item 15-2-4**

The Western States Petroleum Association (WSPA) appreciates the opportunity to submit written comments for the record on the above proposed rulemaking. WSPA is a non-profit trade association representing twenty-five companies that explore for, produce, refine, transport and market petroleum, petroleum products, natural gas and other energy supplies in California and four other western states.

WSPA members hold the compliance obligation under the LCFS and are responsible for the challenging job of producing the vast majority of the transportation fuels used daily in California. WSPA has been engaged in the rulemaking process to develop and implement the LCFS since 2007. We have continued to make technical comments on updated regulatory packages and changes to the program despite our concerns about the overall feasibility of the LCFS program.

The fundamental problem with the LCFS remains that it is not good public policy and is incorrectly structured in its reliance on the emergence of a significant low carbon fuels market. We do not see anything in the regulatory package to change our assessment that the LCFS program and compliance schedule will remain infeasible when reauthorized.

A government agency such as ARB should not be setting goals that are aspirational and unrealistic, and then following up with band aid measures that make compliance easier while the market waits for low carbon intensity (CI) fuels to be produced at commercial volumes. The fact that a multitude of credit generation options and a cost containment provision are being proposed for inclusion in the program is a signal reflective of the program's fundamental problems.

LCFS 40-1

In our view, the current 1% CI reduction freeze has given all stakeholders and ARB an opportunity to reflect on what has worked, and particularly what has not worked within the LCFS. As ARB has admitted frequently, the development of commercial–scale low CI fuels, such as cellulosic ethanol, has been much slower than originally envisioned. We must take this re-adoption effort as an opportunity to assess the true status of low CI fuel production, infrastructure, vehicle availability, and consumer acceptance (not aspirational projected or nameplate capacity estimates) and make the changes necessary for an effective program. Additional research and development needs to occur before we can transform to a low CI fuel system.

LCFS 40-2

At its core we believe the LCFS, as envisioned by Governor Schwarzenegger in his original Executive Order and as currently designed, is infeasible. Although there will continue to be a slow shift in the transportation fuels market, staying the course with the current design of the program could result in disruptions in the transportation fuels market. There needs to be recognition that California consumers depend on and expect a reliable, useable, and scalable fuel source based on the vehicle population and fuels infrastructure in existence now.

LCFS 40-3

A successful climate-oriented fuels policy must protect against fuel supply disruptions, severe job losses in the state's refining industry and unacceptable economic harm to California and its citizens. WSPA and its members are committed to engaging with you to find better, achievable ways of reducing carbon emissions from transportation fuels.

WSPA Requests

WSPA requests two main items of ARB relative to the effort to reauthorize the program. We also have a number of more specific recommendations and requests in our detailed comments that follow. In short:

- WSPA requests program reviews that culminate in staff reports to the Board on an annual basis.

LCFS 40-4

- WSPA requests no further efforts to create post-2020 LCFS reduction targets until the pre-2020 program is a proven, feasible program.

LCFS 40-5

Sincerely,

1415 L Street, Suite 600, Sacramento, California 95814
(916) 498-7752 ▪ Fax: (916) 444-5745 ▪ Cell: (916) 835-0450
cathy@wspa.org ▪ www.wspa.org

c.c. ARB Board Members – arbboard@arb.ca.gov
Virgil Welch – vwelch@arb.ca.gov
Richard Corey – rcorey@arb.ca.gov
Jack Kitowski – jkitowsk@arb.ca.gov
Samuel Wade – swade@arb.ca.gov
Elizabeth Scheehle – escheehl@arb.ca.gov
Jim Aguila – jaguila@arb.ca.gov
Jim Nyarady – jnyarady@arb.ca.gov
John Courtis – jcourtis@arb.ca.gov
Manisha Singh – mansingh@arb.ca.gov
Wes Ingram – wingram@arb.ca.gov
Kirsten King – kking@arb.ca.gov
Anil Prabhu – aprabhu@arb.ca.gov
Carolyn Lozo – clozo@arb.ca.gov
Stephanie Detwiler – sdetwile@arb.ca.gov
Jim Duffy – jduffy@arb.ca.gov
Hafizur Chowdhury – hchowdhu@arb.ca.gov
Hurshbir Shahi – hshahi@arb.ca.gov
Stephen d'Esterhazy – sdesterh@arb.ca.gov

Western States Petroleum Association Comments on CARB's Public Hearing to Consider a LCFS – February 19, 2015

General Comments

1. Current Program Status and Proposed Compliance Targets

Since its inception, the LCFS program has aspired to deliver a 10% reduction in California motor fuel carbon intensity by 2020 versus the 2010 baseline year. Over the same period, WSPA questioned the program's viability pointing out that ARB is relying on as-yet to be developed novel technologies to supply the low CI fuels necessary to meet this goal. WSPA also questioned whether the timetable for the emergence of such technologies (primarily cellulosic fuels) would coincide with ARB's projections. To date, ARB staff has maintained that the LCFS program is working as intended, but WSPA remains concerned about the viability of achieving the targets proposed in the LCFS reauthorization proposal, given the current status of low-CI fuel-producing technologies.

Halfway through the 2010-2020 "compliance" decade, the program is delivering approximately 2% CI reduction (versus an annual target of 1% for 2014 and 2015). ARB maintains the primary reason the program CI reduction targets have not been ratcheted up as originally intended is pending litigation (discussed later in our comments). WSPA is concerned that the program still faces considerable challenges, even as ARB proposes to scale back some of the program's targets, e.g., interim year CI reduction targets, while leaving others such as the 10% 2020 target in place, despite mounting evidence that it cannot be met.

LCFS 40-6

ARB's own estimates indicate the LCFS program as proposed in the reauthorization proposal is not sustainable. Approximately 3% of the 10% CI reduction shown for staff's illustrative scenario for 2020 is derived from accumulated credits (from "over-compliance" during previous years) and only 7% is actual, sustainable CI reductions obtained during the year. While ARB staff forecasts a credit bank build up to 9 MMT at the end of 2015 to help satisfy the otherwise un-sustainable reduction targets, in actuality the credit bank stood at just under 4 MMT at the end of the third quarter of 2014 (since program inception) and, given the rate of credit buildup to date, the assumption that banked credits will reach 9MMT over the next 15 months is aspirational. Even if credit generation sees an increase due to more regulatory certainty, as ARB posits it will, there is unlikely to be enough of a generation increase to meet ARB's projections.

Setting aside the issue of ARB's reliance on an unrealistic initial credit bank at the start of 2016 (to meet the 10% 2020 target), WSPA does not agree that staff's projection of a 7% sustainable reduction in 2020 is accurate. WSPA believes ARB's projections for estimating the degree of market penetration of renewable biogas for motor fuel applications and the volumes of renewable diesel that will be incorporated in the CARB diesel pool are too optimistic. Questionable LCFS credit contributions are also

forecasted from the Refinery Investment Credit segment of the re-adoption program. The reasons for WSPA's reservations in these areas are outlined further in the detailed section of our comments.

WSPA notes the "redirection" of ARB's reliance on different sector contributions to achieve the program's CI reduction goals, in particular, the absence of a significant contribution expectation from advanced cellulosic biofuels – an expectation that once provided justification for the original program's ambitious goals. While this appropriately reflects the lack of growth in technologies for advanced cellulosic biofuels, the degree to which such low CI fuels are expected to contribute going forward is now but a fraction of the overall program CI reduction needs. Given ARB's tacit acknowledgment that this area has not grown as initially projected, resulting in a substantial decrease in its potential contribution to program CI reduction, WSPA is surprised that ARB has not reduced program targets accordingly.

Instead, ARB has largely held on to the original program targets (at least for 2020) and looked to fill the CI reduction "gap" created by the lack of development in cellulosic fuels through larger-than-justified increases in reliance on renewable biogas and renewable diesel, and the arbitrary decision to allow the generation of LCFS credits from stationary source segments such the "Refinery Investment Credit" and "Innovative Technologies for Crude Oil Production", and the inclusion of "Pre-LCFS electricity sources (e.g. fixed guideways and electric forklifts)". In WSPA's view, this "redirection" coupled with the overstated focus on credit reliance in the 2016-2020 timeframe without an acknowledgement of the magnitude of sustainable CI reductions, fails to accurately project the true challenges of meeting the program's targets.

LCFS 40-6 cont.

WSPA is concerned that if unachievable targets are set at the outset, the regulated community will not receive the benefit of the certainty ARB is seeking to provide with the LCFS because the targets will be viewed as placeholders that will ultimately have to be revised. If overly ambitious targets are promulgated, they may have the unintended consequence of prolonging the climate of uncertainty, sustaining deferred action on compliance plans, investments, etc. that are necessary to the success of the program, and potentially undermining the program's goals. In the case of the readopted LCFS, if the credit bank status for 2015 is confirmed to be substantially lower than staff's expectations (roughly within a year's time from re-adoption), the 2020 CI reduction target will be infeasible and the need for revision will be even more urgent since 2020 will be only four years away at that point.

ARB's ISOR documentation lacks detailed data to clearly support the contention that the program is still feasible. A full analysis of the supply of low CI fuels actually available to California and the projected cost; the supply logistics (marine, rail, etc.) available to accommodate these alternative fuels; the infrastructure needed to blend, transport and dispense these fuels; incentives necessary for consumer acceptance; and other regulatory impediments should all be delineated.

Since the original LCFS adoption package, WSPA has worked with the Boston Consulting Group (BCG) to both analyze ARB's assumptions relating to the LCFS compliance curves but also to provide its own projections of what can sustainably be accomplished by certain timeframes. WSPA and BCG have met several times with ARB during the initial work on the re-authorization in 2014 to compare updated analyses relative to the program's feasibility. WSPA continues to urge ARB to reset the 2020 target CI reduction level to a more realistic and sustainable level of approximately 5%, as indicated in the projections of the Boston Consulting Group's most recent study that has been shared with staff. This WSPA recommendation of the 2020 target factors in staff's proposed lowering of the interim year targets and the associated credit bank impacts it will have.

The attached BCG report (Appendix 1) contains their most recent analysis that compares ARB's and BCG's forecasts and investigates the reasons for the differences. Some of the summary conclusions from the BCG report are:

- A 5.1% reduction in the total fuel pool is sustainable by 2020 based on credits available through blending low-CI fuels (e.g. renewable diesel, biodiesel) and purchasing credits (e.g. electric, natural gas).
- Using the same compliance schedule, BCG forecasts banked credits being exhausted earlier than ARB with annual deficits starting in 2018.
- BCG forecasts a 4.4MMT larger deficit in 2020 versus ARB's scenario
- ARB's near term growth is overestimated [ARB's "illustrative" compliance curves show significantly MORE banked credits in 2014 than are actually going to be available based on projections for the year-end report. While ARB has only published the credit numbers through 3Q2014 as 3.9MMT excess credits, it is highly unlikely this will balloon to 5.5MMT excess credits through 4Q2014.]
- Even ARB's forecast shows only a 6MMT credit bank remaining for 2020, so there is no sustainability anticipated beyond 2020.
- ARB's forecasts of volumes of several low CI fuels through the first three-quarters of 2014 remain excessively aggressive
- The program continues to depend heavily on CI reductions in the diesel/distillate pool.

LCFS 40-7

2. <u>LCFS Program Feasibility – Low CI Fuel Availability</u>

- <u>WSPA requests credible assessment of projections of low CI fuel availability using WSPA criteria, fuel cost competitiveness, plus an assessment of infrastructure and vehicle availability to match with the fuels.</u>

LCFS 40-8

Overall, WSPA's greatest concern continues to be the lack of a credible ARB assessment and forecast of the availability and costs of low carbon fuels and credits that ARB has assumed will be available. We note that multiple caveats are included in ARB's analyses indicating the illustrative scenarios are <u>not forecasts or predictions</u>.

In addition, ARB staff must justify why assumptions that the bulk of the nationwide supply will be delivered to and used in California, are reasonable in light of current and proposed competing programs (i.e., RFS2 and LCFS initiatives in the Pacific Northwest states and B.C.). It is also imperative this analysis include the expected added costs for compliance, including those associated with fuel distribution and refueling infrastructure, and specialized vehicles (e.g., battery electric vehicles).

Although no one can say with any degree of certainty what fuel/credit combinations may be used to attempt to comply with the program, there are a number of assumptions ARB staff has used in the past that are not believable based on EIA projections, historical experience with timing and volumes of new fuel/vehicle introductions, and future market economics.

WSPA has requested several times now that ARB provide an updated analysis based on the technical criteria below, so staff can provide the Board with a realistic update. The technical criteria relate to the three interrelated transportation system components: fuel (availability and cost), infrastructure and vehicles:

Fuel Volumes

The volume analysis should include the following items to assess the capability of the low CI fuel production facilities (current and proposed):

1. Design capacity in gallons per day
2. Date of construction completion
3. Date that feedstock first introduced to process
4. Date that on-specification product first produced
5. Highest utilization demonstrated in a consecutive three month period (utilization is defined as production rate divided by design capacity, inclusive of downtime)
6. Percent of product that was produced on-specification without reprocessing or blending during the period in Question #5.
7. Duration in days of longest continuous period of plant operation
8. Utilization during last calendar year (production rate divided by design capacity, inclusive of downtime)
9. Percent of product that was produced on-specification without reprocessing or blending during the period in Question #8. Qualified biofuels have to be able to replace a certain meaningful percentage of the previous year's demand for the on- ramp to be triggered.
10. Feedstock availability analysis including what percentage of available feedstock the actual production volume requires. Analysis of feedstock

LCFS 40-8 cont.

availability should be done separately for domestic and foreign supply sources.

Footnote: A definition of "success" could, for example, be once answers to questions #5 and #6 exceed 80%. Or, before a facility is deemed to be viable and included in a consideration of low CI fuels facilities to be in ARB's list of "available fuels" would be the answer to question #5 multiplied by the answer to question #1. Note that typical refinery process utilization ranges between 93 and 98 percent, on an annual basis.

Fuel Cost-competitiveness

Not only is the availability of low CI fuels important, but those fuels must also be cost competitive if the LCFS is to be feasible in a real world market. Accordingly, a cost-competitive analysis must be performed. This analysis should assess how much greater the low CI fuels are in average market costs than petroleum products on a per-gallon basis, and the analysis should also evaluate the role or continued need for subsidies in the cost of the fuels.

Fuel Infrastructure

This analysis should also consider the capability of the distribution system infrastructure (including retail sites) to handle these volumes and types of fuels and what additional infrastructure would be needed, including costs, to support the assessed volumes.

Vehicle Availability

A mandate for further CI reduction should consider whether commercially produced vehicles are available in sufficient quantity to use the low CI fuels. Further, the compatibility of the existing vehicle fleet to use these higher volumes or types of fuels needs to be analyzed. Barriers like consumer acceptance should also be analyzed in an intellectually honest manner with sensitivity runs to bracket an appropriate range of consumer acceptance.

LCFS 40-8 cont.

- Low CI Fuel Availability - Three Fuel Examples:

Renewable Diesel

Renewable diesel is one of the more promising available low carbon intensity fuels for LCFS compliance. However, ARB's supply projections are optimistic and overly reliant on announced projects and nameplate capacities. Announcements regarding new production facilities are frequently optimistic in their projected startup dates and facilities rarely reach nameplate capacities in the first months or even years following completion of construction as they face startup issues. Feedstock availability is of particular concern for a product like renewable diesel that will be competing with established food and industrial product markets for the same lipid feedstocks.

The critical barriers to the market penetration of renewable diesel, however, are not production levels but blending infrastructure and regulatory hurdles. ARB has projected

LCFS 40-9

that renewable diesel will make up 12% of the California diesel pool by 2020, but we anticipate it will reach roughly half that level. Logistical hurdles on pump labeling (FTC regulations), superimposed on the fungible nature of the common carrier pipeline system will be difficult to overcome in the 2016-2020 timeframe. BCG projects that the vast majority of diesel in the state will contain 5% renewable diesel by 2020, with higher percentages seen in select centrally fueled fleet applications, resulting in an overall pool average slightly above 5% renewable diesel.

ARB has speculated that regulated parties may pursue several options for getting around the 5% blending limit imposed by FTC labeling rules.

- Segregated grades of diesel at terminals – Staff contends that selling two blend levels (0-5% and 6-20% renewable diesel) would enable higher blend levels.

  This option is problematic as terminals face multiple logistical constraints when it comes to any attempts at additional product segregation (e.g. plot space for additional tankage). Even where it could be considered, it is highly unlikely to occur until LCFS implementation establishes RD supply stability and justifies the investment in expansion of diesel grade infrastructure.

- Moving entire pipeline/terminal systems to higher blend levels – Some terminal position holders could move to 6-20% blends, causing the retailer community served by those terminals to label accordingly.

  Voluntarily industry adoption of an RD6-RD-20 specification is equally problematic. The existing fungible pipeline system dictates that industry must move in "lockstep" for any geographic move to higher blends. Such a change would have to be implemented through a common carrier pipeline specification change, which can take a lot longer than expected.

- Large-scale fleet blending – Bypassing the traditional supply system to blend high renewable diesel levels for fleet applications.

  This is a very real possibility. Centrally-fueled fleet blending at higher renewable diesel percentages will likely occur but its impact is small and it has already been comprehended in BCG's estimates.

- Relying on an FTC re-interpretation of the underlying law (2007 EISA) – The FTC may revisit their understanding of Congress' intent and remove the regulatory barriers.

  This is the least likely solution. Several unsuccessful inquiries have already taken place by both fuel providers and renewable diesel producers as expanded blending has been pursued for Renewable Fuel Standard and other blending mandate compliance. The FTC has been unmoved on this point. Congress providing the necessary authority (by reopening EISA) is even more unlikely near term.

LCFS 40-9 cont.

Furthermore, strong opposition should be expected by the biodiesel lobby to any revision attempt.

In view of the above, terminal blending above 5% (on average) before 2020 is highly unlikely and fleet blending will have only a marginal impact on the overall market balance.

LCFS 40-9 cont.

Renewable Biogas

Reliance on large-scale production of renewable natural gas as a supply of LCFS credits is questionable. Investors will weigh high regulatory risk as they consider such projects. Without RFS and LCFS credit subsidies, renewable natural gas for transportation is uneconomic. Cellulosic RINs are estimated to add three times the commodity value of natural gas, the LCFS may add another one to two times the value. While this may seem like a significant motivator for investment, the possibility that these programs may be modified at any time (based on political and/or regulatory reassessment) represents a significant issue for investors as the consider projects whose returns are based solely on the RFS and/or LCFS credit premiums that they generate.

Typical economics (capital investment, absence of need for gas "cleanup", access to gas pipeline, etc.) of biogas utilization drive the application of such gas to power generation and not motor fuel use. We have cautioned ARB that the GHG reduction benefits associated with "re-purposing" biogas from power generation CNG/LNG production are not appropriately accounted for in staff's estimates. ARB's carbon intensity assessment of these products ignores this very real possibility, taking full credit for any renewable CNG/LNG production as though it represents green-field landfill gas production. Should it be found that a significant portion of the landfill gas supply used for CNG/LNG production was redirected from electricity production, much of the compliance value of those biogas products will have been lost.

LCFS 40-10

The current version of CA-GREET2.0 estimates the lifecycle CI of CNG from landfill gas to be 17gCO2e/MJ. If this landfill gas was re-purposed from on-site electricity generation, the amount of electricity displaced from the grid would need to be accounted for as average grid electricity, which has a much higher CI than electricity from landfill gas. CA-GREET2.0 estimates the US-average electricity CI to be 183gCO2e/MJ, while EPA has estimated the CI of electricity from landfill gas to be 11.4gCO2e/MJ. EPA has also estimated that 3.4MJ of landfill gas energy is required to produce 1MJ of electricity*. The increase in the landfill gas CNG/LNG CI from displacing LFG electricity would therefore be:
(1 MJ Elec. / 3.4 MJ LFG) * (183 - 11.4gCO2e/MJ Elec.) = 50gCO2e/MJ LFG

For the example above (Landfill Gas CNG), the CI would increase from 17gCO2e/MJ to 67gCO2e/MJ if re-purposed from on-site electricity generation, or about the same as fossil natural gas.

*Note: *"Support for Classification of Biofuel Produced from Waste Derived Biogas as Cellulosic Biofuel and Summary of Lifecycle Analysis Assumptions and Calculations for Biofuel Produced from Waste Derived Biofuel," U.S. EPA Office of Transportation and Air Quality Memorandum to Docket EPA-HQ-OAR-2012-0401, July 1, 2014.*

Table 6: CI of Electricity from Landfills that Flared Biogas = 12 kg CO2e/mmBTU (= 11.4 gCO2e/MJ)
Table 5: Efficiency of Electricity Generation from Biogas = 11,700 BTU biogas/kWh (= 3.4 MJ biogas/MJ electricity)

Advanced Biofuels

ARB staff continues to strongly assert that the LCFS program (and more particularly LCFS credit prices) will drive advanced biofuels production. WSPA notes that almost all of the advanced biofuel production facilities ARB and others mention are not in California – challenging the notion that the state is really driving the advanced biofuel market and attracting investments. As previously commented by WSPA in our Wood Mackenzie and BCG contractor work in 2012, the LCFS will draw any limited quantities of these fuels that may be available to California via shuffling resulting in sub-optimal costs and often increased emissions.

When calculating/projecting future biofuels supply, ARB should not rely on press announcements as credible evidence of actual facilities/volumes, since many projects are cancelled after initial press announcements but prior to construction, based on engineering studies that are completed and a more definitive cost estimate becoming available. ARB should count facilities that have started construction for potential facility/volume availability in the next 2 – 3 years. If construction has not started, then a discount factor of at least 50% should be used in projecting future capacity. When using past growth rates and projecting them into the future, ARB should take into account the period of two or so years of essentially no growth.

LCFS 40-11

3. Assessment of LCFS Program – Major Milestone Review

Although ARB has conducted two formal Periodic Reviews of the LCFS program since its inception, WSPA believes ARB needs to conduct a Major Milestone review to inform transportation fuel consumers and state policymakers of the program's progress towards meeting its objectives over the first 5 years of its existence. We note that during the 2014 Advisory Panel meetings there was discussion of the need for a thorough review which provided more definitive data. We urge ARB to conduct such a review where the analysis is focused on quantifiable metrics that should include, at a minimum, the following considerations that are different in scope from the normal Periodic Reviews:

• Actual GHG reductions achieved through the program (in-state and out-of-state reductions quantified separately), and the avenues/means used to drive those reductions.

• GHG reduction achieved solely by the LCFS, exclusive of other programs, (such as the federal RFS2 and CAFÉ standards, or the California ZEV mandate.) To objectively assess LCFS program progress, GHG reduction benefits should be viewed on an incremental basis, i.e. above and beyond what is delivered from these other programs.

• Costs associated with the LCFS program. These should include any subsidies or program expenditures (i.e., total cost for the California taxpayer), and any additional fuel costs.

LCFS 40-12

• Cost-effectiveness of the LCFS program. The analyses should compare the cost-effectiveness of the incremental GHG reduction delivered by the LCFS program (in terms of dollars per ton CO2 reduction) to those of other GHG reduction programs such as the California Cap and Trade Program or and vehicular efficiency programs (CAFÉ).

• Prospects for future successes in terms of GHG reduction which may be attributed to the LCFS program [in the absence of other related regulatory policies], and a reasonable assessment as to their probability of success.

• Assessment of incremental incentives for innovation and in-state employment paid for by state or local dollars. We believe the California public should be apprised as to what their taxes have supported, their incremental fuel and vehicle costs, and be allowed to judge the effectiveness of the LCFS program versus other transportation-related GHG reduction approaches in a transparent, objective manner.

LCFS 40-12 cont.

Economic Impact Analysis Update

To add to the above note on a Major Milestone review, there appears to be a false sense of the degree of updates staff has provided – especially for the economic analysis. There has been minimal effort to update the 2009 economic impact analysis, and during the various 2014 Workshops staff indicated there would not be a comprehensive update to the five year old economic impact analysis.

During the 2011 program updates ARB stated that much of the 2009 analysis remains valid, but acknowledged the need for an entirely new analysis. It was also stated that staff was considering using a contractor to conduct a more comprehensive economic analysis of the LCFS. We were told such an analysis would not be completed until sometime in 2012 or early 2013, but this seems to not have materialized.

LCFS 40-13

4. Cost Containment Mechanism – Credit Clearance

WSPA is concerned that the cost containment mechanism proposed will also act as either a price floor or have the unintended effect of raising LCFS credit prices. Because LCFS credits do not expire, the proposed cost containment mechanism will provide an incentive for those parties that have excess credits to hold on to their credits if they believe that a Clearance Market will occur in the future or to hold out for an offer that is near the Clearance Market price. This negative impact of the cost containment mechanism could be partially mitigated if participation in the Clearance Market was voluntary and if staff re-inserts the deficit carry over provision that was in the previous LCFS reglulations (which WSPA is also suggesting).

LCFS 40-14

In June 2014 WSPA commissioned a paper by Analysis Group, Inc. to review the cost containment mechanisms being proposed by ARB at that point in time.

The Analysis Group pointed out that there "*is a meaningful risk that LCFS compliance costs will increase significantly at some point in the near- to medium-term due to the*

confluence of an increasingly stringent standard, and diminishing opportunities for low-CI fuel substitutions. By virtue of the rate at which the LCFS standard declines, the nature of the transportation systems regulated, and the LCFS design, there is a meaningful risk in the near- to medium-term that compliance with the LCFS could become increasingly difficult. Due to these factors, the cost of actions to generate LCFS credits could rise significantly. Despite the current large bank of surplus credits, the risk of either cumulative deficits or significantly elevated credit costs is high, although the timing and severity of these outcomes is uncertain."

ARB recognized the need for some mechanism to accommodate short-term market disruptions and prevent excessive LCFS cost of compliance during such periods from ultimately impacting fuel prices. WSPA's advice in that regard has been that the setting of realistic goals coupled with frequent program reviews to ensure ample credit availability in a liquid LCFS credit market would obviate the need for a cost containment mechanism such as the Credit Clearance Market that ARB is proposing as part of the re-adoption package.

WSPA agrees with the Analysis Group's finding that, "*While regulated parties are building up a cumulative credit surplus in the early program years, there is a definite risk that these credit surpluses will become exhausted as the standard becomes more stringent, which could lead to very high costs and/or a cumulative credit deficit, which would increase the risk that regulated parties could not achieve compliance. Current ARB proposals that might add limited credits to the market (e.g., Innovative Technologies for Crude Oil Production) would only shift out the date at which these barriers are hit. While there is much technological uncertainty about the timing and severity of these constraints, there is a clear risk that compliance with the LCFS could become increasingly costly and challenging to comply with. Thus, there is justified concern about cost containment*."

LCFS 40-14 cont.

ARB staff maintains that sufficient low CI fuels and credits will be available and, thus, the cost containment mechanism will be seldom (if ever) needed. Staff's vision is that, when it is necessary, it will be in response to some short-lived market "blip" or disturbance that will quickly give way to reestablishment of equilibrium. Staff acknowledges that this tool is not designed to accommodate systemic and prolonged LCFS credit shortages. Staff considers the ability to carry deficits forward (albeit with interest) for up to five years an "insurance policy" and sees no particular negative aspects to the end-of-year credit clearance auction they are proposing (where regulated parties can buy their pro-rata share of pledged credits at a price as high as $200/ton).

WSPA is opposed to the inclusion of such a cost containment mechanism in the LCFS because we believe that it will not accomplish its stated objective (contain costs) and will instead have a number of undesirable (and unintended) consequences. More specifically, the Credit Clearance Market (CCM):

<u>Does not stipulate a mechanism for retiring deficits, if multi-year market shortages persist</u>.

LCFS 40-15

Obligated parties that participate in the year-end auction of credits pledged by suppliers at costs as high as the pre-determined "cap" Maximum Price, have no recourse but to

carry over any remaining deficit into the following year with interest. There is no way to retire deficits if shortages persist year to year. Instead, obligated parties face the prospect of an ever-increasing accrued financial liability that is essentially outside their control. In a market that is consistently short credits year after year, the ability to defer unsatisfied obligation (with interest) offers little comfort to the regulated community staring down the specter of ever-increasing deficits and no method to retire part of the obligation generated by an infeasible standard.

LCFS 40-15 cont.

<u>May drive credit costs up (if credits are withheld from the regular market to get a higher CCM cost)</u>.
During periods of rising costs (i.e., credit shortages in the open market), the CCM will not keep credit costs in check. In fact, the CCM to clear the market at the end of the year is meaningless during a credit-short environment as there will not be any remaining credits to be brought to the table by sellers. The compounding of "interest" on the carryover/deferred balances will ensure credit buyers soak up the available pool of real LCFS credits in the market during the year rather than wait for the CCM. The pool of real LCFS credits available is fixed – it is only their cost that remains in question. Staff's setting of the Maximum Price at $200/ton will serve as the benchmark for credit costs in that environment.

During periods of stable or declining costs (i.e., credit surplus in the open market), the CCM cap Maximum Price creates an artificial "floor" value below which sellers will be hesitant to offer real LCFS credits for sale to the regulated community at substantially lower costs. This would artificially increase compliance costs – as credit costs will be artificially raised to (or near) the ARB cap and very few transactions will take place before the end-of-year sale. Credit trading would be seriously impaired as the open market would not be allowed to function as it should.

LCFS 40-16

<u>Provides no liability protection against invalid credits secured through the CCM.</u>
We reference the issue of lack of an acceptable liability defense provision or protocol in the LCFS to protect obligated parties from potentially fraudulent credit sellers elsewhere in our comments. For the purposes of discussing this topic within the CCM provisions, we emphasize that the only protection we have as buyers of credits is to perform our due diligence and carefully screen the parties we choose to engage as partners in LCFS credit-buying transactions. It appears to WSPA that we will not be afforded this ability with respect to the credits we are obligated to purchase (our pro-rata share) through the CCM. Moreover, the timetable set by ARB to organize and complete the CCM raises concerns that the agency will be undertaking minimal, if any, screening of the credits that are pledged by sellers for the CCM. WSPA objects to the fact that regulated entities may potentially wind up in a position of non-compliance through no fault of their own simply because there is a credit shortage and they are required to participate in a CCM that provides them no control over what credits they buy and from whom.

LCFS 40-17

Offers no connection between CCM outcome, program off-ramps, future CI reduction targets

It stands to reason that LCFS credit market liquidity (measurable potentially through a number of different indicators) is not only essential to the program's success but, also, that the absence of such liquidity should be viewed as a clear signal that the program's CI reduction targets are overly ambitious and that the regulated community is finding it difficult to meet its obligations and remain in compliance. There is no connection or tie-in in the current CCM proposal to initiate a comprehensive program review should the alarming trend of potential credit shortages materialize and become evident through the CCM.

LCFS 40-18

Is incomplete in its definition of the mechanics (recordkeeping, reporting, etc.) of deficit carryover

Even if all of the above issues were resolved, the CCM proposal in the ISOR and draft regulatory language is sorely lacking in the execution/implementation details that would allow the regulated community to understand exactly how it would work. For example: What is the "order" of applying generated credits (through blending or purchases) to the various potential uses for a regulated party o on any given year (e.g., meet the current year's obligation, retire previous years' obligations)?

LCFS 40-19

Finally, the proposal to make public the long and short credit positions of regulated parties flies in the face of the principle of confidential business information. A regulated party's competitive position could be seriously compromised by the publication of this information. In addition, this information would give competitors both an understanding of a regulated party's compliance strategy and a view into the regulated party's fuel and credit acquisition activity for the year. Using this information and average market pricing, one could estimate the financial impact of LCFS compliance on a regulated party.

Alternative to the CCM

In lieu of the CCM, a dual approach of setting reasonable, practically achievable CI reduction targets and holding frequent (annual) program reviews to ensure that the program remains on track and the LCFS credit market is healthy should prevent the type of cost excursions that CCM is meant to accommodate. More specifically, staff could eliminate the proposed CCM and:

- Provide for annual mandatory program reviews with the first one due by 1/1/2017. The initial review should include LCFS credit history including actual credit generation, obligation, and a comparison of actual current credit bank versus staff's projections in the ISOR. As part of the review, staff should include a projection of where the credit bank is expected to be in the future. If overall credit generation is above or below staff's projections (plus/minus a modest estimate allowance/tolerance), CI reduction targets should be adjusted up or down to re-establish an aggressive yet achievable program.

- Establish triggers that would require early program reviews prior to the planned annual staff report. Specific, measurable thresholds and triggers should be

LCFS 40-20

established as part of this process. Some examples of such triggers for an early review of subsequent year CI targets include:

- Monthly credit cost exceeds $150
- Industry credit bank falls below 5 million metric tons (MMT)
- CA fuel price > "x"cpg above national average

- Incorporate a simple carryover rule for one-off company imbalances. The provisions of this segment could be tailored along the lines established for RINs by EPA in the RFS program, with potential additional enhancements. Key features could include:
  - A regulated party may carry over a deficit balance for one year, without penalty
  - Credits must be retired in the following year to completely settle the deficit balance
  - A deficit balance cannot be carried over two years in a row

LCFS 40-20 cont.

This simple-to-execute approach would satisfy staff's stated goal of addressing short-term tightness in the credit market, while avoiding the market-manipulating aspects of the proposed CCM. Neither this solution nor the CCM can address the very real possibility of a long-term credit shortage. This must be met with the program reviews and schedule adjustments recommended above.

If staff insists on moving forward with a CCM, WSPA recommends that, at a minimum, the following changes should be made:

- Participation in the CCM should be voluntary. In order for ARB to determine whether or not to hold a CCM for a particular year, ARB could issue a "Call For Deficits" similar to the "Call For Credits" already incorporated in staff's proposal.

- Regulated parties that have pledged credits to sell into the Clearance Market, and have not sold or contractually agreed to sell all their pledged credits, cannot reject an offer to purchase pledged credits at the Maximum Price.

- The LCFS credit balance and the individual entity names should be treated as highly confidential because the release of this information could adversely impact business operations. The release of the LCFS credit balance would provide competitors and other LCFS credit market participants with short or long position knowledge.

- The Deficit Carryover provisions should be reinstated. WSPA objects to the removal of the Deficit Carryover provisions in the proposed regulations and request that the current provisions be retained as there may be planning or operational reasons why a regulated party may wish to carry deficits from one year to the next.

LCFS 40-21

On many occasions, WSPA has raised concerns about the interactions between the LCFS and the GHG cap-and-trade program.[1] In general, "quantity-based" programs such as the

LCFS 40-22

LCFS (which relies on averaging across entities to meet a standard) that overlap with a cap-and-trade program do not generate additional emission reductions but do potentially raise costs. Because the LCFS affects sources both under and outside of the GHG cap-and-trade system, these interactions are somewhat more complex. However, this does not affect the conclusion that these interactions create significant concerns for the environmental and economic efficacy of the LCFS.

ARB's cost containment proposal in no way affects these conclusions. The cost containment proposals may mitigate the extent to which the LCFS raises the costs of meeting the AB 32 targets compared to a policy that relies solely on the GHG cap-and-trade program, but does not affect the conclusion that the LCFS raises overall costs.

LCFS 40-22 cont.

WSPA provides additional detailed comments later in this document regarding specific concerns about the cost containment provision as proposed by ARB.

[1.] *see* Schatzki, Todd and Robert Stavins, "Implications of Interactions for California's Climate Policy," Regulatory Policy Program, Mossavar-Rahmani Center for Business and Government, Harvard Kennedy School, August 27, 2012.

Legal Comments:

1. ***ARB has failed to comply with statutory requirements with respect to enacting a fuel specification, including inadequately analyzing fuels impacts through multimedia analysis.***

   WSPA strongly disagrees with ARB's characterization of the LCFS as a fuel "standard" rather than a fuel "specification." ARB argues that because the LCFS governs the production process for fuels, rather than imposing "an ARB mandate on a vehicular fuel's particular composition," the LCFS is not a fuel "specification" subject to the Health & Safety Code's requirements for fuel control measures. Initial Statement of Reasons for Proposed Rulemaking, Proposed Re-Adoption of the Low Carbon Fuel Standard ("ISOR"), at III-58 – III-63. ARB argues that a fuel "specification" would be more like a recipe, with quantifiable measurements of components that would make up the fuel; because carbon intensity measurements rely more on how a fuel is made than what is in it, ARB says the LCFS is not a "specification." *See* ISOR at III-61.

   LCFS 40-23

   But contrary to ARB's assertion, carbon intensity is a criterion or "specification" to which motor vehicle fuels must comply. The Health & Safety Code nowhere requires that a "specification" relate only to the quantity of fuel components. Indeed, the Code recognizes a fuel specification for light-duty vehicle exhaust emission standards—standards that, like the LCFS, are based on overall emissions from fuels as opposed to quantification of their particular components. Cal. Health & Safety Code § 43018(d)(1).

   Furthermore, the LCFS will change specifications of California reformulated gasoline and diesel and may require fuel additives to be added to or removed from fuels and new fuels to be used statewide. ARB Draft LCFS Regulation, § 95422

("[T]he transportation gasoline and diesel fuel for which a regulated party is responsible in each calendar year must meet the average carbon intensity standards set forth in this section . . . "). ARB is not permitted to avoid the statutory requirements associated with fuel control measures by simply labeling the LCFS a "standard" as opposed to a "specification."

Furthermore, the Ninth Circuit has already considered the LCFS to be a fuel control measure. *See Rocky Mountain Farmers Union v. Corey*, 730 F.3d 1070 (9th Cir. 2013) (recognizing that the LCFS is "a control respecting a fuel or fuel additive and was enacted for the purpose of emissions control"). In fact, ARB itself has argued that it should have the authority to enact the LCFS precisely because the LCFS is a control on motor vehicle fuels. *See* Defendants' Memorandum in Support of Cross-Motion for Summary Judgment, *Rocky Mountain Farmers Union v. Goldstene*, Case No. 09-CV-02234 (C.D. Cal. Dec. 17, 2010) at 2, 11-18. In its *Rocky Mountain Farmers Union* papers, ARB admitted that "[t]he LCFS controls the carbon intensity of fuels offered for sale in California. It does so by applying a lifecycle analysis." *Id*. at 15. ARB even pointed out that as fuel sources diversify, "differentiating among them on the basis of lifecycle carbon intensity becomes even more critical"— in other words, carbon intensity is a specification of fuels that is controlled by the LCFS with the goal of reducing emissions.

LCFS 40-23 cont.

ARB cannot now change its tune in an effort to escape the statutory requirements applicable to fuel control measures. Under the California Health & Safety Code, ARB must assess not only the cost-effectiveness of such controls, but also the technological feasibility of the controls, including, but not limited to, the availability, effectiveness, reliability, and safety of the proposed technology. Cal. Health & Safety Code § 43013(e). ARB's documentation does not adequately assess any of these factors. In addition, as discussed in greater detail below, ARB has failed to undertake the requisite multimedia analysis for the LCFS, also mandated by the Health & Safety Code.

Multimedia Analysis Under Health & Safety Code § 43830.8

One key requirement ARB has attempted to avoid by its improper characterization of the LCFS, is conducting multimedia analyses for fuels that will likely be used to comply with the LCFS, as required under the Health & Safety Code.

Under section 43830.8 of the Health & Safety Code, ARB may not adopt "any regulation that establishes a specification for motor vehicle fuel" unless the regulation, and a multimedia evaluation for the regulation, are reviewed by the California Environmental Policy Council ("Council"). Cal. Health & Safety Code § 43830.8(a). A multimedia evaluation requires ARB to identify and evaluate "any significant adverse impact on public health or the environment, including air, water, or soil, that may result from the production, use, or disposal of the

motor vehicle fuel that may be used to meet the state board's motor vehicle fuel specifications." Cal. Health & Safety Code § 43830.8(b).

ARB staff promises they will perform a multimedia analysis later—either if and/or when ARB adopts a new fuel specification (such as the current specification for biodiesel) or if and/or when it amends an existing fuel specification (such as natural gas or E85). ISOR at III-64. Such an approach fails to address upfront any adverse environmental impacts that may be associated with producing fuels that can meet the carbon intensity requirements of the LCFS. Multimedia evaluations are necessary in order to obtain a full and independent assessment of the range of potential environmental impacts of any newly proposed fuel regulations across all media. This assessment should be completed as soon as feasible, not at later dates if and/or when ARB chooses to prepare it.

In addition, delaying such an evaluation until a later time could hinder the development of the full range of LCFS-compliant fuels due to concerns about allocating any significant resources to the commercialization of a fuel that could ultimately fail a multimedia evaluation.

Nearly six years have passed since ARB stated, during the first LCFS rulemaking, that there was not enough information to conduct a multimedia evaluation for fuels designed to comply with the LCFS. ARB and fuel producers have much better information now regarding the types and blends of fuels that will likely be used under the LCFS. In fact, ARB completed a multimedia analysis for biodiesel in conjunction with the Alternative Diesel Fuel (ADF) rulemaking. ARB should now complete multimedia analyses for all fuels that will likely be used to comply with the LCFS in order to comply with its statutory duty under the Health & Safety Code.

LCFS 40-23 cont.

2. ***Combining the ADF and LCFS processes into one CEQA "project" is not procedurally appropriate, and results in an insufficient environmental analysis.***

ARB should analyze the LCFS and the ADF as two separate projects. At the very least, ARB must acknowledge the possibility that the two regulations will not pass concurrently, and should rework the Draft EA to clarify the impacts from each of the regulations, and the specific mitigation measures applicable to each.

The Draft EA published by ARB is the environmental document for both the LCFS and the ADF regulations. While these two rulemakings are being run concurrently, parallel to one another, they are also being run as two separate processes. Because the two regulations are subject to two separate rulemakings, there is the possibility that one regulation could pass but the other could not, or that one regulation could be challenged and its implementation delayed while the other continues to move forward.

LCFS 40-24

ARB has cited CEQA Guidelines § 15378(a) in support of its approach to combine environmental review of the two regulations into one CEQA "project." However, section 15378(a) of the Guidelines simply states that a "project" is "the whole of an action, which has a potential for resulting in either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment…" While section 15378(c) of the Guidelines clarifies that a "project" can include an activity that requires more than one discretionary approval by one or multiple government agencies, the Guidelines nowhere provide for a "project" that encompasses two separate activities that happen to be related to one another, but are not interdependent. *See* CEQA Guidelines § 15378(c).

LCFS 40-25

Interdependence, an element lacking here, is key to including separate actions under the umbrella of one CEQA "project" for purposes of environmental review. *Tuolumne County Citizens for Responsible Growth, Inc. v. City of Sonora* (2007) 155 Cal.App.4th 1214, 1230-1231 [finding a road realignment and construction of a shopping center were part of the same "project" because the shopping center's opening was legally dependent upon the road's realignment]. The LCFS and ADF regulations certainly pertain to related subject matter, but they are not legally dependent upon one another—the LCFS can (and has, in the past) exist without the ADF, and vice versa.

Both statute and regulation recognize the need to analyze separate "projects" in circumstances similar to these. For example, while a real estate developer may request a rezoning of property, as well as a tentative subdivision map, for purposes of effectuating development, those two related but separate actions are recognized as distinct "projects." *See El Dorado Union High School Dist. v. City of Placerville* (1983) 144 Cal.App.3d 123, 129-130; CEQA Guidelines § 15037. Just as with the two related but distinct rulemakings here, each of these two legal actions, which may very well impact the same development, nonetheless may occur without the other and in completely separate processes, and may produce significantly different impacts.

LCFS 40-26

Simply put, CEQA does not allow ARB to take two different activities which each have different impacts and require different analyses and pass them off as one "project" to streamline its environmental review process. The process that ARB has adopted here makes it impossible to separate out which impacts stem from the LCFS regulations and which from the ADF regulations, even though the two rules are being considered in separate rulemakings, have distinct impacts as a practical matter, and may not both be adopted, or may be adopted on different schedules.

LCFS 40-27

CEQA requires that environmental review documents be "written in a manner that will be meaningful and useful to decision-makers and to the public." Cal. Pub. Res. Code § 21003(b); *see Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 392. When neither decision-

LCFS 40-28

LCFS 40-29

makers nor the public can meaningfully understand the impacts that will arise from each proposal and available mitigation, the usefulness of the Draft EA as a valuable decision-making tool for is significantly undermined, contravening the intent of CEQA.

LCFS 40-29 cont.

3. ***The Draft EA does not sufficiently analyze alternatives.***

Under CEQA, an environmental review document "must consider a reasonable range of alternatives to the project" and must "make an in-depth discussion of those alternatives identified as at least potentially feasible." *See Preservation Action Council v. City of San Jose* (2006) 141 Cal.App.4th 1336, 1350; *Sierra Club v. County of Napa* (2004) 121 Cal.App.4th 1490. The purpose of such an analysis is to allow informed decision-making, and the onus for analyzing a sufficient range of alternatives falls squarely on the agency. *Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 405.

LCFS 40-30

LCFS 40-31

But ARB's Draft EA falls far short of this requirement. The Draft EA only analyzes a "no project" alternative—LCFS regulations being set aside as a result of the *POET* decision and no adoption of the ADF; a second alternative—re-adopting the existing LCFS without any of the proposed updates and adopting the ADF regulation as proposed; and finally, a "Gasoline-Only Compliance Curve" alternative—an alternative that would remove the diesel standard from the LCFS so that the compliance curves apply only to gasoline and gasoline substitute fuels. Despite the Draft EA's statement that it presents a fourth action alternative—the "No Trading Case Alternative" –ARB never includes a description of that alternative in the Draft EA. Draft EA at 130.

LCFS 40-32

LCFS 40-33

Additionally, ARB's description of the alternatives is somewhat misleading. The alternatives that ARB discusses are more accurately described as: (1) no LCFS and no ADF; (2) re-adoption of the existing LCFS and adoption of the proposed ADF as-is; and (3) the "Gasoline-Only Compliance Curve Alternative," which, like the first alternative, would not adopt the proposed ADF, or any rule on diesel fuels. There is no analysis of an alternative that would involve re-adoption of the proposed LCFS with a different ADF regulation, or of a different approach to the LCFS beyond simply dropping diesel fuels from the regulation. In contravention of CEQA, this analysis overlooks potentially less impactful options. *See Citizens of Goleta Valley v. Board of Supervisors* (1990) 53 Cal.3d 553, 566.

LCFS 40-34

The mere three alternatives presented by the Draft EA insufficiently represent the broad scope of alternatives, and fail to take into account clearly feasible scenarios—such as an ADF regulation that is substantively different from the one proposed by ARB. In fact, the Draft EA analyzes no alternatives beyond a "no project" alternative for ADF: either the ADF is not adopted at all, or it is adopted exactly as is. ARB cannot limit the alternatives analysis on the ADF without explaining "in meaningful detail" the basis for its conclusion that there are no

LCFS 40-35

feasible alternatives to the ADF as proposed. *Laurel Heights Improvement Assn.*, 47 Cal.3d at 405.

LCFS 40-35 cont.

CEQA requires that the Draft EA explore more alternatives than the three presented here. ARB has provided an insufficient alternatives analysis in connection with these rulemakings, and therefore the Draft EA should be revised accordingly.

LCFS 40-36

4. ***The Draft EA does not sufficiently analyze air quality impacts.***

CEQA requires that reasonably foreseeable impacts of a project must be adequately analyzed and, if necessary, mitigated by the agency. Cal. Pub. Res. Code § 21003(b); *see Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 392; *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 431 . But ARB has not adequately analyzed the potential impacts of the interplay between NOx and VOC emissions stemming from the implementation of the LCFS and ADF.

The Draft EA does not attempt to assess the impacts of the LCFS and ADF regulations on ambient ozone and PM concentrations. Instead, ARB staff simply analyzed the impacts of the LCFS in combination with the ADF on the emissions inventory. Table 4-1 of the Draft EA summarizes ARB staff estimates of the NOx emissions impacts of the LCFS and ADF regulations. That table reports a net reduction in NOx emissions of 1.0 tons per day in 2020, growing to 1.3 tons per day in 2023. The Draft EA then asserts that the "long-term impacts on air quality would be **beneficial**." (emphasis in original text)

LCFS 40-37

Ozone formation chemistry is highly non-linear and so to assess whether the proposed NOx reduction would bring about discernible reductions in ambient ozone, photochemical modeling is necessary. Because the draft EA does not include the impact of LCFS and ADF on VOC emissions, it is impossible to even qualify the net ozone response due to the regulation.

Air quality impacts of the LCFS are addressed in a recent report prepared by ENVIRON International Corporation for the Coordinating Research Council.[1] Among the findings of that report were:

- The LCFS rule constitutes a potential regional control strategy that has not been specifically studied.
- Reductions in precursor emissions (i.e., NOx, VOC reductions) do not always provide air quality benefits, because ozone chemistry is highly non-linear.

[1] "Low Carbon Fuel Standard Program Air Emissions Effects," Prepared by ENVIRON International Corporation, CRC Project No. A-86, September 24, 2014. http://www.crcao.com/reports/recentstudies2014/A-86%20Low%20Carbon%20Fuel%20Standard%20Program%20Air%20Emissions%20Effects/CRC%20A86%20Final%20Report_%20Sep30_2014.pdf

- In the 2009 rulemaking ARB asserted that due to the relatively small magnitude of emission reductions associated with LCFS it was not practical to expect the air quality model to reasonably predict the cumulative potential benefit on ozone air quality. However, such modeling may be warranted.

LCFS 40-37 cont.

5. ***Formulas have changed without the appropriate level of transparency.***

Key elements of the regulation depend on data that are used in calculations that compute indirect land use change and carbon intensity values relevant to the regulation's overall compliance scheme. Changes in the type of data used to compute these values can therefore have a significant effect on the thresholds regulated entities need to meet to come into compliance.

ARB has removed indirect land use change values from the look-up tables that were included in the prior version of the regulation, and now simply describes a credit calculation which requires the incorporation of a land use modifier. The values for such a modifier are not included in the regulation.

Additionally, the carbon intensity calculation process relies on CA-GREET. However, ARB has failed to provide a transparent process to outline bases for changes to the GREET model or allow input for future changes to the model is lacking. ARB acknowledges GREET is used "to provide many emission factors, life cycle inventory data, and fuel cycle emissions values." ARB, LCFS Reauthorization Initial Statement of Reasons, p. II-20. In fact, ARB admits that changes to the GREET model were the impetus for OPGEE revisions—but the GREET changes themselves lacked transparency; even ARB's comparison of the updated model to prior models offers conclusory statements of changes rather than explanations for them. *See, e.g.,* ARB, Comparison of CA-GREET 1.8B, GREET1 2013, and CA-GREET 2.0, pp. C-2-C-3, C-8-C-9. Nothing in the regulations suggests future changes to GREET will be more transparent.

LCFS 40-38

Similarly, the sources for data to be used in calculating the Annual Crude Average carbon intensity value have changed, and that data is now to be provided by two different state agencies, with no apparent opportunity for verification or explanation of the data's bases.

Each of these actions opens the door to changes to key formulas outside of the rulemaking process and without opportunity for public comment. When regulations are amended, the California Administrative Procedure Act requires "basic minimum procedural requirements" for rulemaking, including giving interested parties an opportunity to comment on the rulemaking, and a response to public comments. *See Tidewater Marine Western, Inc. v. Bradshaw* (1996) 14 Cal.4th 557, 558; Cal. Gov. Code § 11346. But the proposed regulations attempt to avoid public discourse on potentially significant changes to the implementation of the LCFS by tying key values that are the rule's backbone to calculations and

data that could change at any time, with no explanation—essentially a *de facto* amendment of the regulation with no public process.

ARB must explain the bases for relying on the data sources it has chosen, and must provide more certainty that key values and calculations will not change without public input.

LCFS 40-38 cont.

6. ***ARB does not have the authority to compel regulated parties to purchase credits without the capability of verifying those credits.***

The regulations penalize credit holders if they hold invalid credits, even if that is through no fault of their own. Because credits must be verifiable, ARB lacks power to require entities to participate in the credit scheme without providing some level of certainty that credits validly represent the reductions they purport to represent. *See* Cal. Health & Safety Code § 38562(d)(1) ["Any regulation adopted by the state board pursuant to this part or Part 5 [market-based compliance mechanisms] shall ensure all of the following: (1) The greenhouse gas emission reductions achieved are real, permanent, quantifiable, ***verifiable***, and enforceable by the state board …"] [emphasis added].

The statute and regulations do not address independent verification by purchasers of credits, and we have not located any comparable program with such provisions. However, even if buyers were provided the opportunity to verify credits prior to purchase, ARB's authority to suspend, revoke or modify credits under proposed section 95495 would not be limited and, as a result, there is still a risk credits could be invalidated by ARB.

LCFS 40-39

Such a scenario is not without precedent. In 2012, EPA invalidated over 60 million Renewable Identification Numbers (RINs), the tradable credits that are generated as part of the federal Renewable Fuels Standard program, due to criminal fraud perpetrated by certain RIN generators. Because the RFS was set up as a strict buyer liability system, unknowing, good faith obligated parties were left with worthless invalidated RINs and faced enforcement penalties from EPA. ARB should avoid the risk of creating a similar situation under the LCFS regulations.

However, the risk of invalidation could be reduced by limiting the bases for invalidation under proposed section 95495(b)(1) and adding a statute of limitations on ARB's right to commence invalidation procedures.

WSPA therefore requests the following changes be made to the regulations (bold, underlined type):

Section 95495(a)

(1) If the Executive Officer determines that any basis for invalidation set forth in subsection (b)(1) below occurred, in addition to taking any enforcement action, he or she may: suspend, restrict, modify, or revoke an LRT-CBTS account; modify or delete an Approved CI; restrict, suspend, or invalidate credits; or recalculate the deficits in a regulated party's LRT-CBTS account. For purposes of this section, "Approved CI" includes any determination relating to carbon intensity made pursuant to section 95488, or relating to a credit-generating activity approved under section 95489.

(2) The Executive Officer shall commence enforcement actions under subsections (b)(1)(A)-(F) as follows:

(A) The Executive Officer shall commence an action under subsections (b)(1)(A), (C), or (D) within one (1) year from either the date that the subject Approved CI or credit was generated in accordance with section 95486 or the date upon which disputed data was reported in accordance with section 95488, as applicable.

(B) The Executive Officer shall commence an action under subsection (b)(1)(B) arising from incorrect material information submitted in connection with an Approved CI or credit transaction within one (1) year from either the date of approval of the CI or the recordation date, as defined by section 95487, of the first transaction wherein incorrect material information was submitted, as applicable.

LCFS 40-39 cont.

(C) The Executive Officer shall commence an action arising from a transaction made in violation of applicable laws, statutes and regulations under subsection (b)(1)(E) within one (1) year from the recordation date, as defined by section 95487, of the disputed transaction or from the date the credit was generated in accordance with section 95486, as applicable.

(D) The Executive Officer shall commence an action under subsection (b)(1)(F) within six (6) months from the date that a party refused to provide records or failed to produce records within the required time.

Section 95495(b)(1)

Determination that a Credit, Deficit Calculation, or Approved CI is Invalid.
(1) *Basis for Invalidating.* The Executive Officer may modify or delete an Approved CI and invalidate credits or recalculate deficits based on any of the following:
(A) any of the information used to generate or support the Approved CI was incorrect **for reasons including due to** the omission of material information **or changes to the process following submission**;
(B) any material information submitted in connection with any Approved CI or credit transaction was incorrect;

(C) fuel reported under a given pathway was produced or transported in a manner that varies in any way from the methods set forth in any corresponding pathway application documents submitted pursuant to section 95488 (or former section 95486, effective January 1, 2010);
(D) fuel transaction or other data reported into LRT-CBTS and used in calculating credits and deficits was incorrect or omitted material information;
(E) credits or deficits were generated or transferred in violation of any provision of this subarticle or in violation of other laws, statutes or regulations **directly applicable to the credit generation or transfer**; and
(F) a party obligated to provide records under this subarticle refused to provide such records or failed to produce them within the required time.
For purposes of this subsection, "material" means information directly relevant to the generation and calculation of credits under section 95486 or the requirements for credit transactions under section 95487, as applicable.

LCFS 40-39 cont.

7. ***Enforcement provisions with respect to credits and carbon intensities are deficient.***

If invalidation of a credit or CI creates a deficit, the generator and/or holder of the credit will have 60 days to correct the compliance issue by purchasing new credits. *See* proposed section 95495(b)(4) ("If [the Executive Officer's] final determination invalidates credits or deficit calculations, the corresponding credits and deficits will be added to or subtracted from the appropriate LRT-CBTS accounts. Where such action creates a deficit in a past compliance period, the deficit holder has 60 days from the date of the final determination to purchase sufficient credits to eliminate the entire deficit. A return to compliance does not preclude further enforcement actions.").

The proposed regulations do not include an appeals mechanism for challenging the Executive Officer's final determination as to invalidated credits. Although appeals may be brought in Superior Court pursuant to Civil Procedure Code section 1085, it would be preferable for ARB to create a hearing and appeals procedure within its regulations. The 60-day period for correcting deficits should not commence until appeals are exhausted.

LCFS 40-40

WSPA therefore requests the following additions to the regulations (bold, underlined type):

Section 95495(b)(2)

Notice ***and Opportunity for Hearing***. Upon making an initial determination that a credit, deficit calculation, or Approved CI may be subject to modification, deletion, recalculation, or invalidation under subsection (b)(1), above, the Executive Officer will notify all potentially affected parties, including those who hold or generate credits or deficits based on an Approved CI that may be invalid, and may notify any linked program. The notice shall state the reason for the initial

determination **and the party's right to request a hearing**, and may be distributed using the LRT-CBTS. Any party receiving such notice may submit, within 20 days, any information that it wants to the Executive Officer to consider **and, if desired, its request for a hearing.** The Executive Officer may request information or documentation from any party likely to have information or records relevant to the validity of a credit, deficit calculation, or Approved CI. Within 20 days of any such request, a regulated party shall make records and personnel available to assist the Executive Officer in determining the validity of the credit, deficit calculation, or Approved CI. **If a party requests a hearing on the Executive Officer's initial determination, the Executive Officer must set a hearing date no later than 60 days from the date of the hearing request.**

Section 95495(b)(4)

Final Determination.

(A) Within 50 days after making an initial determination under sections 95483.3(b)(1) and (2), above, **or holding a hearing, whichever is later,** the Executive Officer shall make a final determination based on available information whether, in his or her judgment, any of the bases listed in subsection (b)(1) exists, and notify affected parties and any linked program. **Affected parties may appeal the Executive Officer's final determination to the Board within 30 days of receiving notice of the Executive Officer's final determination. Such appeals shall be placed on the agenda of the next regularly scheduled Board meeting.**

(B) If the final determination invalidates credits or deficit calculations, the corresponding credits and deficits will be added to or subtracted from the appropriate LRT-CBTS accounts. Where such action creates a deficit in a past compliance period, the deficit holder has 60 days from the date of the final determination **or the disposition of any appeal, whichever is later,** to purchase sufficient credits to eliminate the entire deficit. A return to compliance does not preclude further enforcement actions.

LCFS 40-40 cont.

8. ***ARB's proposed per-day penalties for violations of the LCFS are unnecessary.***

Proposed section 95494 sets penalties for the failure to demonstrate compliance at the end of a compliance period or carry over all deficits; under the proposed regulations, such a failure would constitute a separate violation for each day of the compliance period or, alternatively, ARB could impose a penalty of $1000 per deficit.

LCFS 40-41

WSPA opposes a per day penalty, and proposes that ARB's suggested alternative penalty of $1000 per deficit be employed. While AB 32's enforcement provisions provide for per day penalties when a violation results in the emission of an air contaminant, where, as here, no actual emission of air contaminant is occurring on a per day basis, the imposition of such a penalty would be unnecessary. *See* Cal. Health & Safety Code §§ 42400.1, 42400.3. For example, even if a penalty drew

the lowest strict liability level of $10,000 per violation, a failure to demonstrate compliance or carry over deficits could draw a penalty in the range of millions of dollars. Such a penalty is far too severe for an offense that does not signify actual emission of air contaminants beyond a statutory threshold.

Instead, penalties should be assessed on a per deficit basis, an approach which is authorized by the applicable penalty provisions of the Health & Safety Code and which ARB has already suggested. *See* Cal. Health & Safety Code § 38580(b)(3); proposed LCFS regulation § 95494(c). Unlike the extreme per day penalty provision, a per deficit penalty of $1000 is reasonable and more consistent with the nature of the violation.

LCFS 40-41 cont.

WSPA therefore proposes a revision to the text of section 95494(c) as follows:

"~~Failure to demonstrate compliance at the end of a compliance period or carry over all deficits pursuant to section 95485(c) constitutes a separate violation for each day within the compliance period. Alternatively,~~ **E**ach deficit that is not eliminated or carried over **at the end of a compliance period** as required by section 95485(c) constitutes a separate violation of this subarticle for purposes of determining penalties pursuant to Health and Safety Code section 38580(b)(3), subject to a penalty not to exceed $1000 per deficit."

9. ***The requirement that refinery investment credits only be approved for reductions from projects with no increase in criteria or toxic emissions should be eliminated.***

WSPA strongly opposes the additional complex provisions that ARB has added to the refinery investment credit provisions. This added complexity and ambiguity will limit or eliminate legitimate GHG reduction projects from receiving credits. In particular, we oppose the requirement to approve credits only from projects with no increase in criteria or toxic emissions. It is complex, unnecessary, and inequitable when compared to other parties that are participating in the LCFS.

LCFS 40-42

First, while seemingly simple in concept, there are volumes of regulations, guidance documents, and court cases related to air quality permitting where various methodologies are employed for determining what constitutes an increase.

For example, some of the questions that arise are: Is it only operational emissions or construction emissions? Is it only direct emissions from the source or indirect emissions? What if it adds personnel – will their driving trips be included? Should the increase be in terms of mass or concentration at sensitive receptors? What is the baseline for determining an increase? What years are picked for the baseline? What if there is an increase – but it is still within the permitted limit for that source or facility? How is it enforced after-the- fact – when other non-related

changes at the refinery may occur that impact emissions year to year? The list can go on and on. This is a regulatory quagmire for ARB since any attempt to address or clarify these issues in the regulation could double the size of the regulation and create substantial litigation risk from various parties.

Second, this limitation is unnecessary because various regulations are in place to make sure emission increases either do not occur or are appropriately mitigated.

Under the California Health & Safety Code and Clean Air Act permitting requirements, there are already ample regulations that reduce the likelihood of an emission increase, and ensure that increases are within regulatory limits. Compliance with these programs is sufficient to ensure that no negative impact would arise from an increase in toxic or criteria air pollutants, should one occur, and thus limiting credits to GHG emission reduction modifications that do not result in any net increase of these pollutants is at best redundant and at worst unnecessarily restricts crediting when sufficient controls on increases are already in place.

For example, pursuant to California Health & Safety Code 39666, California has already adopted airborne toxic control measures to reduce toxic air contaminant emissions from non-vehicular sources such as refineries. Generally, refineries are also subject to Clean Air Act requirements, including permitting, which mandate that their emissions of criteria pollutants remain below a particular emission limitation. *See* 42 U.S.C. 7661c(a).

LCFS 40-42 cont.

Increases of toxic and criteria air pollutants are already sufficiently regulated. ARB's requirement that refinery investment credits only be given when there is no net increase of criteria or toxic air pollutants is unnecessary and should be removed from the regulations.

Finally, this limitation is inequitable. There is no effort by ARB to address contemporaneous criteria and toxic emission impacts for any of the other credit generating parties in the regulation. Is this being addressed for innovative crude projects or modifications at alternative fuel facilities for improving their fuel pathway CI? Is this addressed for the construction of natural gas fueling stations or for receptors near the power plants that generate the electricity for new charging stations?

WSPA therefore requests that, at a minimum, ARB strike proposed section 95489(f)(1)(D) from the proposed regulations. Moreover, we ask that ARB eliminate the capital project requirement, any distinction based on historic refinery efficiency, and the complexity of a CI based on metric and references to petroleum products consistent with prior WSPA comments.

It is WSPA's position that ARB should make this process simple, allowing the applicant to demonstrate that a project or initiative implemented since 2010 will

have a decrease in greenhouse gas emissions after 2016. ARB should also work with the applicant on appropriate, on-going monitoring provisions to ensure that the decrease is real, verifiable, quantifiable and sustainable. Refinements can be made to this process based on the applications submitted, but the complexity of the current proposal presents huge barriers to legitimate, creditable projects.

LCFS 40-42 cont.

Policy/Technical Comments:

Section 95481- Definitions and Acronyms

The following terms are in the definition section, but not used in the rule. They should be removed.

- "Aggregation Indicator"
- "Biodiesel Blend"
- "Biofuel Production Facility"
- "Intermediate calculated value"
- "LRT-CBTS Reporting Deadlines"
- "Petroleum Intermediate"

The following terms are in the definition & acronym section, but not used in the rule. They should be removed.

- "AEZ-EF Model"
- "GTAP" or "GTAP Model"

WSPA recommends the following changes to section 95481 definitions (denoted in red):

"B100" – defined in "Biodiesel – does not need to be defined twice. Recommend either:

LCFS 40-43

- ~~(6) "B100" means biodiesel meeting ASTM D6751-14 (2014) (Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels), which is incorporated herein by reference.~~

OR

- (8) "Biodiesel" means a diesel fuel substitute produced from nonpetroleum renewable resources that meet the registration requirements for fuels and fuel additives established by the Environmental Protection Agency under section 211 of the Clean Air Act. It includes biodiesel meeting all the following:
  - (A) Registered as a motor vehicle fuel or fuel additive under 40 Code of Federal Regulations (CFR) part 79;
  - (B) A mono-alkyl ester;
  - (C) Meets ASTM D6751-08 (2014), ~~Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels, which is incorporated herein by reference~~;
  - (D) Intended for use in engines that are designed to run on conventional diesel fuel; and

(E) Derived from nonpetroleum renewable resources.

(11) “Biogas” means the raw methane and carbon dioxide derived from the anaerobic decomposition of organic matter in a landfill or ~~artificial~~ manufactured reactor (digester).

(12) “Bio-CNG” means biogas-derived biomethane which has been compressed to CNG. Bio-CNG has equivalent performance characteristics when compared to fossil CNG.

(13) “Bio-LNG” means biogas-derived biomethane which has been compressed and liquefied into LNG. Bio-LNG has equivalent performance characteristics when compared to fossil LNG.

(14) “Bio-L-CNG” means biogas-derived biomethane which has L-CNG. Bio-L-CNG has equivalent or better performance characteristics than fossil L-CNG.

(15) “Biomass” means …

(17) “Biomethane” is the refined end product when carbon dioxide and the impurities present in biogas are separated from the methane in the mixture, resulting in a product ~~about~~ containing approximately 99 percent methane content….

(69) “Producer” means, with respect to any fuel, the entity that made or prepared the fuel. This definition includes “out-of-state” where the production facility is out of the State of California and the entity has opted into the LCFS ~~production as long as~~ pursuant to section 95483.1.

(70) “Product Transfer Document (PTD)” means a document or set of documents that authenticate(s) the transfer of ownership of fuel from a regulated party to the recipient of the fuel and convey(s) the specific information required by this regulation.

The above correction to the PTD definition is a typographical correction only. WSPA has additional comments regarding this PTD definition below.

(75) “Reporting Party” means any person who, pursuant to section 95483 or 95483.1 is the initial regulated party holding the compliance obligation, and any person to whom the compliance obligation has been transferred ~~directly or indirectly~~ from the initial upstream regulated party.

The following terms are in the Acronyms section, but not used in the rule. They should be removed.

- “FFV”
- “FOA”
- “FPCOA”
- “GREET” (defined in CA-GREET acronym – duplicative)
- “ILUC”
- “TOER”

LCFS 40-43 cont.

Section 95481(a)(3)(B) – recommend the following changes *(denoted in red):*

Transfer of Oxygenate or Biomass-Based Diesel and Retaining Compliance Obligation. Section 95483(a)(3)(A) notwithstanding, a regulated party transferring ownership of oxygenate or Biomass-Based Diesel may elect to remain the regulated party and retain the LCFS compliance obligation for the transferred oxygenate or Biomass-Based Diesel by providing the recipient at the time of transfer with a product transfer document that prominently states the information specified in 95491(c)(1).

LCFS 40-44

Section 95481(a)(5) – incorrect reference *(denoted in red):*

(5) *Effect of Transfer by a Regulated Party of Oxygenate to be Blended with Gasoline.* Where oxygenate is added to gasoline, the regulated party, with respect to the oxygenate, is initially the producer or importer of the oxygenate. Transfers of the oxygenate are subject to section 95483(a)(1)(C).

LCFS 40-45

Section 95481(c)(2 & 3) – incorrect reference *(denoted in red):*

(2) *Transfer of a Blend of Liquid Alternative Fuel and Gasoline or Diesel Fuel and Compliance Obligation.* Except as provided for in section 95483(a)(4)(C), on each occasion that a person transfers ownership of fuel that falls within section 95483(a)(4) ("alternative liquid fuel blend") …

(3) *Transfer of a Blend of Liquid Alternative Fuel and Gasoline or Diesel Fuel and Retaining Compliance Obligation.* Section 95483(a)(4)(B) notwithstanding, …

LCFS 40-46

Section 95482 – Fuels Subject to Regulation

No comments.

Section 95483 – Regulated Parties

Section 95483.2 *Establishing a LCFS Reporting tool Account*

This section contains new regulations and establishes registration requirements, account management roles and duties, and an application submittal deadline. The proposed regulations allow for two Account Administrators (primary and secondary). The proposed regulations do not contain a definition for Account Administrator in the definition section but their responsibilities are defined in this section.

WSPA requests ARB include the definition of "Account Administrator" in the definition section (§95481).

LCFS 40-47

Q. Regulated Party Miscellaneous Updates

Section 95483(a)(2)(A) - WSPA does not support inclusion of the requirement for the buyer to notify the seller as to whether a company is a producer or importer. The typical

LCFS 40-48

transaction is completed entirely with the seller's paperwork and the only buyer response would be to reject a term. No response implies acceptance after a customary 10-day period. This would create a huge burden on a transaction-by-transaction basis. If ARB is presuming this communication is done verbally, then how is it documented in order to show compliance? If the seller's contract passes the obligation on to the buyer, by default, can it be assumed that the buyer communicated their status to them? Can ARB post entity status on the website and enable this to be the communication tool by directing sellers to the website?

WSPA does not believe the requirement outlined in the first sentence above is necessary and opposes its addition to the regulation. The addition of the language makes a long, complicated regulation even longer and more complicated.

ARB is adding new language to an existing paragraph (§95483(a)(2)(E)) dealing with the transfer of diesel fuel and adding a new section (§95483(d)(3)) dealing with LNG that is re-gasified and then compressed. Here are WSPA's comments:

LCFS 40-48 cont.

Section 95483(a)(2)(E) Regulated Parties for Gasoline and Diesel

ARB is proposing to add explicit and clarifying language to what is already allowed in the existing regulation. ARB has added a proposed definition for "Above the Rack" (§95481(a)(1)) and added new language to an existing paragraph dealing with the obligation transfer. The proposed language states:
"… A person, who is neither a producer nor an importer and who acquires ownership of Diesel Fuel or Diesel Fuel Blends from the regulated party above the rack, may become the regulated party for the Diesel Fuel or Diesel Fuel Blends if, by the time ownership is transferred, the two parties agree by written contract that the person acquiring ownership accepts the LCFS compliance obligation as the regulated party…".

WSPA agrees with staff that any party who acquires ownership of Diesel Fuel or Diesel Fuel Blends above the rack may become the regulated party. However, WSPA does not believe the proposed change to the existing regulatory language is necessary.

LCFS 40-49

Section 95483(e) Regulated Parties for Electricity [Note: WSPA has consolidated our comments on the electric portion of the regulation below]

As WSPA has stated numerous times in the past, we strongly oppose ARB's electricity provisions, and continue to propose that electricity NOT be part of the LCFS program. ARB should account for the GHGs from electricity separately and reduce the compliance obligation within the LCFS proportionally based on ARB's anticipated success of the roll-out of EVs.

The electricity provisions should be eliminated from the LCFS since it is a readily available fuel – in fact ubiquitous. Based on ARB's experience, the innovative market signal hoped for from the LCFS is not needed for this fuel. In fact, ARB is proposing to reduce the incentive funding to EVs based on successful consumer acceptance to date.

LCFS 40-50

The applications for incentive funds are chronically over-subscribed; and moreover, this has all been accomplished without any credit generation revenue from the LCFS. Utility reports to ARB in 2012 and 2013 indicate that no revenue has been derived from credit generation; and yet, ARB is touting the popularity of EVs amongst consumers. Clearly, the LCFS credits have not contributed to consumer acceptance to date and should not be needed in the future.

LCFS 40-50 cont.

Barring removal from the regulation, there are key issues related to the electricity provisions that need to be addressed include the following:

Credit Generation For Pre-LCFS Off-Road Electricity Applications: WSPA is opposed to this provision.

1) It is unclear whether ARB has the statutory authority to allow credit generations from sources that pre-date the LCFS.
   - The off-road sources that will generate credits under this provision were in existence prior to the development or implementation of the LCFS.
   - ARB's own projections in the ISOR Appendix B, Table B-19 show that Electricity usage for HDVs/Rail is expected to remain static between 2016 and 2020.
   - The generation of credits for pre-LCFS electric does not meet the intent of the LCFS. These credits do not:
     - Reduce transportation fuel CI,
     - Reduce dependence of petroleum,
     - Reduce GHG emissions.

1) This proposal creates an un-level playing field.
   - "Rewards" status quo activities by allowing them to generate CI credits.
   - Sales of these credits results in a cross-sector subsidy (transportation fuel sector to the electricity sector)
   - Merely allows ARB to justify an infeasible LCFS reduction target.
     - For example, the ARB estimates HDV/Rail credits will be range from approximately 35 – 59% of the total electricity credits between 2016 and 2020 (from ARB's illustrative mix of fuels, ISOR Appendix B tables B-18 and B-19).

LCFS 40-51

Removal Of Direct Metering Requirement: WSPA opposes the removal of the direct metering requirement.

1) Its removal creates concerns related to credit validity:
   - Due diligence of credits generated from residential charging of EVs is extremely difficult, if not impossible.
   - There is increased probability of credit invalidation.
   - Credit validity is further eroded by:
     - The proposed CalETC calculation methodology and,
     - The removal of supplemental reporting by electricity credit generators.

2) This proposal creates an un-level playing field**:**

LCFS 40-52

- ARB is picking "winners and losers" by allowing electricity providers to bypass the detailed application, reporting, and recordkeeping, and rigor required by providers of liquid fuels.

3) Does ARB have the authority to remove the direct metering requirements?
4) Does ARB have the authority to authorize the sale of credits from estimated fuel usage?
5) ARB should, at a minimum, guarantee the validity of such credits and hold transportation fuel providers harmless in the event the credits are invalidated, including not requiring regulated parties to replace invalidated credits used or purchased for compliance.

LCFS 40-52 cont.

Inclusion of new Heavy Duty EERs

1) WSPA does not support the proposal to allow these sources to generate credits without accurately including them in the 2010 baseline.

2) We do not support the proposed EER values for electric buses, and have provided specific comments below. We are concerned there is not sufficient information to establish EER values for electric buses as proposed.

3) If ARB continues to move forward with the proposed electric bus EER, the application should be limited specifically to new electric buses of the type tested and not be extended to existing electric buses (e.g. cantilever buses) in service prior to the implementation of the LCFS.

LCFS 40-53

More detailed comments related to ARB's electricity provisions are outlined below:

Credit Generation for Off-Road pre-LCFS electricity applications:

In ARB's ISOR for the re-adoption of the LCFS, ARB states:

" Providing an opportunity for credit generation for use of use of electricity as a transportation fuel supports the overall purpose of the LCFS to reduce the carbon intensity of the transportation fuel in California, reduce California's dependence on petroleum, create a lasting market for clean transportation technology, and simulate the production and use of alternative, low-carbon fuels."

WSPA argues that while this may be true for new off-road electricity applications, it is certainly not the case for pre-LCFS electrical installations. In addition, the majority (if not all) of the GHG reductions provided by these sources pre-date the LCFS and will not provide any of the opportunities identified above nor reduce GHGs in the road transport sector.

This provision does not reduce the carbon intensity of transportation fuels, but rather "rewards" status quo activities by allowing them to generate CI credits. In addition, the sale of any such credits results in a cross-sector subsidy from the transportation fuel sector to the electricity sector, with no GHG or transportation fuel CI reductions. The

LCFS 40-54

generation of credits by pre-LCFS electrical installation merely allows ARB to justify an infeasible LCFS reduction target.

Allowance of LCFS credits for electricity used in applications in place prior to 2010 will lead to a smaller reduction in transportation fuel CI and GHGs undermining the stated LCFS objectives. WSPA's position continues to be that we are against including credits for fixed guideway systems and electric forklifts unless they are also properly accounted for in the 2010 baseline. Under no circumstances is it appropriate to make credits available for systems and equipment, such as BART, that have been in operation for decades. If ARB insists on pursuing credits for these off-road sources, credits should only be generated for prospective alternative fuel projects that occurred after LCFS adoption.

LCFS 40-54 cont.

Direct Metering: §95491(a)(3)(D)(1)(b):

The proposed rule eliminates the requirement that reporting of electricity dispensed to electric vehicles at residences must be based on direct metering. Instead, staff is proposing to allow the use of a "robust estimation method" developed by CalETC.

We continue to emphasize that credit generators should be held to the same set of standards as liquid fuel providers and not be allowed to estimate the fuel supplied for transportation purposes. Eliminating the direct metering requirements also increases the risk of generating invalid credits, which weakens the integrity of the entire LCFS program. In our opinion the credits obtained through the use of estimates are more suspect than credits generated from actual metered electricity usage.

There is also a fairness issue. Considering the minutia of OPGEE inputs, the level of detail required for liquid fuel reporting and the detail involved with obtaining a CI pathway (and the record-keeping requirements for some pathways) simply allowing estimates of electricity used for residential charging is inconsistent. ARB is picking "winners and losers" by not requiring similar degrees of rigor across the program.

LCFS 40-55

Further, because credits must be verifiable, ARB lacks power to require entities to participate in the credit scheme without providing some level of certainty that credits validly represent the reductions they purport to represent. *See* Cal. Health & Safety Code § 38562(d)(1) ["Any regulation adopted by the state board pursuant to this part or Part 5 [market-based compliance mechanisms] shall ensure all of the following: (1) The greenhouse gas emission reductions achieved are real, permanent, quantifiable, ***verifiable***, and enforceable by the state board …"] [emphasis added]. ARB should not remove direct metering requirements, which erode the ability to verify and validate credits, and lacks authority to authorize the sale of credits from estimated fuel usage, which cannot be verifiable under California law.

As regulated parties, we are concerned that any credits generated via estimation techniques are more susceptible to challenges and invalidation. ARB should require measures to increase the validity of credits and not erode the validity. Only verified

credits should be allowed in the program. WSPA believes the utilities ought to provide enough incentives through LCFS credit revenue or other incentive programs to maximize the amount of direct metering deployed for charging. We continue to oppose the proposal to allow electricity producers to generate credits from unmetered residential EV charging.

LCFS 40-55 cont.

Calculation methodology:

Although staff has posted a letter on the ARB website approving this method (dated April 5, 2012), there are insufficient details for us to adequately review and comment upon the methodology. Based on the limited information available, it appears that the method would assume that vehicles within a service area without direct metering would be used in the same fashion as those that do have direct metering. Closer examination of this approval raises many questions/issues as follows:

- The proposal requires the utilities to report data quarterly for EV charging that is metered. The intention is to use this data as a proxy for unmetered EV charging. What is the extent of the metered data? Will this assessment be done only on a regional utility basis because the driving and utilization patterns might vary from region to region? What is the percentage of the metered data relative to unmetered data? What discussions have occurred about the extent necessary to be statistically relevant? For example – one metered customer should not represent hundreds of unmetered customers in the calculation. Is it ARB's intention to post this data in a de-identified or aggregated manner for public review?

LCFS 40-56

- The proposal then allows a utility that does not have the ability to compile and report their direct metered data to use a statewide average of the direct metered data that is submitted. This means that a utility can use a statewide average value for direct metering as a proxy for its direct metering information that will be submitted to ARB, which will in turn be used as a proxy for statewide unmetered charging. An embedded approximation like this for use in a broader approximation is hardly robust. Moreover, will ARB report on which utilities have direct metering data and which do not and why? At a minimum, any utility that lacks any directly metered data should be excluded from the estimation technique and the ability to generate credits. There is no guarantee that the usage patterns in one utility's region will be representative of the usage patterns in another region.

LCFS 40-57

- To determine numbers of PEV customers, CalETC will obtain 'zip+4' PEV registration data from a data management firm that accesses DMV data, or data from other sources. First, what are the zip+4 data and will this data be posted on the website? Second, who is the data management firm and what controls do they have to ensure the validity of the data? Are they subject to ARB audit and jurisdiction? If DMV data is not used, what are the other sources? How can the data from these other sources be assured?

LCFS 40-58

- Is data separately available for PHEVs and BEVs? What is the average and range of the directly-metered data? It would be important to understand the variation potential that exists to understand the potential error band in the unmetered data. Perhaps some safety factor based on a statistically significant lower range should be incorporated into the credit calculation. LCFS 40-59

- Vehicle owners who go to the trouble of installing a separate meter are likely to plug in more faithfully than those who do not and are therefore not representative of the entire fleet. This is particularly important for PHEV estimates. Are there any data with which to confirm that the results from the metered fleet can be extrapolated to the unmetered fleet? LCFS 40-60

- Is ARB accounting for metering in public and work place setting and adjusting the residential estimates as appropriate? Will ARB review the total credits generated by all EV charging and compare it to the DMV records to ensure charging estimates are not "double counting"? LCFS 40-61

- The data collected on vehicles with direct metering cannot be applied to the entire fleet of BEVs and PHEVs in an area without also confirming that the distribution of vehicles (by BEV/PHEV and by all-electric range) is the same between those with meters and those without. It is highly unlikely that this distribution would be the same. For example, a PHEV with a 10-mile electric range that was purchased primarily for carpool lane access would likely be under-represented in the sub-set of vehicles with at-home meters. LCFS 40-62

- How is double-counting of electricity usage prevented? If at-home charging for those vehicles without a separate EV meter is accounted for with this method, is it assumed that all of the public charging stations get full credit for that electricity? What if a vehicle owner only charges at public or work-based charging stations and rarely charges at home? Is that vehicle assigned home-based charging at the same rate as those vehicles with at-home meters? LCFS 40-63

Excluding Supplemental Information:

ARB is proposing to exclude some supplemental information now required in annual reporting. WSPA disagrees with this, particularly the exclusion of the number of EVs operating in a service territory. Without this basic piece of information, ARB will not able to cross-check reported electricity usage by EVs for reasonableness.

In fact, we suggest that the reporting requirements be enhanced to include not only the number of EVs in a service territory, but also the number of plug-in vehicles in various categories (i.e., pure electric vs. plug-in hybrids by range). LCFS 40-64

It is important to distinguish between pure battery electric vehicles (BEV) and plug-in hybrid electric vehicles (PHEV); and within each of those categories, identifying the distribution of vehicles by electric range. For example, data collected by the Idaho

National Laboratory on in-use driving patterns for the Chevrolet Volt and Nissan Leaf can be found at: http://avt.inl.gov/evproject.shtml#.

Dividing the all-electric miles by the number of vehicles reported at that website gives quarterly VMT per vehicle for Oct-Dec 2013. The BEV Leaf (~6000 miles per year if 4Q2013 numbers are forecast to a full year) is accumulating fewer miles on electricity than the PHEV Volt (~8000 miles per year).[1] Clearly, the limited range of the Leaf is resulting in much lower VMT than a typical new car, while the broader utility of the Volt results in greater overall usage and higher VMT on electricity. However, PHEVs with lower range would have fewer miles on electricity, while BEVs with greater range would likely have more miles on electricity. These results reinforce the importance of understanding the make-up of the plug-in fleet in a particular area to generate an accurate estimate of on-road electricity usage. In addition, it is important to continue monitoring recharging and electricity usage of these vehicles as the patterns of usage may change as the vehicles expand beyond "first adopters."

WSPA opposes the proposal to remove the Supplemental Information from electricity providers reporting obligations, including accounting of credits generated, sold, and banked and accounting of number of EVs known to be operating in the service territory.

While WSPA recognizes the confidential nature of credit generation in the LCFS, if electricity credits are based on estimated electricity usage rather than direct metering, the public has a right to know precisely how those estimates were prepared and the number of credits generated as a result.

LCFS 40-64 cont.

H.D. EERs: §95490 Table 5

Staff has proposed changes to the heavy-duty EV EER based on electric buses operating in California. Similarly, staff has proposed EERs for heavy rail, light rail and trolley buses, and electric forklifts. WSPA cannot comment on these values without reviewing the data upon which they were based. In general, however, we reiterate our concern about allowing these sources to generate credits without accurately including them in the 2010 baseline.

It is unclear whether ARB has adequate information to establish EER values for electric buses as proposed, and recommend that ARB evaluate whether additional testing or other information is needed prior to publication of EER values. We do not support the use of the proposed EER values.

LCFS 40-65

Specific concerns that we would like to raise include the following:

1. There is insufficient evidence available to show that the proposed EERs represent actual in service fuel economies.
    a. The test procedure for electric buses is incomplete. Key information such as the measurement of energy consumption is not adequately described to independently repeat the test.

b. The Altoona Bus Test website does not have a published test procedure for electric buses and the test procedure posted on the website is dated 2006.
c. It is not illustrated that the posted 2006 diesel bus testing procedure is applicable to electric buses.
d. In the posted test results and on the Altoona website, there are caveats presented that indicate that the Fuel Economy tests "will not represent actual "in service" fuel economy but will provide comparative data" (see http://www.altoonabustest.com/bus-tests.htm).

2. Modifications to the testing protocols have the potential to impact test results, making them non-representative of in-service conditions:
   a. Both an acceleration and deceleration profile should be followed during testing – there is the potential for a biased comparison between buses without a set profile.
   b. Modification of the maximum speed during the commuter cycle testing from 55 miles per hour (mph) to 40 mph may not be representative of real world conditions.
   c. A control vehicle should be used in the testing to account for external factors.

LCFS 40-65 cont.

We continue to stress that ARB has not given regulated parties adequate time or information to truly evaluate this proposal. Given the concerns raised and the short comment timeframe, we urge ARB to not include the proposed EER values for electric buses. If ARB continues to move forward with this proposal, the application should be limited specifically to new electric buses of the type tested and not be extended to existing electric buses (e.g. cantilever buses) in service prior to the implementation of the LCFS.

LCFS 40-66

Section 95484 – Average CI Requirements

CaRFG Carbon Intensity

WSPA cannot find a reference to the carbon intensity for CaRFG in the regulation. This is important because it is the baseline against which the reductions are determined. In the existing regulation it is part of the look-up table. Neither can we find any documentation detailing how the CI was derived. WSPA requests that it be included in the regulation.

LCFS 40-67

Section 95485 - Demonstrating Compliance

Credit Clearance 95485(c)(1)(B)2 – we continue to have concerns with the credit clearance proposal as summarized below:

- This provision only serves to 'kick the can down the road' and adds additional complexity to an already complex regulation.
- We question whether any parties will pledge credits to the credit clearance market knowing that parties will have more obligation added the following year.
- The proposal to include a 5% interest rate on carried over credits only exacerbates the issues with infeasibility of LCFS targets in later years of the program.

LCFS 40-68

- This option does not address the infeasibility of the LCFS targets.
- It is not clear how ARB developed the $200 / credit price ceiling.
- We have concerns regarding the ability to perform any due diligence on the Credit Clearance Market credits. ARB should, at a minimum, guarantee the validity of such credits and hold transportation fuel providers harmless in the event the credits are invalidated; including not requiring regulated parties to replace invalidated Credit Clearance Market Credits.

Here are some suggested revisions:

WSPA proposes that participation in the CCM be voluntary. In order for ARB to determine whether or not to hold a CCM for a particular year, ARB could issue a "Call For Deficits" similar to the "Call For Credits" described in §95485(c)(3)(A) in order to inform their decision.

Section §95485(c)(3)(E)(5) – recommend the following additions *(denoted in red):*

Regulated parties that have pledged credits to sell into the Clearance Market, and have not sold or contractually agreed to sell all their pledged credits, cannot reject an offer to purchase pledged credits at the Maximum Price.

LCFS 40-68 cont.

Deficit Carryover (formerly Section 95488(a)(4))
WSPA objects to the removal of the Deficit Carryover provisions in the proposed regulations. There may be planning or operational reasons why a regulated party may wish to carry deficits from one year to the next. We request that this section remain in the regulation as an option for entities not wishing to participate in the CCM.

This would be accomplished by changing Section 95485 Demonstrating Compliance, (c) *Credit Clearance Market*, (1) by adding the following:

"(D) Deficit Carryover. Non-withstanding the above, a regulated party may carry over the deficit to the next compliance period, without penalty and without participating in the Credit Clearance Market, if both of the following conditions are met:

(A) The regulated party fully met its annual compliance obligation or participated in the Credit Clearance Market in the previous compliance period; and
(B) The number of credits retired for the current annual compliance period is at least equal to 90 percent of the current annual compliance obligation."

If this change is made the following changes would also be required to the proposed regulatory language:

Section 95485(c)(4) - Add the following to the first paragraph: "unless the party elected to exercise the Deficit Carryover provision.

LCFS 40-69

And for 95485(c)(4) (A) change the definition of "total Deficits" to: "total deficits" refers to the sum of all regulated parties' obligations for the compliance year that have not been met pursuant to section 95485(a) or the Deficit Carryover provision; and
Section 95485(c)(4)(B) The LCFS credit balance and the individual entity names should be treated as highly confidential because the release of this information could adversely impact business operations. The release of the LCFS credit balance would provide competitors and other LCFS credit market participants with short or long position knowledge. While that knowledge would enable the credit clearance market to perform as desired, it would allow for manipulation of the normal LCFS credit market. For example, if a party has to purchase a specified pro rata share of LCFS credits in the credit clearance market and is unable to, then the parties who have credits to sell after the credit clearance market is completed would have a financial incentive not to sell until the next credit clearance market and they would be aware of entities' shortfalls. Rather than have positions posted publicly as noted in 95485(c)(4)(B)1. and 2., regulated parties would prefer to have a designated overseer within the California Air Resources Board to bring buyers and sellers together and preserve confidentiality of individual parties positions.

LCFS 40-69 cont.

Section 95485(c)(5) – WSPA understands ARB is proposing to prohibit entities that have a roll-over deficit under the credit clearance approach from transferring/selling credits to another party until the deficit is "paid back." WSPA understands this prohibition is only intended to apply to "separated" credit transactions and not to the transfer of obligation with physical fuel. We are requesting that ARB confirm this in writing.

LCFS 40-70

Section 95486 – Generating & Calculating Deficits & Credits

Section 95486(a)(4)(A) – recommend the following change – to be consistent with existing regulation & §95486(a)(4)(B)(2) *(denoted in red):*

(A) *Extended Credit Acquisition Period.* A regulated party may acquire, via purchase or transfer, additional credits between January 1st and March 31st ("extended period") to be used for meeting the compliance obligation of the year immediately prior to the extended period. Credits acquired for this purpose are defined as "carryback" credits. All carryback credit transfers must be initiated in the LRT-CBTS by March 31st and completed by April ~~15~~30th to be valid for meeting the compliance obligation of the year immediately prior.

LCFS 40-71

Section 95486(a)(4)(B)(2) – recommend the following change – to be consistent with existing regulation *(denoted in red):*

The additional credit was generated in a compliance year prior to the extended period.

A regulated party electing to use carryback credits must identify the number and source of credits it desires to use as carryback credits in its annual compliance report submitted to the Executive Officer no later than April 30th of the year in which the additional credits were obtained.

LCFS 40-72

A regulated party electing to use carryback credits must acquire and retire a sufficient amount of carryback and other credits to meet 100 percent of its compliance obligation in the prior compliance year. If sufficient credits are not available, a regulated party must minimize its compliance shortfall by retiring all credits purchased during the extended periods that are eligible to be used as carry back credits.

LCFS 40-72 cont.

Section 95486(c) - Credit Generation Frequency. Beginning 2011 and every year afterwards, a regulated party may generate credits quarterly after data are reconciled with its business partner.

WSPA believes that the new proposed language is unworkable in its current form. WSPA supports the goals of staff of accurate reporting, and we support the new reporting provisions requiring an initial report followed by a 45 day reconciliation period. Section 95491 Reporting and Recordkeeping (a)(1)(A) calls for reporting parties to "work in good faith with their counter parties to resolve and fuel transaction discrepancies between the parties". WSPA supports this but notes that this does not ensure that there will not be any discrepancies between reporting parties. To be consistent with section 95491, WSPA believes the language of 85486 (c) should be modified to state:

(c) Credit Generation Frequency. Beginning 2011 and every year afterwards, a regulated party may generate credits quarterly after its quarterly report has been filed and it has made a good faith effort to ~~after data are~~ reconcile~~d~~ its data with its business partner

LCFS 40-73

Section 95487 – Enhancements to LCFS Credit Provisions

WSPA agrees with the required use of the LRT for initiating and completing all credit transfers. However, WSPA questions whether ARB has a contingency plan for any prolonged outages that the system may experience. It may be appropriate to include a provision empowering ARB to put a temporary manual transaction process in place under such circumstances.

LCFS 40-74

Section 95488 - Obtaining and Using Fuel Pathways

(a) Applicability-(page 51 – 52 of Appendix A)
Item (1)
WSPA is concerned about the short timeframe for parties to register and obtain a fuel pathway certification for those pathways that do not meet the requirements of 95488 (a) (1) given the two step board adoption process and the possibility of one or more 15-day packages. WSPA suggests a sunset date of one year after the effective date of the LCFS Re-Adoption regulations for **all** fuel pathways.

This can be accomplished by deleting the last sentence of the first paragraph 95488 (a) and the following paragraphs (1), (1)(A), (1)(B), (1)(C); and the following to the first paragraph in 95488 (a):

LCFS 40-75

A fuel pathway certification or a registered fuel provider's use of a fuel pathway that was approved under the provisions of the previous LCFS regulation order may remain valid for as long as one year after the effective date of this subsection, and then shall be automatically deactivated.

Item (2)

For clarification purposes, assuming staff makes the above change, WSPA suggests the following phrase "both with approved physical pathways and those with physical pathways pending" be inserted into the revised first sentence of 95488 (a) ~~(1)~~ so it reads as follows:

A fuel pathway certification or a registered fuel provider's use of a fuel pathway both with approved physical pathways and those with physical pathways pending, that was approved under the provisions of the previous LCFS regulation order may remain valid for as long as one year after the effective date of this subsection, and shall then be automatically deactivated.

WSPA believes the above proposed change is consistent with the language in this subsection which uses the terms "in effect", "registered", and "certified"; but does not specifically address the initial demonstration of physical pathway.

LCFS 40-75 cont.

(c) Specific Requirements and Procedures.

Item (4)

For increased transparency and because it is used to calculate the CI of denatured ethanol and the CI of CARFG for the 2010 standard, WSPA believes the regulations should contain a specific reference to the California Reformulated Gasoline and Ethanol Denaturant Calculator spreadsheet.

This can be accomplished by adding a new paragraph (o) after paragraph 95488 (c) (1) (N) that reads as follows:

(N) A copy of the California Reformulated Gasoline and Ethanol Denaturant Calculator spreadsheet showing the anhydrous and denatured ethanol CI values if the pathway is for ethanol.

LCFS 40-76

California Reformulated Gasoline and Ethanol Denaturant Calculator spreadsheet

Item (5)

WSPA recommends that several changes be made to the spreadsheet that staff has posted that is used to calculate the Carbon Intensity (CI) of CARFG and the incremental CI value that parties are directed to add to their CA-GREET 2.0 Pathway CI Result to account for the denaturant added to anhydrous ethanol.

Cell C13 (Line C) should be corrected to contain the correct updated ILUC value for corn ethanol. The proposed new value is 19.8g CO2e/MJ. Cell C13 currently has a value of

LCFS 40-77

20.00g CO2e/MJ. The proposed CaRFG baseline number and the 2016+ standards in section 95484 should be updated to reflect this change.

LCFS 40-77 cont.

WSPA believes staff is incorrectly characterizing the content of denatured ethanol based on the fuel specification rather than actual industry practice. The denatured ethanol standard allows up to 2.5 vol% denaturant, 1% water, 0.5% methanol and 1.4% other. Ethanol produced at ethanol plants does contain some water and methanol plus higher order alcohols. The reference cited in the spreadsheet only cites the current ethanol specification and gives no justification for treating the water, methanol, and other (which are higher order bio-alcohols) as CARBOB for the CI calculation.

Ethanol producers do not add more than 2.5% denaturant because exceeding this amount would result in having to assign less than 1 RIN per gallon of denatured ethanol (per EPA regulations) and ethanol buyers expect each gallon of ethanol to have 1 RIN attached to it. Thus WSPA agrees that 2.5 vol% should be used for the percent denaturant.

Ethanol producers also typically add water to ethanol up to the 1% standard. This water has no Carbon Intensity (CI) since it is not petroleum based. Theoretically, staff should divide the calculated ethanol vol% of anhydrous ethanol by .99 to account for this.

Ethanol producers do not add anything else to the ethanol. Any methanol contained should be treated as a biofuel (which it is) and not assigned a CI of CARBOB by subtracting the methanol content when calculating the ethanol content of denatured ethanol. The goal is to calculate the biofuel content. The "other" compounds are higher order alcohols which should also be treated as biofuels and not as CARBOB. Their energy content is greater than ethanol which makes up for the lower energy content of methanol. To not over calculate the CI of denatured ethanol staff should set the ethanol content at 96.5% (100% - 2.5% - 1%) or 97.47% (100% - 2.5% - 1%)/0.99 if staff elects to back out the water. Commercial denatured ethanol contains above 96% ethanol if not 97%.

LCFS 40-78

To make the changes Cell C33 Line N should be changed to 9.698250% (10.05% times 96.5%). In addition, Cell C49 Line Y should be changed to 96.5% and Cell C50 Line Z should be changed to 3.5% (100% - 96.5%).

Making these changes including the iLUC correction will change the value of CaRFG from 98.18 to 98.14gCO2e/MJ. More importantly, it will change the 2010 denatured minus anhydrous value Cell 55 to 1.15gCO2e/MJ from the incorrect high value of 1.78.

Making these changes will also correct the calculated CI impact of denaturant in Cell C62 Line HH which ethanol producers have to use in calculating their new CI values per section 95488 or the regulations. For a 60 CI anhydrous ethanol the denaturant value to add would now be the correct value of 2.03gCO2/MJ versus the high value (when treating the methanol and other higher order alcohols as CARBOB) of 3.15gCO2/MJ. This is a decline of 1.12gCO2/MJ which is significant. If fact, the proposed regulations

in this section at 95488(c)(4)(G)(2) Substantiality Requirements, consider 1.0 gCO2e/MJ to be a significant threshold for applying for a new pathway.

LCFS 40-78 cont.

Item (6)
WSPA believes that the inclusion of regulated parties reporting CI's in addition to fuel producers, in section 95488(c)(6) *Relationship of Pathway Carbon Intensities to Units of Fuel Sold in California,* is unworkable. Regulated parties that are not fuel producers cannot reasonably be held responsible for the producer's assignment of a CI value. Nor should they be required to determine that the actual CI of the fuel is equal to or less that the CI value reported. This paragraph should just refer to fuel producers.

This can be fixed by changing the two references of "regulated parties" to "fuel producers" in paragraph 95488(c)(6)(A).

LCFS 40-79

Evidence of Fuel Transport Mode- (page 84 – 87 of Appendix A)
Item (7)
WSPA suggests that all existing and submitted demonstrations of fuel transport modes be grandfathered into the LCFS Re-Adoption regulations. This could be accomplished by adding a statement to this effect to the second paragraph of 95488(e) Evidence of Fuel Transport Mode so it reads as follows:

A regulated party must submit the demonstration of a fuel transport mode to the Executive Officer within 90 days of providing a fuel in California unless an initial demonstration of fuel transport mode was previously submitted and approved for that facility under the provisions of the previous LCFS regulation order.

LCFS 40-80

WSPA cannot see any benefit of having alternative fuel providers re-submit their initial or updated demonstrations of fuel transport modes to ARB. The changes in the LCFS Re-Adoption regulations do not have any impact on the validity of previous initial demonstrations of physical pathways under the existing regulations.

Revised Indirect Land Use Change (iLUC) Values

Indirect land use change (iLUC) estimates continue to be a source of uncertainty in the overall lifecycle GHG footprint of biofuels, and significant efforts to refine those estimates[2] have continued since ARB initially included iLUC in the LCFS. Although uncertainty in the estimates remains, WSPA agrees that iLUC effects for biofuel production need to be addressed in the context of the LCFS regulation, consistent with our comments on the 2009 LCFS rulemaking. In principle, the scientific basis for addressing iLUC in the LCFS remains sound, and improvements to methods and models for estimating iLUC values continue to be made.

In our 2009 comments WSPA also supported convening a Work Group with experts on both sides of the debate to ensure a balanced and transparent approach to further work on

[2] See, for example, proceedings from Coordinating Research Council workshops on life cycle analysis of biofuels/ transportation fuels held in 2009, 2011, and 2013 at http://www.crcao.com/workshops/index.html.

the issue. We applaud ARB for facilitating that effort, as well as the work group participants who devoted considerable time and energy to better define the issues around indirect effects. Although disagreements remained among experts about some key elements of the iLUC calculations (e.g., time accounting), there were other areas of agreement and recommended GTAP model improvements that have been incorporated by Purdue University and ARB (e.g., improved treatment of co-products for corn ethanol and soy biodiesel).

The detailed analysis of revised iLUC values is summarized in Appendix I of the ISOR. We have the following comments and questions on that analysis and the ensuing results.

1. A comparison of the current regulatory iLUC values and the proposed iLUC values is shown in the table below. Also shown are values presented at the November 20, 2014, workshop.

Comparison of Current and Proposed iLUC Values (gCO2e/MJ)			
Fuel Pathway	**Current Value (2009 Regulation)**	**Proposed Value (December 2014 ISOR)**	**November 2014 Workshop[3]**
Corn Ethanol	30	19.8	20.0
Sugarcane Ethanol	46	11.8	19.6
Soy Biodiesel	62	29.1	27.0
Canola Biodiesel	n/a	14.5	14.5
Sorghum Ethanol	n/a	19.4	12.7
Palm Biodiesel	n/a	71.4	46.4

Given the significant changes to both the GTAP model, which estimates the location and amount of land use change for a particular biofuel pathway and a given volume "shock," as well as the emission factors applied to the land use change (via the AEZ-EF model), it would be useful for ARB staff to identify how much of the ILUC changes in the table above are associated with GTAP model revisions versus emission factor revisions. Additionally, what is the basis for the changes between the November 2014 workshop and the December 2014 release of the ISOR?

LCFS 40-81

2. It appears CARB is making a procedural change in how they plan to address iLUC. In the current regulation, iLUC values are part of the regulation (they are specified in the look-up tables). In the proposed regulation, the only mention of iLUC values is in §95486(b)(3)(B) which describes the credit calculation. The calculation requires incorporation of "a land use modifier (if applicable)" but those values are not found in the regulation.

LCFS 40-82

[3] See http://www.arb.ca.gov/fuels/lcfs/lcfs_meetings/112014presentation.pdf

This opens the door to changes to key formulas outside of the rulemaking process and without opportunity for public comment. When regulations are amended, the California Administrative Procedure Act requires "basic minimum procedural requirements" for rulemaking, including giving interested parties an opportunity to comment on the rulemaking, and a response to public comments. *See Tidewater Marine Western, Inc. v. Bradshaw* (1996) 14 Cal.4th 557, 558; Cal. Gov. Code § 11346. But the proposed regulations attempt to avoid public discourse on potentially significant changes to the implementation of the LCFS by tying key values that are the rule's backbone to calculations and data that could change at any time, with no explanation—essentially a *de facto* amendment of the regulation with no public process.

ARB must provide more certainty that key values and calculations will not change without public input. A possible remedy would be to add a table of iLUC values to the regulation.

LCFS 40-82 cont.

3. Table I-1 of Appendix I summarizes the "shocks" used in GTAP to model iLUC emissions. For sugarcane ethanol, the table appears to indicate that 3 billion gallons of Brazilian production and 1 billion gallons of U.S. production were assumed. Is this a correct interpretation of the table, or do those volumes reflect the volumes consumed in Brazil and the U.S.? If the former interpretation is correct, what is the basis for these estimates, as we are not aware of large volumes of sugarcane ethanol being produced in the U.S.? What is the sensitivity of the model to changes in the split between Brazilian production and U.S. production?

LCFS 40-83

4. The proposed iLUC values are based on an average of 30 model runs which used 5 different values for the yield-price elasticity, 2 sets of values for a yield adjustment for the cropland pasture land category, and 3 sets of values for the elasticity of crop yields with respect to area expansion (5 X 2 X 3 = 30 runs). ARB also prepared a Monte Carlo uncertainty analysis that consisted of up to 1,000 model runs for some pathways. Why were the means of the 30 discrete scenarios used to establish the iLUC values rather than the means of the Monte Carlo simulations?

LCFS 40-84

5. As noted above, one of the parameters that was varied to establish the 30 model runs for the iLUC analysis was a yield adjustment for the cropland pasture land category, which is a new land category in the GTAP model relative to the 2009 analysis. This yield adjustment is intended to account for potential investments to increase the productivity of this land as it is brought into crop production. The discussion on page I-12 of Appendix I indicates:

> "However, Purdue researchers acknowledge that although they believe the effect is real, there is no empirical basis for the elasticity parameter proposed for this endogenous yield adjustment. In the absence of

LCFS 40-85

empirical evidence to estimate this parameter, staff used two sets of values for the runs employed for each biofuel analyzed here."

Given the lack of empirical data with which to estimate this parameter, what was the basis for the elasticities used in the analysis?

LCFS 40-85 cont.

6. Land use change effects for cellulosic ethanol are discussed beginning on page I-18 of Appendix I. The discussion indicates that a value of 18gCO2e/MJ is proposed for cellulosic feedstocks, and that staff is continuing to work on model inputs for cellulosic ethanol from non-food crops and waste. The discussion further indicates that results will be published when the analysis is complete. Will an updated iLUC value be proposed for cellulosic ethanol via a 15-day change notice as part of the current rulemaking, or does staff envision another avenue to formalize this value? In what timeframe does staff expect to have an updated iLUC value for cellulosic feedstocks? Is the 18 gCO2e/MJ value only for farmed trees, miscanthus, and other purpose-grown cellulosic feedstocks, i.e., would waste products used for cellulosic ethanol feedstocks be assigned a land use change value of zero?

LCFS 40-86

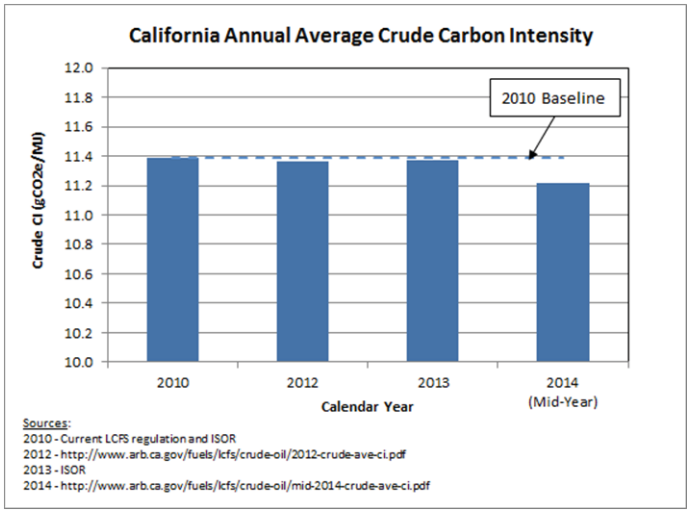
Section 95489- Provisions for Petroleum-Based Fuels

Section (a) – General - Annual Crude CI Calculation

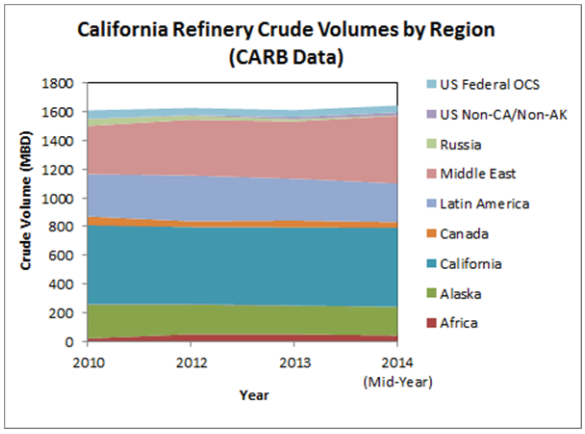
WSPA comprehends ARB's desire to continually improve the accuracy of LCFS data inputs, and recognizes the approach taken by staff in attempting to refine the crude handling provisions as part of the re-adoption rulemaking is consistent with that principle. However, we also believe that the degree of crude differentiation built into LCFS, to comprehend concerns over CA crude CI increasing over time, remains unnecessarily excessive and should be reduced. Our reasoning is as follows:

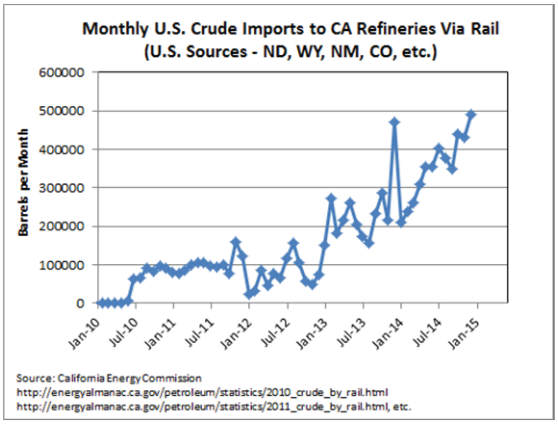
- The fundamental reason for these provisions in the rule was to ensure that the Average carbon intensity of the California crude slate did not increase over time. The available crude breakdown data for recent years (2011-2013) suggests that this threat has never materialized and that the CA crude average CI has remained relatively stable (see plot below).

LCFS 40-87



Moreover, ARB data on crude volumes run in California Refineries show a decreasing trend in heavier Canadian crudes, while light Middle Eastern and U.S. mid-continent crudes ("U.S. Non-CA/Non-AK" in the figure below) have trended upwards. Furthermore, CEC data on U.S. mid-continent crude imports by rail show strong growth over the past three years that has continued through the second half of 2014.





LCFS 40-87 cont.

50

- As a result, we believe that the justification drivers for installing, maintaining and expanding the current LCFS crude differentiation provisions have been greatly diminished since these provisions were implemented.
- Even if ongoing monitoring is necessary to ensure that staff's concerns that a heavier crude CI outlook does not materialize, the worst case scenario (i.e., exporting heavy California crude to maintain a constant annual average crude CI) yields no tangible greenhouse gas reduction benefits from a global standpoint. California's average crude CI may well remain constant, but global GHG emissions are likely to increase as the GHG emissions associated with transporting the crude exported from California (to non-optimal refining centers for processing) will be higher.
- The ongoing staff effort to maintain and improve crude differentiation inputs and modeling tools in the LCFS is resource-intensive for the ARB and equally burdensome for our industry in terms of the recordkeeping and reporting requirements it entails. In the absence of a valid GHG justification for engaging in such a complex crude differentiation and tracking scheme, we believe staff should be moving in the opposite direction than they have been following, i.e., one of simplification and streamlining.

LCFS 40-87 cont.

WSPA understands staff does not propose a fundamental change in the California Crude Average approach as part of this re-adoption package. We support staff's decision not to proceed with Refinery-Specific Crude Accounting for large, complex refineries and understand the rationale offered for doing so. We agree that there is no practical alternative to facilitate detailed individual crude breakdown in the pipeline crude blends that comprise a large part of refinery crude inputs in the state. We look forward to working with staff in the near future to examine potential options to modify the crude differentiation requirements in LCFS (post re-adoption), toward a less complex alternative that can hopefully satisfy staff's desire to track crude CI trends over time while reducing the compliance burden on our industry.

LCFS 40-88

We note the proposed changes in the methodology for calculating the CA crude average to rely on CA on-shore crude production data (supplied by The Department of Conservation- DOC) and off-shore data (supplied by The Bureau of Safety and Environmental Enforcement- BSEE). This is in lieu of refinery-reported crude volumes that have been used for this purpose up to this point. Staff's rationale is simply that this is essential to improve the accuracy of the crude volumes used in the calculation of the CA Annual Crude Average. There is no backup support or analysis of the impact of the proposed changed in calculation methodology. More specifically, staff does not:

- Present data to determine how this change will impact the calculated annual volume averages to date. Staff merely indicates that total refinery-reported volumes for 2012 and 2013 closely match the volumes reported by CA field

LCFS 40-89

operators. We would recommend a more rigorous side-by-side comparison for 2011-2013 using the CA crude volumes estimated/reported by refineries versus the newly proposed utilization of DOC and BSEE data.

- Elaborate on the methodology that will be used to combine the in-state crude data with out-of-state crude volumes imported into California (both U.S. and foreign) to develop the overall annual CA crude average. Furthermore there is no indication that any potential discrepancies with the refinery-reported volumes will be investigated and reconciled.
- Recognize the difficulty that increased CA exports will entail should this methodology be adopted, dismissing such concerns by simply indicating that production volumes will be adjusted for exported crude volumes (should the need arise). Staff believes their proposal will work as long as all CA-produced crude is processed in CA, which is currently the case. However, staff's proposal appears to be short-sighted and inconsistent with the overall crude handling approach in the LCFS which, despite WSPA's input, is designed to drive increased crude exports to prevent CA crude average CI increases. Moreover, the same issues staff outlines in breaking down reported volumes of typical CA pipeline crude blends currently will be in play if/when staff tries to back out exported crude volumes out of the calculated CA annual average.

LCFS 40-89 cont.

Many inputs are required to run the OPGEE model for a specific oil field and in particular for California fields, a number of important parameters, such as water-oil ratio, steam-oil ratio, and production volumes are available or are calculated from data published by the California Department of Conservation, Division of Oil, Gas, and Geothermal Resources. We encourage ARB staff to revise the OPGEE modeling to reflect actual realistic input values, such as for the steam generator feed water temperature, and we will work with ARB staff to provide more specific data on this and other model inputs for California crudes. ARB should pursue collecting the same composition, quality, and environmental profile details for other domestic and worldwide crudes as transparency and comprehensive, reliable, comparable data is critical to making effective and sustainable decisions.

LCFS 40-90

Section (c) Addition of Incremental Deficits that Result from Increases in the Carbon Intensity of Crude Oil to a Regulated Party's Compliance Obligation (page 96 – 97 of Appendix A)

Item (1)
95489(c)(3)(B)
WSPA is concerned about the long lag time between the submittal of quarterly crude receipt data to ARB and the regulatory requirement of posting the prior year's Annual Crude Average carbon intensity calculation at the LCFS web site. WSPA requests that in order to facilitate obligated parties compliance planning and execution that ARB be required by the regulations to also post a quarterly Crude Average compliance calculation within 15 days of receiving the 1st, 2nd, and 3rd Quarter Compliance reports. This requirement should be added to paragraph (B) of 95489(c)(3).

LCFS 40-91

Item (2)

52

95489(c)(3)(C)
The LCFS Regulations have been in a constant state of change since they were adopted by the board. WSPA believes that this uncertainty has and could continue to result in increased LCFS credit prices, compliance issues and difficulty in meeting the goals of the LCFS program. WSPA believes that a three-year cycle for not just updating Table 8 but of the LCFS regulations will have little benefit and add uncertainty to the program. WSPA suggests all LCFS regulatory revisions occur no more frequent than once every 5 years. This should not preclude CARB from adding new crudes to Table 8 on an annual basis. However, overall revisions to Table 8 or the OPGEE model should occur no more frequent than once every 5 years.

LCFS 40-92

Section (d) – Credits for Crudes Using Innovative Methods

WSPA notes the revisions to the innovative crude provision, which help resolve several issues with the original provision that rendered it unworkable and thereby inhibited the use of these low-carbon production methods.

Most importantly, reducing the minimum threshold for carbon intensity reduction from 1.0 g/MJ to 0.1 g/MJ, or alternatively achieving annual emissions reductions of 5,000 MTCO2e or more, removes an impossibly high hurdle and might allow for a number of projects to receive approval. Allowing the producer to opt in as a regulated party and generate the credits rather than the refiner generating the credits provides the producer with a stronger incentive than the current regulation to apply to the Executive Officer for approval of the method. WSPA supports replacing the complex formula for calculating credits with default calculations as it will also aid applicants. Finally, WSPA supports the addition of solar and wind electrical power generation and solar heat generation as allowable innovative methods, as this could result in more successful applicants and therefore more available credits for regulated parties.

LCFS 40-93

However, WSPA takes issue with limiting CCS as an innovative method to those instances where the carbon capture occurs onsite at the crude oil production facilities. CCS has the potential to generate a substantial number of credits under this provision, but many projects (and proposed projects) involve capturing carbon such as from power generation or other industrial emission streams not at the same physical site where the crude is extracted. This could seriously limit the potential of CCS under this provision and in general and stem the flow of much-needed credits. The capture of CO2 from a steam generator or other equipment at the oil production is desirable, but the overall cost of actual capture, sufficient volume, gathering and clean-up to a CO2 purity to allow for miscible injection and recovery at a reasonable economic scale is prohibitive in/through CCS as compared to capture from other large CO2 emission sources.

LCFS 40-94

WSPA also objects to Section 95489 (d)(1)(B), which proposes that credit generation for CCS projects will only be allowed through the use of a Board-approved quantification methodology including monitoring, reporting, verification, and permanence requirements associated with the carbon storage method being proposed for the innovative method." Since applicants are required to be approved by the Executive Officer, WSPA proposes

LCFS 40-95

that quantification methodology for CCS projects should only require the approval of the Executive Officer, not the entire Board. WSPA would also encourage ARB to expedite the process for implementing the quantification methodology in order to incentivize applications under this provision.

LCFS 40-96

Moreover, the proposal should include an option for Crude Production companies to apply for this credit for other GHG reduction projects above and beyond the four envisioned by ARB and included in the regulations:

- There are other technologies (e.g. solvent extraction) that may result in reduced energy usage and/or GHG from crude oil production.
- Limiting credits to solar and wind eliminates credits for other renewable energy, such as land fill gas, tidal power, etc.
- We feel the use of renewable electricity transmitted through an electricity grid should be eligible for this credit.
- We oppose the requirement that third parties providing either innovative steam or electricity must be co-applicants, especially given that co-applicants are not able to generate credits under the proposal.
    - Any recordkeeping or regulatory requirement would be more appropriately managed through contractual language between third party providers and crude producers.
    - Such a requirement may dis-incent applications for this credit and the use of the technologies ARB is trying promote.

LCFS 40-97

LCFS 41-90

Section (e) - Low Complexity/Low Energy Use (LC/LE) Refinery Provisions.

WSPA opposes the LC/LE Refinery provisions. We continue to believe it is inappropriate for ARB to be picking "winners and losers" among the refiners in the state and to effectively place those who have made the investments necessary to generate the volumes of refined product demanded by the market at a competitive disadvantage as far as LCFS compliance is concerned.

LCFS 40-98

We oppose the LC/LE Incremental Deficit proposal, as we have consistently opposed crude differentiation in the LCFS program. If crude slate changes are going to be accounted for, WSPA opposes the treatment of individual refinery carbon intensities and particularly when such treatment is separate from, but additive to the statewide average.

LCFS 40-99

In general, WSPA has the following concerns about the LC/LE approach to incremental crude oil CI calculation:

- The options are already overly complex for refiners and importers.
- It continues to differentiate between crudes and disadvantage one over the other.
- It could reward a refinery for past high CI crude use while penalizing a refinery with historically low CI crudes. It is not sensitive to energy security concerns.
- Allowing some refiners to opt-out of the industry-wide average approach creates a bifurcated market and introduces the potential for fraud given the chain of custody for crude and feed stocks is immensely complex and there is no uniform,

LCFS 40-100

verifiable certification scheme. ARB's LCFS regulatory requirements should be fraud resistant. LCFS 40-100

If ARB moves forward with the LC/LE provision, we support the proposal to limit the LC/LE Refinery provisions only to transportation fuels produced from crude oil. However, the proposal as outlined raises some specific concerns:

- We believe the definition of "LE refineries" should be based on the lifecycle carbon intensity of the transportation fuels produced. The current proposed definition is based on total energy used at a refinery, and does not take into account life cycle energy use, e.g. whether the energy used per barrel of transportation fuels ***produced from crude oil*** for the LC/LE refiner is high or low compared to other refiners in the state. A LC/LE refiner that uses more energy per gallon of transportation fuel ***produced from crude oil*** should not be granted special treatment. LCFS 40-101
- In the ISOR ARB states that CARBOB and ULSD produced by LC/LE refiners have a CI that is approximately 5gCO2e/MJ less than the CI of other California refiners. However, it is not clear from the ISOR how ARB calculated the LC/LE refiners transportation fuel CI. LCFS 40-102
- Does the calculation of LC/LE overall CI include the transportation fuels produced from all feedstocks to the LC/LE refineries or the transportation fuels produced from crude oil? If the overall CI used to calculate the 5 gCO2e/MJ "adjustment" includes the processing of feedstocks other than crude oil, WSPA believes ARB should modify the adjustment to only take into account the transportation fuels produced from crude oil. LCFS 40-103
- With respect to Low Complexity-Low Energy Use Refineries seeking CI adjustments for the CARBOB and Diesel production from crude oil in 95489 (e), please explain how the volumes of CARBOB and diesel produced from crude oil versus transmix versus "intermediates" in 95489 (e)(2) are calculated? We request that ARB include a methodology for calculation of these different volumes in the regulation. LCFS 40-104
- In the ISOR, ARB staff stated these credits would only be used for compliance obligation by the LC/LE Refinery generating the credit, and would not be eligible to be sold or traded. However the draft regulation does not include any restrictions on how these credits are treated. The regulatory language should indicate that the sale and/or trade of any credits generated under the Low Complexity-Low Energy Use Refinery provisions is prohibited. LCFS 40-105

Section (e)(1) – incorrect reference *(denoted in red):* LCFS 40-106

- To be eligible for the credit and deficit calculations in section 95489(e)(3) and the refinery-specific incremental deficit calculation in section 95489(e)(4), a Low-Complexity/Low-Energy-Use Refinery must meet the criteria in section 95481(a)(5~~7~~) using the following equations:

Section (e)(2)(C) – if ARB does not remove the definition of "Petroleum Intermediate" recommend the following *(denoted in red):* LCFS 40-107

- The volume of CARBOB and diesel produced from Petroleum ~~i~~Intermediate feedstocks; and…

LCFS 40-107 cont.

Formatting in the refinery-specific incremental deficit equations listed in 95489 (e)(4)(B) contains very little spacing between the individual portions of the "If" and "And" statements. It would be helpful for clarity if a line was inserted to increase the space between the "If" and "and" equations to avoid any confusion about subscripts in the upper equation versus potential superscripts in the lower equation.

LCFS 40-108

Section (f) - Refinery Investment Credit

WSPA recognizes ARB's efforts to allow credit for refinery investments as an element of LCFS GHG reductions. However, the proposed thresholds and restrictions risk eliminating most potential projects for arbitrary reasons. California refineries have a long history of investing in energy efficiency and optimization projects. This history is documented in the ARB energy efficiency summary for the refinery sector (http://www.arb.ca.gov/cc/energyaudits/eeareports/refinery.pdf).

WSPA's consultant, PetroTech Consultants, reviewed a recently-released Promotum report entitled, "California's Low Carbon Fuel Standard: Evaluation of the Potential to Meet & Exceed the Standards" dated February 2, 2105, as well as another NRDC-sponsored TetraTech report, " PetroTech provided comments that are summarized below on the two referenced report's conclusions which were that ARB's refinery investment credit option has significant credits to contribute to the pool.

A relevant subset of PetroTech's comments are:

LCFS 40-109

<u>Different base years used</u>

Even though the base year for measuring CI reductions under the LCFS is 2010, the currently proposed regulation uses 2011-2013 refinery energy consumption data as the basis for estimating the CI of the petroleum refining process, not 2010. Furthermore, the regulation limits credit generation only to energy efficiency projects that are ***permitted*** *after December 31, 2014. Credit generation is also limited by ARB to capital projects or those using renewable feedstocks that do not increase criteria or toxic pollutants. Capital projects normally take at least one year to implement. Thus, any energy efficiency improvements that were implemented in petroleum refineries between 2010 and 2016 cannot generate credits even though they have reduced the CI of the products.*

<u>Potential refinery energy efficiency improvements</u>

Refiners are in the business of transforming and delivering energy. Refinery energy use for the conversion of crude oil to finished products is their second largest cost behind feedstock (crude oil and blendstocks) acquisition. Energy usage and cost is monitored very closely within each refinery and has been for many years. Converting crude oil to

finished products requires energy. There is a theoretical minimum amount of energy required for the conversion that depends on the quality of the crude oil, product specifications and refinery configuration. More complex refineries generally require more energy to operate.

Two recent studies commissioned by NRDC, one by Promotum[2] and one by Tetratech[3], have greatly overstated the energy efficiency improvements that are still available to the petroleum refineries in California. Both studies use the same 2013 CARB study of California refinery energy efficiency[4] as a basis. In this CARB study, the 12 largest refineries were required to report their 2009 energy usage as well as past and potential energy efficiency projects. This report stated,

> *"The estimated GHG emission reductions are approximately 2.8 MMTCO2e annually. Approximately half of the GHG emission reductions identified were completed before 2010 and are reflected in the 2009 GHG totals shown in Table IS-1. The other half of the GHG emission reductions are from projects that were completed during or after 2010, scheduled, or under investigation and are not reflected in the 2009 GHG values shown in Table IS-1."*

The total emissions reported in Table IS-1 were 31.4 MMTCO$_2$e per year. 50% of the projects were completed prior to 2010, so the remaining potential reductions for 2010 and beyond would be 1.4 MMTCO$_2$e per year. 80% of the projects were listed as competed or ongoing in the report, so the remaining reductions that could potentially be permitted after 2015 would result in a reduction of about 0.5 MMTCO$_2$e per year. The CARB report goes on to state:

LCFS 40-109 cont.

> *"However, implementation of some projects may preclude the implementation of other projects that deal with the same equipment or processes. Therefore, these estimated reductions do not necessarily represent readily achievable on-site emission reductions."*

These identified projects with a total reduction of 2.8 MMTCO$_2$e per year were estimated to cost $2,600 million and result in annual savings of $200 for a simple payback of 14 years or a first year rate of return of about 7.7%. The highest rate of return projects would be implemented first, so the rate of return for the remaining projects would be lower.

The Tetratech report estimates that a 5-10 percent reduction in refinery GHG emissions from 2010 levels (1.6 to 3.2 MMTCO$_2$e per year) is easily attainable by 2020. Even their low estimate is higher than the CARB study estimates as a remaining potential. Tetratech justifies their higher estimate as follows:

> *"We note that these estimates [estimates reported in the CARB study] are likely conservative, given that (1) the information is based on self-audits and (2) the estimates do not include the off-site production of electricity, steam, or hydrogen,*

which is a potential major source of emissions and would be included in a life-cycle assessment."

Regarding item (1) in the Tetratech justification, refineries continuously evaluate their energy use and invest in projects to improve energy efficiency. Most of the refining capacity in California is owned by publicly traded corporations. As such, their stockholders (including many public pension funds) expect a minimum rate of return on their investment. Management's fiduciary responsibility limits potential energy efficiency investment to those that meet the minimum return requirements, but also encourages them to invest in projects with good rates of return. The CARB report does state that some of the identified projects will not be implemented but does not state the reasons. There is no logical reason to assume that potential energy efficiency projects would be underreported.

Regarding item (2), refineries do not purchase any significant amount of steam except from co-located cogeneration facilities which are relatively new and efficient. Total electricity usage (both internally generated and purchased) is only 4% of refinery energy usage as identified in the CARB report. Purchased electricity is at grid average GHG levels, so measureable reductions in GHG emissions through purchased electricity are unlikely. The recently issued CARB report on energy efficiency in hydrogen production concludes that the merchant hydrogen plants in California are relatively new and very efficient. Future potential GHG reductions from merchant hydrogen production are only 1-2% of the energy used to produce hydrogen.

LCFS 40-109 cont.

CO2 capture and storage for hydrogen plants is often quoted as an easily implemented GHG reduction technology for refineries. CO2 capture from hydrogen plants will not further the objectives of the current California LCFS. The California oil deposits are too shallow to benefit from CO2 based enhanced oil recovery techniques. Futhermore, the U.S. DOE has recently stated that widespread use of large scale CO2 storage facilities is not expected to be ready for dissemination until 2030[5].

The Promotum report estimates a potential reduction in refinery GHG emissions of 4.3 MMTCO_2e per year by 2025 (~14% reduction from 2010) primarily based on the added value of the emission credit.

> *"For refinery energy efficiency (EE) investments, it is assumed that at $100/ton, the incentive is sufficient to more than double the payback of EE, such that a reduction of 1.5% per year improvement in GHG emissions at refineries across the industry. We estimate that reductions from EE investments grow linearly from 2017 to 2025, reaching 4.3 MMT in annual reductions by 2025."*

According to the 2013 CARB energy efficiency report, 80% of the potential 2.8 MMT of annual CO2e reductions would have been implemented by now, leaving only 0.5 MMT of potential reduction projects that could be permitted in 2015 or beyond and eligible for the credit. The $100/MT of CO_2 credit is about $50 per barrel of crude. Although this

would change the rate of return for energy efficiency projects, the magnitude of this credit would not be sufficient to "more than double the payback of EE."

Furthermore, there is no technical basis for Promotum's estimated total potential reduction of 4.3 MMT CO_2e per year. There is a theoretical amount of energy required to refine crude oil into saleable products. Neither the Tetratech nor Promotum studies recognize this fact. They both use arbitrary percentage reductions with no theoretical basis for the values.

Allowing full credits for refinery efficiency improvements implemented since 2010 is consistent with the objectives of the LCFS. As stated in the subject document,

> *"The LCFS is performance-based and fuel-neutral, allowing the market to determine how the carbon intensity of California's transportation fuels will be reduced."*

Refinery efficiency improvements since 2010 have reduced the carbon intensity of fuels produced within California relative to the base year of 2010 and should receive full credits under the program. Furthermore, all future projects, not only those that are permitted in 2015 or later should receive full credits. As highlighted by Promotum, the credits raise the rate of return and will cause more projects to be implemented, although not to the extent estimated by Promotum.

2. Promontum, California's Low Carbon Fuel Standard: Evaluation of the Potential to Meet and Exceed the Standards. http://docs.nrdc.org/energy/files/ene_15012801a.pdf
3. CARB, "Energy Efficiency and Co-benefits Assessment of Large Industrial Sources, Refinery Sector Public Report," June 6, 2013.
4. U.S. DOE, National Energy Technology Laboratory, "Carbon Storage Technology Program Plan," September 2013., http://www.netl.doe.gov/File%20Library/Research/Coal/carbon-storage/Program-Plan-Carbon-Storage.pdf

LCFS 40-109 cont.

Therefore, due to our industry's prior investments, the proposed limitations and restrictions staff has developed for the Refinery Investment Credit option are too high, create arbitrary inequities, or are inconsistent with existing programs and law.

We propose modifying the proposed section to address several of the restrictions and thresholds for the following reasons:

a. Limiting onsite increases of criteria air pollutants and toxics unreasonably excludes offsets of criteria and air toxic pollutants
b. 0.1 gCO2e/MJ threshold is too stringent and unfairly penalizes larger, more efficient refineries
c. Investments should not be limited to capital or onsite projects
d. Eligibility cutoff date does not recognize improvements made since program adoption
e. Biofeedstock 10% threshold is too restrictive and unfairly penalizes larger, more efficient refineries.

Incorporating criteria and air toxic pollutant controls in LCFS is misguided

California's long-standing framework of stringent air quality programs must remain the primary tool to regulate local and regional air pollutants rather than grafting co-pollutant measures or requirements onto the LCFS. The proposed limitation in attempt to address criteria and air toxic emissions is complex, unnecessary, and inequitable:

- Complex – there are volumes of regulations, guidance documents, and court cases related to air quality permitting where various methodologies are employed for determining what constitutes an increase. For example, some of the questions that arise are: Is it only direct emissions from the source or indirect emissions? Should the increase be in terms of mass or concentration at sensitive receptors? What is the baseline for determining an increase? What if there is an increase – but it is still within the permitted limit for that source or facility? How is it enforced after-the- fact – when other non-related changes at the refinery may occur that impact emissions year to year? This is a regulatory quagmire for ARB since any attempt to address or clarify these issues in the regulation could double the size of the regulation and create substantial litigation risk from various parties.

- Unnecessary – the CEQA process and robust air quality permitting processes are more than sufficient to reduce the likelihood of an increase, mitigate any increase, or ensure that the increase is within regulatory limits that are protective of the community and the environment.

- Inequitable – there is no effort by ARB to address contemporaneous criteria and toxic emission impacts for any of the other credit generating parties/mechanisms in the LCFS regulation (e.g., innovative crude projects or modifications, alternative fuel facilities applying for fuel pathway CI improvement, construction of natural gas fueling stations, or power plants that generate the electricity for new charging stations).

WSPA asks that ARB eliminate the requirement to address criteria pollutant or toxic emissions. ARB could adopt a monitoring approach similar to the approach in their cap and trade program to satisfy itself that its own non AB 32 air programs are effective. At a minimum, ARB should follow its own air pollution policies which provide refiners with the flexibility to offer mitigations offsetting any potential increase in criteria pollutants or toxics.

LCFS 40-110

CI reduction project threshold of 0.1 gCO2e/MJ will unnecessarily eliminate legitimate projects

The threshold for efficiency projects of 0.1 gCO_2e/MJ is overly restrictive and potentially inequitable. For larger refineries, the absolute quantity of emissions reductions required to qualify a project (i.e., satisfy this threshold) will be larger and thus more difficult to meet. Some refineries may be more efficient (from a carbon intensity standpoint). This

LCFS 40-111

restriction may preclude such refiners from making further energy efficiency improvements.

Staff's proposed CI calculation in determining project credit also arbitrarily assigns credits based on product slate rather than GHG reduction. If project CI threshold is calculated based on volume percent of gasoline and diesel produced, a refinery's product slate will affect its ability to receive LCFS credits for energy efficiency projects. For example, if two hypothetical refineries have total emissions of 4 MMT each, but one produces 10% diesel, while the other produces only 5%, the number of tons of emissions reductions necessary to meet the minimum diesel CI target will be different for each refinery (40,000 or 20,000 tons).

Furthermore, the 0.1 gCO_2e/MJ reduction represents a substantially higher hurdle (in terms of absolute quantity of CO_2 reductions required) than is expected for other products' pathways in the regulation. This is due to the substantially larger throughput volumes of petroleum refineries and the fact that many petroleum refineries have already implemented energy efficiency improvements to lower their production CI. As a result, the use of a 0.1 gCO_2e/MJ may prevent refiners from making further reductions and, thusly, disadvantage them versus higher carbon intensity manufacturing processes for other products**.**

WSPA proposes eliminating the threshold altogether. If this is not feasible, an absolute value threshold (e.g. 1000 $MTCO_2e$/year) would incentivize reductions in a more equitable manner. In addition, ARB could also allow bundling of smaller projects to further incentivize energy efficiency where there may not be many large projects available.

LCFS 40-111 cont.

<u>Limitations on project type will eliminate valuable GHG reducing projects</u>

The refinery investment mechanism should recognize non-capital but sustained improvements that reduce GHGs in addition to capital projects and co-processing. Many energy efficiency upgrades are considered non-capital. For example, replacement of equipment such as pumps, compressors, seals and blowers may include upgrades with lower greenhouse gas emissions. Insulation projects also may not be considered a capital project. These upgrades may not be considered capital expenses, and individually have relatively low greenhouse gas emission reductions. However, cumulatively, the cost of upgrades and insulation replacement can be significant, and the emissions reductions can add up. Since additional effort may be needed to upgrade rather than replace equipment "in kind", and to undertake insulation replacement, incentives from the LCFS program could help refineries take these actions.

LCFS 40-112

<u>Project eligibility should extend to early actors and at least to new construction.</u>

The time limitation for eligibility of projects penalizes early actors contrary to AB 32 statutory provisions 38560.5(b)(1) and (3). We suggest that the deadline for project eligibility be based on the start of the LCFS program. At a minimum, WSPA believes

LCFS 40-113

that ARB should allow a refinery greenhouse gas emissions reduction project to be eligible if it is implemented (i.e., started up) after January 1, 2015, regardless of when permits for the project were initially filed.

LCFS 40-113 cont.

Ensure that biofeedstock co-processing projects have a chance to qualify

Staff should reconsider and remove the proposed 10% biofeedstock threshold as it is inequitable. Percentage throughput limits are unfair to larger refineries, since the absolute volume of biofeedstock must be larger as facility size increases. We do not understand the basis for this threshold and believe that several potentially viable options would become essentially "non-starters" as a result.

Co-processing biofeedstocks is generally practical at far lower than 10% refinery throughput, especially for larger refineries. The proposed high thresholds for co-processing will discourage innovation and reduction in greenhouse gas emissions. WSPA recommends that this threshold be removed or that an absolute threshold (such as 1000 $MTCO_2e$/year) reduction should be used.

LCFS 40-114

Other Comments

1) In the proposed section "95489(f) Refinery Investment Credit, the term *"$Volume^{Total}$ = total volume of product output in bbls (bbl)."* could be problematic to define (e.g., does it include only finished fuels or also refinery intermediates requiring further processing at another location? Are sulfur or butane production included?) WSPA would prefer a simple approach and, as an alternative to a potentially complex definition of refinery "products," WSPA recommends that ARB change the denominator in the term, "T = percentage of transportation fuel produced" *from* "total volume of product output…" to the "total volume of crude oil and intermediates supplied to the refinery (bbl)."

LCFS 40-115

2) Currently in 95489(f)(1)(D) it states the refinery must annually replace a minimum of 10% of the fossil based feedstock. The regulation should clarify whether the 10% is based on volume of energy. WSPA would like ARB to provide a comparison of the 10% level to the 0.1g/MJ threshold for other projects. The 10% threshold seems to be a high threshold that will not help encourage such projects.

LCFS 40-116

3) ARB should consider an option for CI reduction credits to be allocated more specifically to the units and products to which they apply (versus overall for the refinery).

LCFS 40-117

Section 95490 – Requirements for Multimedia Evaluation

Please see the Legal comments section.

Section 95491 - Reporting and Recordkeeping

WSPA notes ARB's addition of the 45-day initial reporting deadline and subsequent 45-day reconciliation period. This will enable more immediate reconciliation of discrepancies between reporting parties.

We do not agree that unclear transmission of information on product transfer documents is a key cause of such discrepancies. The primary drivers for reporting discrepancies to date have been confusion regarding changes to regulatory requirements (particularly the nature and timing of the 2011 program amendments), and a steep learning curve for new regulated parties joining the program. LCFS 40-118

We object to the change proposed to the definition of Product Transfer Document (PTD) to refer to a newly created, single document rather than a collection of documents that transmit the required information. The term "PTD" has been used by several regulatory agencies over the years to refer to any document or documents that recognize a transfer of ownership/custody and includes certain required information. The very general nature of this definition has always been intended to allow flexibility in the execution of compliance and cause minimal disruption to operations. Establishing a narrow definition that requires a single, discrete document causes unnecessary additional cost while adding little or no benefit. LCFS 40-119

In the ISOR, ARB states the original transferor of fuel sold without obligation must report any export of that fuel by any subsequent owner or supplier. However, there is no regulatory language on this item in the draft text presented in Appendix A. Assuming that staff will develop language to reflect their intention in this regard and include it in the final regulation order, we have concerns about the practicality and fairness of this requirement. We find it impractical as it will be very difficult for fuel suppliers to ensure that the ultimate exporter communicates their activities backward through the supply chain. It also puts an unfair compliance burden on the original transferor by potentially taking credits away from that transferor because of another party's decision to export. It is understandable that ARB would want to track the export of such fuels, but the compliance cost/benefit of that export should accrue to the exporter and not to another party who has no control over their decision to export. LCFS 40-120

Section (a)(3) – WSPA does not believe the production facility ID and the Company ID should be included in all transaction documents. In many cases, multiple facilities and companies could produce biofuel with the same CI. Once these fuels are introduced into fungible systems where biofuels of the same CI cannot be distinguished, it should no longer be required to be tracked. This information should be included only for the initial transaction in the state of California (either production or importation), but not in further transactions, as the recordkeeping burden and the potential for mistakes and associated non-compliance penalties outweighs the perceived benefit of tracking this information. LCFS 40-121

Section (a)(7) - Provision (7) provides for quarterly and annual report corrections with proper substantiation to ARB, but it does not preclude enforcement. WSPA does not agree with this concept related to quarterly progress reports. Entities should be able to make changes to the quarterly reports with enforcement penalties provided the LCFS 40-122

corrections do not material impact a credit transaction relying on the information submitted in the quarterly report. For example, there could be many, non-substantive changes to what is reported with no impact on credit balance – or perhaps the company does not complete any credit transactions between the completion of the quarterly report and when the correction is made. Promoting corrections to these quarterly progress reports is in ARB's best interest and imposing penalties will inhibit such corrections.

LCFS 40-122 cont.

Section 95492 – Enforcement Protocols

Section 95493 - Jurisdiction

Section 95494 - Violations

Section 95495 – Authority to Suspend, Revoke or Modify

Section 95496 – Regulation Review

The proposed regulation includes a regulation review and a presentation to the Board by January 1, 2019. WSPA has several concerns with this section:

- The first concern is that this date is too late to effect change in the program. Since the compliance curve accelerates substantially in the final few years prior to the 2020 goal, it is highly likely there will be problems and issues with the program in this time period that will begin to manifest themselves beforehand. By the time the Board meets during 2019 to discuss the E.O. Review and determine if revisions to the regulation are needed, it will be too late.

LCFS 40-123

- There is a substantial gap in time between the recent January 1, 2015 review and the January 1, 2019 review. The historical periodicity of regulation review has been more frequent, and as evidenced by several hearings to date held to make changes to the regulation, these more frequent reviews are needed to make changes to the program in a timely way.

LCFS 40-124

- The list of issues that are identified as part of the review have been reduced from 13 items to 8. WSPA requests reinstatement of the items that have been proposed for removal from the review list such as:

  (3) Advances in full, fuel lifecycle assessments;
  (4) Advances in fuels and production technologies, including the feasibility and cost-effectiveness of such advances;
  (6) An assessment of supply availabilities and the rates of commercialization of fuels and vehicles;
  (8) The LCFS program's impact on state revenues, consumers, and economic growth;
  (9) An analysis of public health impacts of the LCFS at the state and local level, including the impacts of local infrastructure or fuel production facilities in place or under development to deliver low carbon fuels, using an ARB approved

LCFS 40-125

method of analysis developed in consultation with public health experts from academia and other government agencies;

LCFS 40-125 cont.

WSPA requests the ARB Board ask staff to revise the regulation to include the review items that were removed, and importantly, that the former Periodic Reviews be replaced with annual staff reports to the Board that provide a detailed synopsis of the health of the program, the challenges, and any need for program changes.

LCFS 40-126

LCFS 40-127

Section 95497 - Severability

No comments.

Appendix 1

Boston Consulting Group's Report – "Revised CARB Low Carbon Fuel Standard (LCFS) Illustrative Compliance Scenario," February 12, 2015

CG
NERGY

WSPA
Western States Petroleum Association

vised CARB Low Carbon Fuel Standard FS) Illustrative Compliance Scenario

ary 12, 2015

THE BOSTON CONSULTING GROUP

tive summary

er as part of its Initial Statement of Reasons (ISOR) for LCFS re-adoption, CARB presented ive LCFS compliance schedule (2016-2020)[1] and forecasted volumes of low-carbon ow-CI) fuels allowing regulated parties to comply through 2020.

believes that these volumes and this schedule are overly optimistic and do not reflect a true "P50" ario. It is more likely that volumes will fall short rather than exceed those predicted by CARB.

falls in any of the fuel pathways would hasten the expected shortage of low-CI fuels and create a ion where there are not enough credits available to regulated parties for compliance

tailed methodology from CARB, this document suggests reasonable volumes of low-CI fuels r when using the CARB compliance schedule

ntent is to consider volumes with competing factors in mind:

- Assume healthy growth rates due to technology advances and potential value of LCFS credits
- Retain some conservatism based on high capital costs, uncertainty regarding vehicle availability, and a poor track record of low-CI fuel production versus expectations

iance schedule suggested by CARB using BCG forecasted volumes results in using all edits by 2020; the year 2020 credit deficit is 10.7 MT.

reduction in the total fuel pool is sustainable[2] by 2020 based on credits available through ow-CI fuels (e.g. renewable diesel, biodiesel) and purchasing credits (e.g., elec., natural gas)

onsiders only the recommended "gradual" compliance scenario recommended by CARB in the ISOR. 2. Slowly using up banked credits up until 2020, and retaining the argeted CI reduction in a given year without relying on credits earned in previous years starting in 2020.
R Appendix B, BCG analysis

da

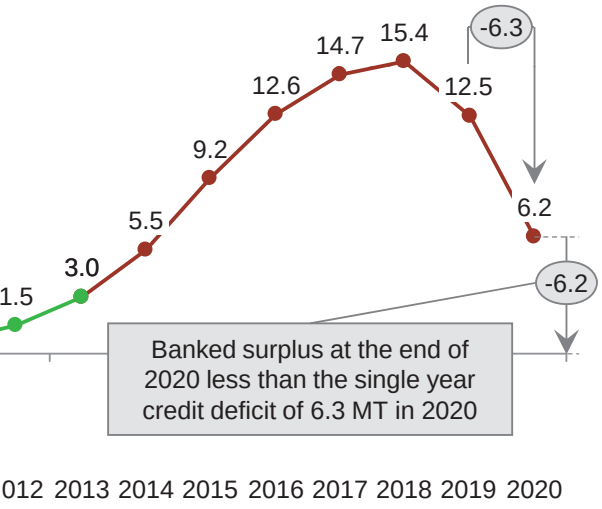
ew

ring BCG and CARB forecasts

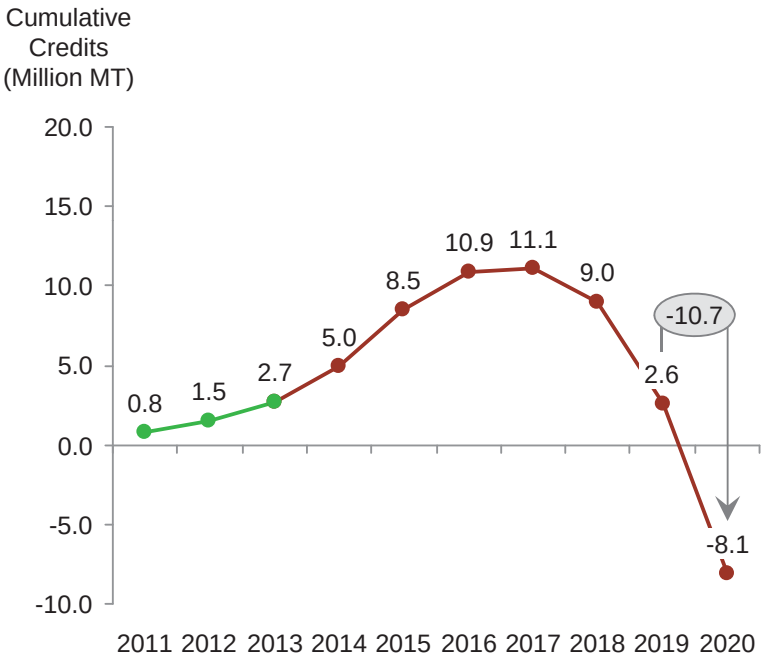
ology

same compliance schedule, BCG forecasts shows d credits being exhausted earlier than CARB

scenarios show banked credits in 20 similar to 2020 annual deficit



BCG scenario shows banked credits gone by 2020, sizable annual deficits starting in 2018



Forecasted Historical

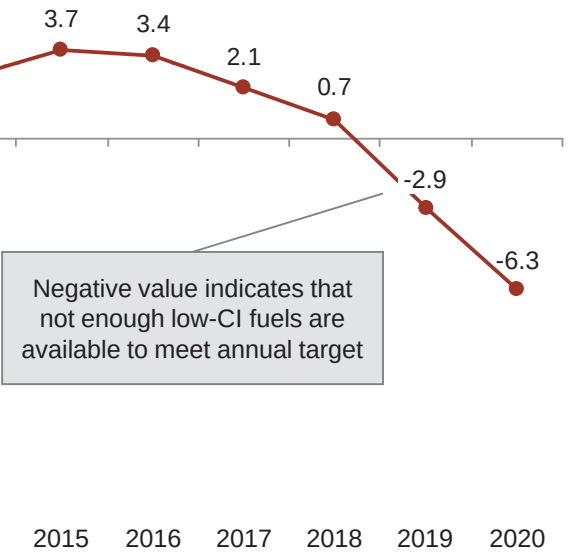
OR Appendix B, BCG analysis

THE BOSTON CONSULTING GROUP

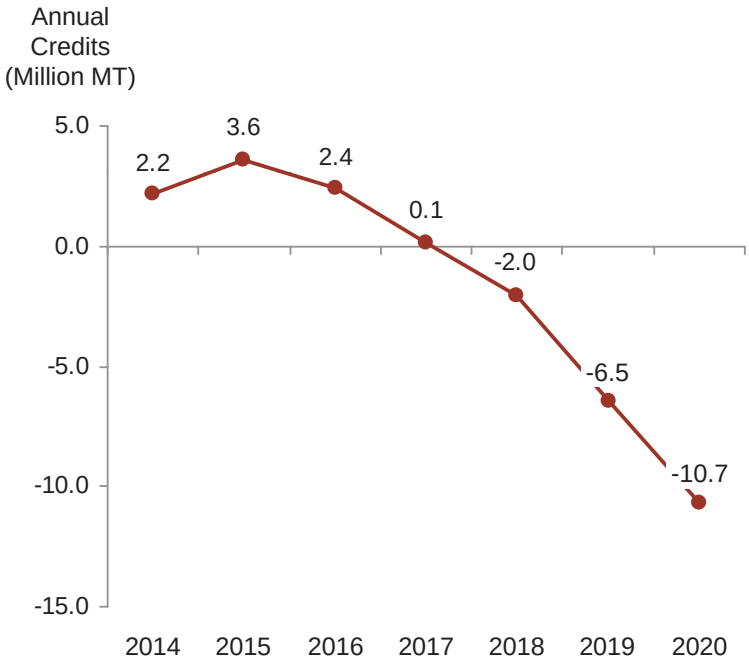
3

orecasts show 4.4 MT larger deficit[1] in 2020 versus scenario

cenario shows inability to meet rget without banked credits starting in 2019

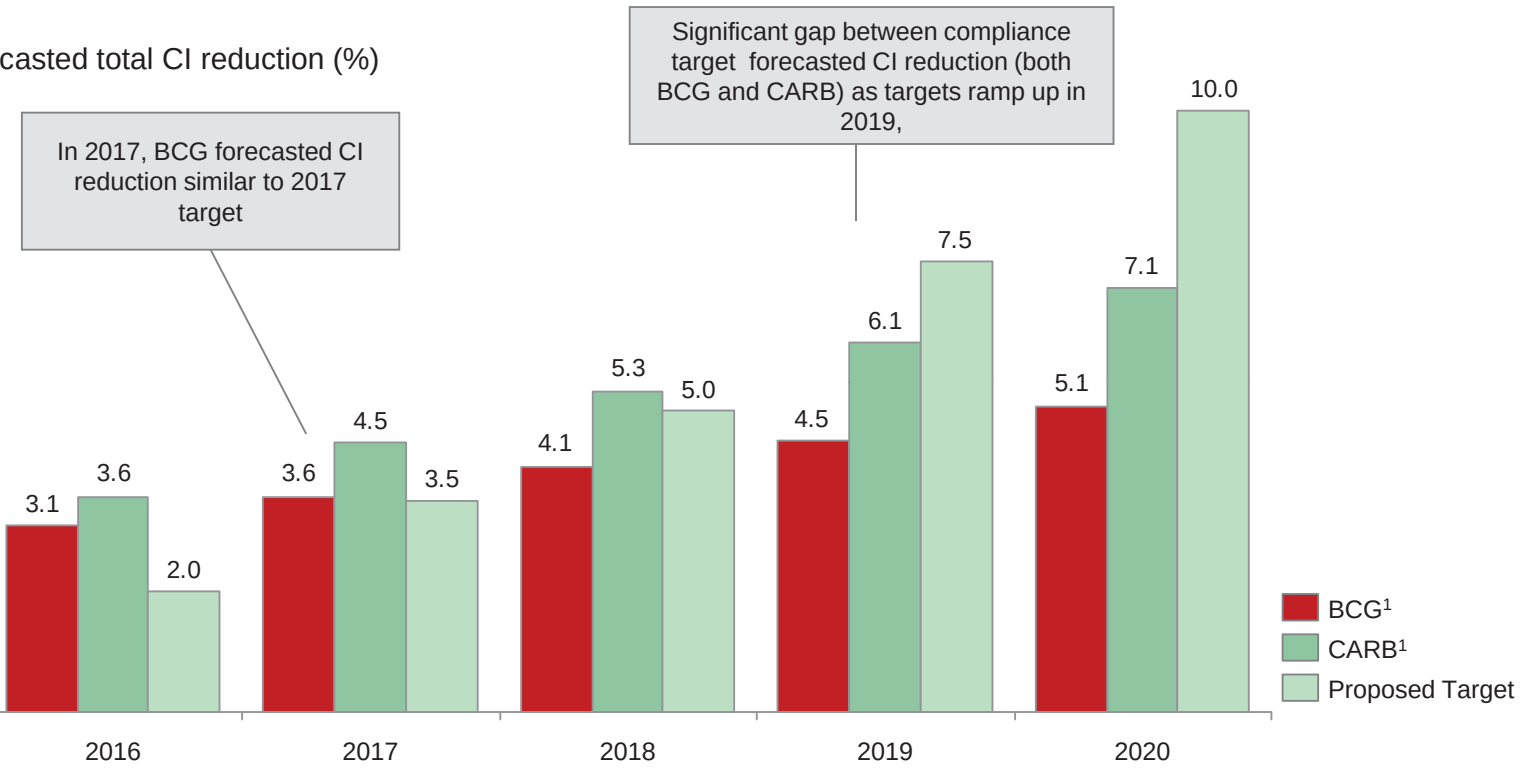


...while BCG forecasts show even more dramatic annual deficits



ts generated (from fuels with CIs exceeding target) less credits generated (from fuels lower than CI target) in a given year
DR Appendix B, BCG analysis

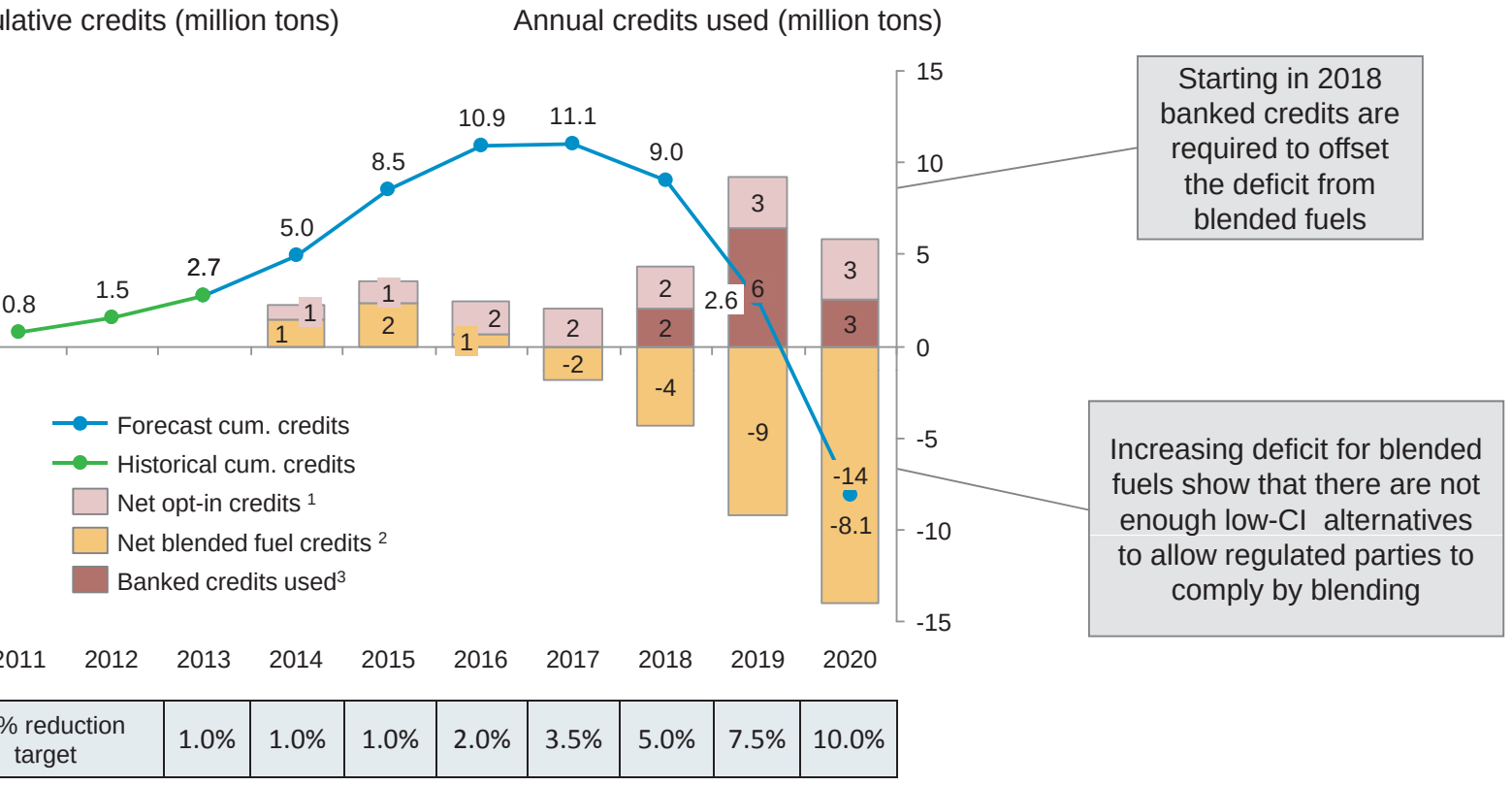
scenario results in annual deficits by 2017



CARB scenarios fall short of CI targets starting in 2019

forecasted CI reductions based on gradual compliance schedule recommended in ISOR Appendix B
OR Appendix B, BCG analysis

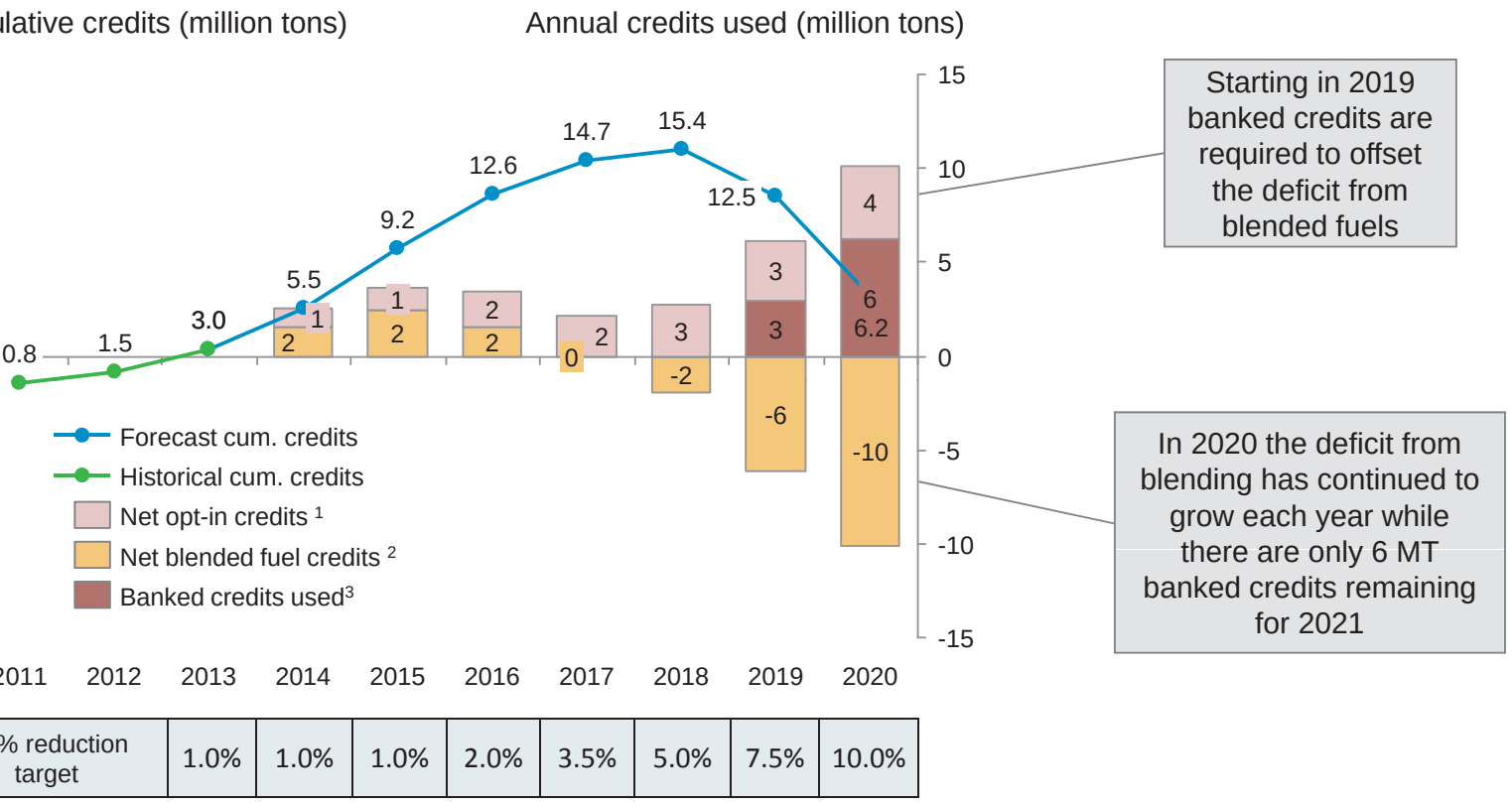
orecast of compliance outlook relies heavily on d and opt-in[1] credits



% reduction target	1.0%	1.0%	1.0%	2.0%	3.5%	5.0%	7.5%	10.0%

udes natural gas, electricity, and hydrogen 2. Credits minus deficits for blended fuel (e.g. CARBOB, CARB Diesel, ethanol, renew. diesel, biodiesel, etc.)3. Calculated as the the annual deficits and credits generated from all fuels until no banked credits remain (2020 in this example) Assumes that if credits are greater than deficits, credits will be regulated parties to achieve compliance.
ysis

forecast of compliance shows similar outlook for net ed fuel credits by 2020



% reduction target	1.0%	1.0%	1.0%	2.0%	3.5%	5.0%	7.5%	10.0%

Uncertain whether all parties selling "opt-in" fuels will necessarily opt-in to the LCFS program

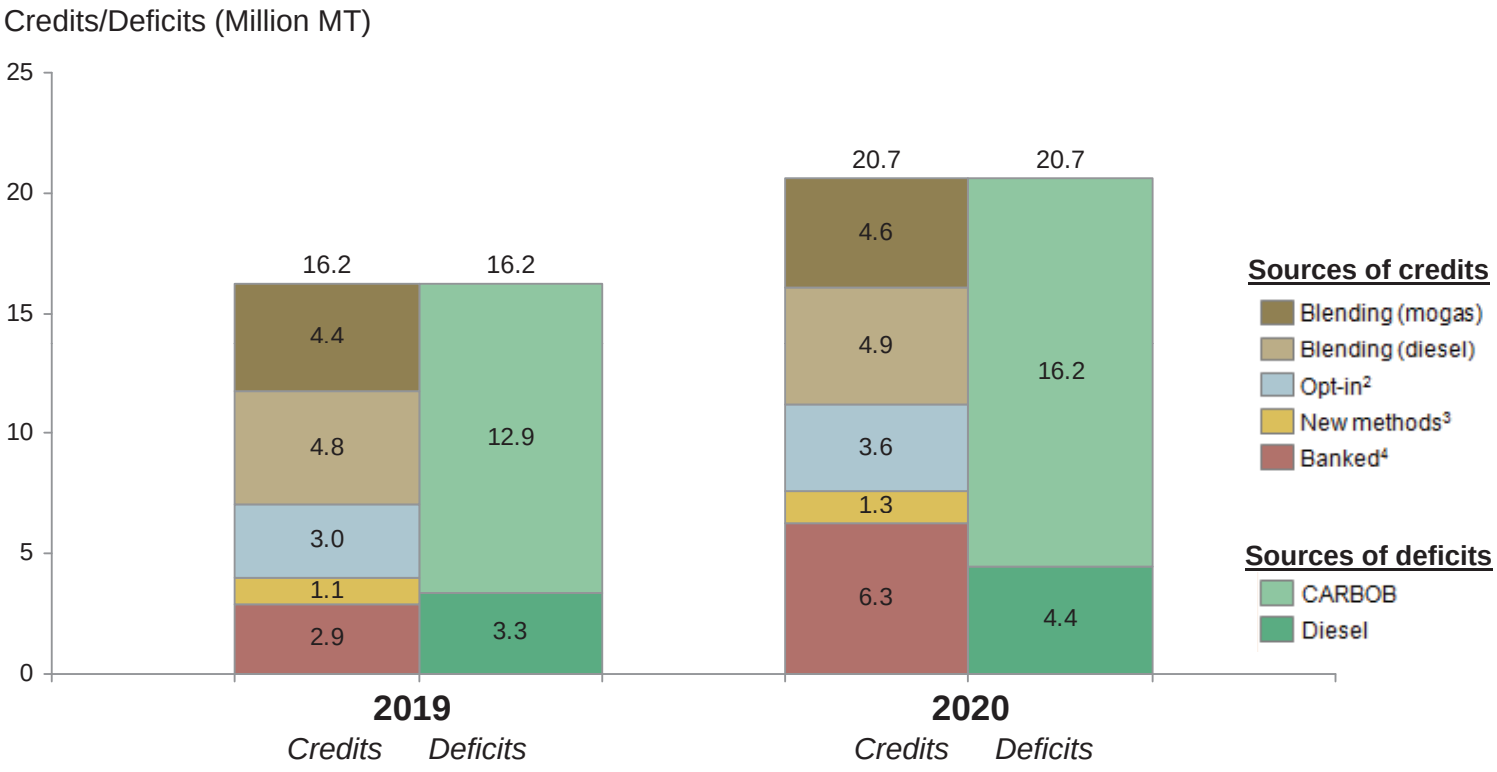
udes natural gas, electricity, and hydrogen 2. Credits minus deficits for blended fuel (e.g. CARBOB, CARB Diesel, ethanol, renew. diesel, biodiesel, etc.)3. Calculated as the the annual deficits and credits generated from all fuels until no banked credits remain (2020 in this example) Assumes that if credits are greater than deficits, credits will be regulated parties to achieve compliance.

OR Appendix B, BCG analysis

THE BOSTON CONSULTING GROUP

7

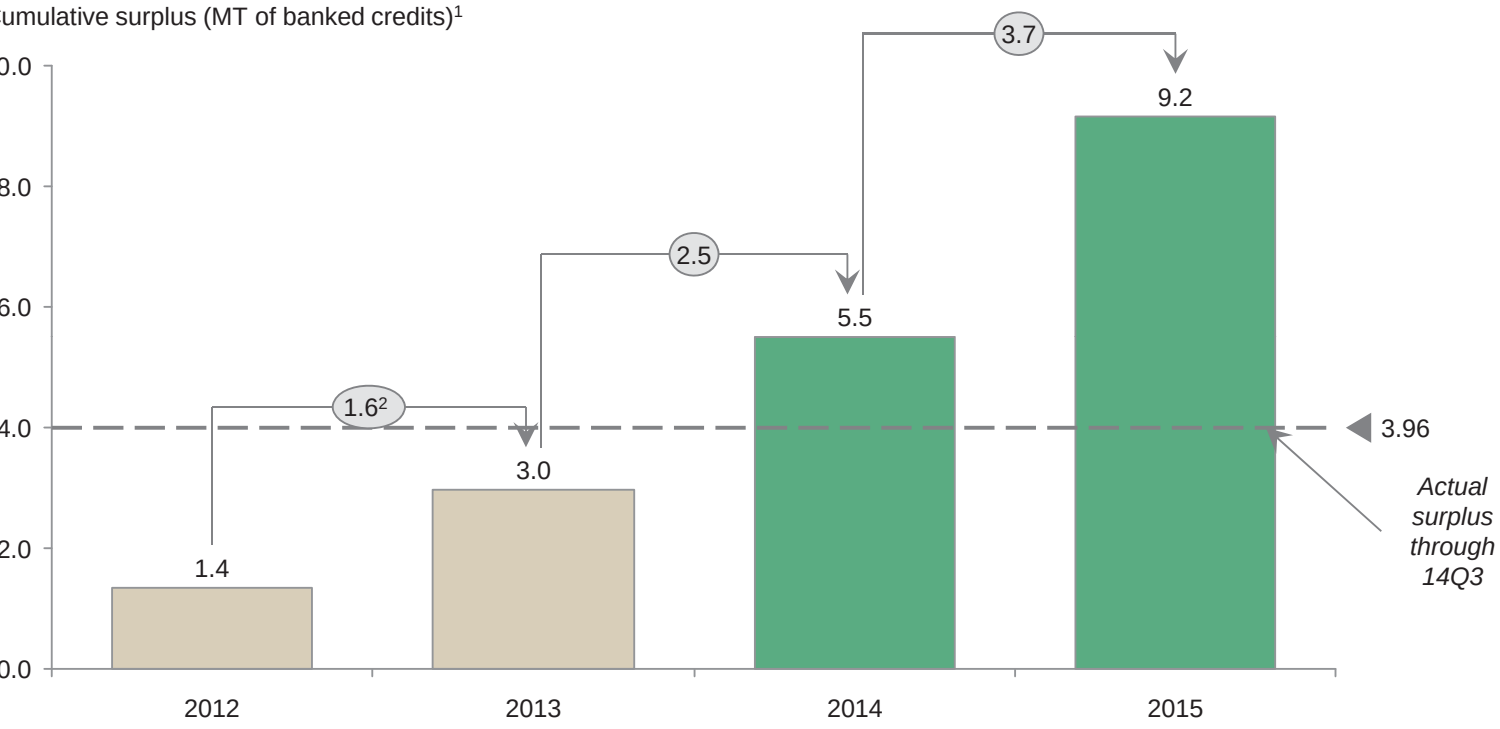
on CARB forecasts, transportation fuel credits[1] only 63% of deficits by 2020



el credits consist of credits generated from blending fuels and from providing alternative fuels (opt-in credits) 2. Opt-in fuels includes natural gas, electricity, and hydrogen 3. de refinery credits and fixed guideway credits 4 Banked credits required in that year to reach a balance of zero
R Appendix B, BCG analysis

assumes surplus will triple during 2014-15

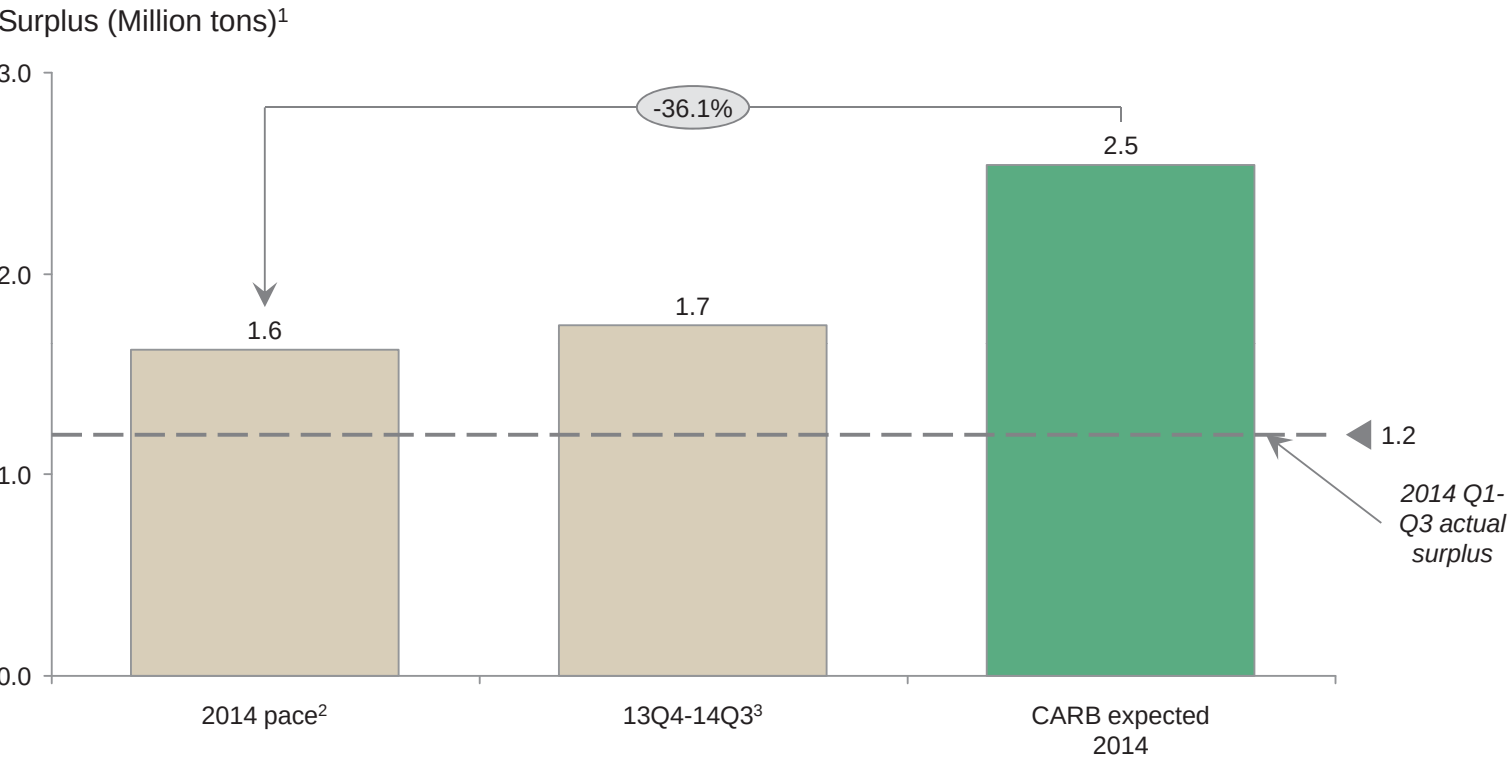
growth likely overestimated by CARB forecasts



Even with flat CI reduction target (1%), CARB assumes high growth in low-CI fuel volumes over next 15 months

its in CARB "base case" scenario. 2. Surplus in CARB model is 1.7 MM credits even though CARB quarterly data indicates a surplus of 1.3 MM credits.
R Appendix B, CARB quarterly LCFS data (as published January 20, 2015), BCG analysis

with three quarters of data available for 2014, credit us on pace to be 36% below CARB forecast



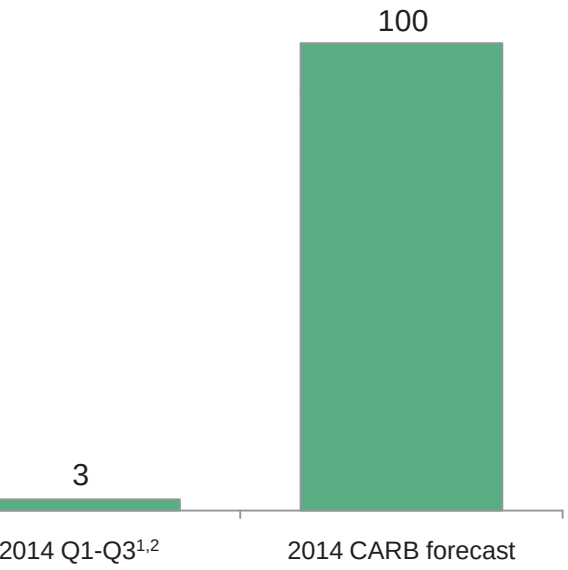
its in CARB compliance scenario. 2. Total surplus for 2014 if 4th quarter surplus is same as average of first three quarters. 3. Surplus for trailing four quarters (13Q4-14Q3)

R Appendix B, CARB quarterly LCFS data (as published January 20, 2015), BCG analysis

gaps exist between CARB forecasts and volumes gh the first three quarters of 2014

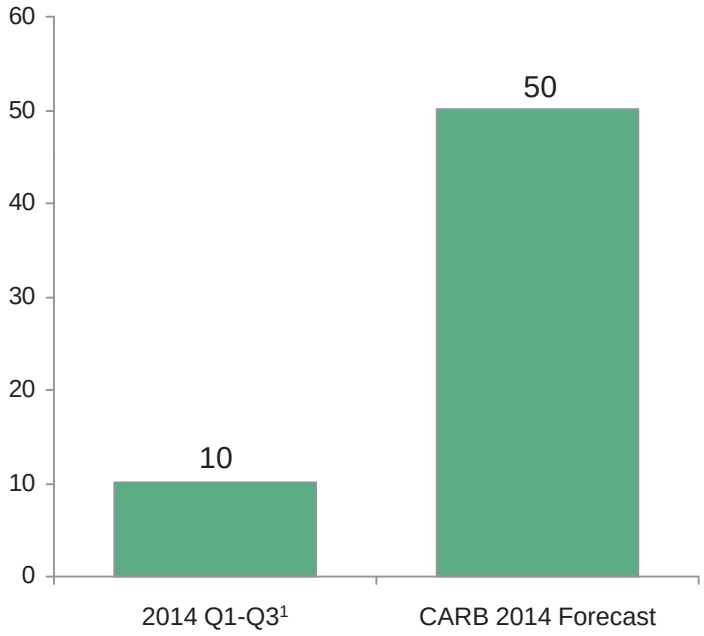
B continues to predict large cane volumes in 2014 contrary to data

ethanol imports to California (Million gal)



Renewable natural gas another pathway lagging expectations

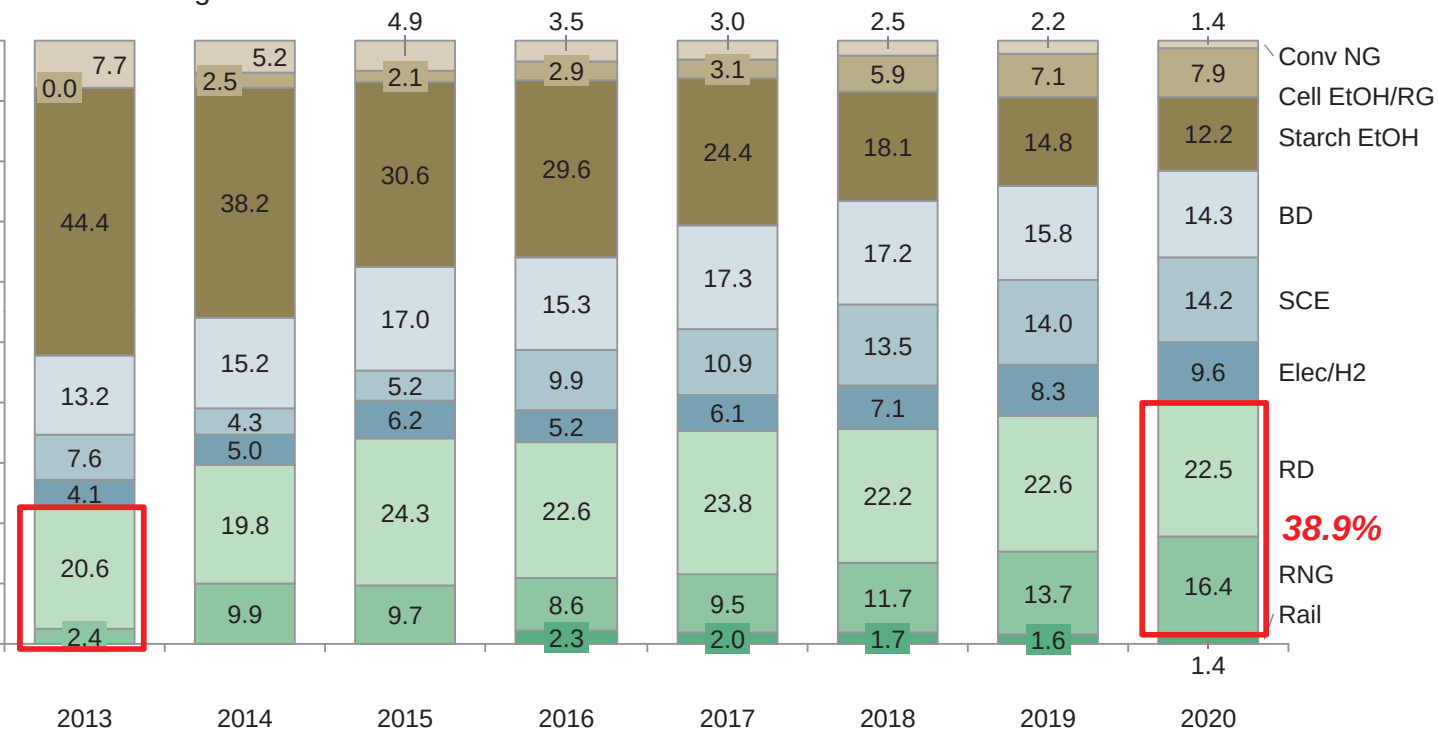
Renewable NG generating LCFS credits (Million gal DGE)



published by CARB as of January 20, 2015). 2. Census data indicates that no volumes have entered California from Brazil since January 2014
R Appendix B, CARB quarterly LCFS data

forecasted credits highly dependent on low-CI diesel

f LCFS credits generated



If RD/RNG credits fall below CARB's optimistic expectations, program will quickly become unsustainable

la

ew

ring BCG and CARB forecasts

ology

are the differences between the CARB and BCG sts?

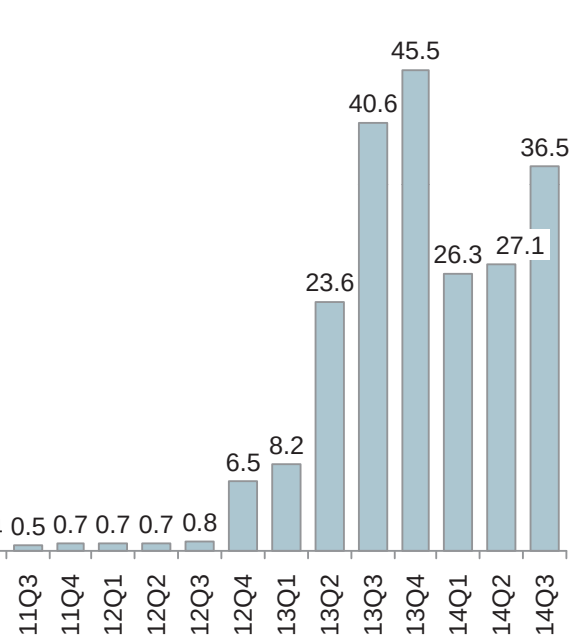
	Reasons for adjusting forecast	BCG 2020	CARB 2020	Cumulative impact by 2020 (MM Tons)[1]
ble diesel (RD)	Renewable diesel volumes to California have grown due to shipments from Singapore. However, blending constraints are expected to keep California volumes near 5% of the blended diesel pool.	200 MM Gal	400 MM Gal	(6.0)
credits	A difficult regulatory environment for new projects and the expected value of these projects for most refiners make it unlikely that any of these credits would be realized through 2020.	0 MT	1.1 MT	(3.2)
ne ethanol olumes	Actual volumes from Brazil have declined and industry forecasts of Brazilian sugarcane imports to the US have moderated since 2012. California has not imported sugarcane ethanol since Jan 2014.	235 MM Gal	450 MM Gal	(1.9)
ble natural gas	Without detailed market information, BCG uses CARB's expected growth in RNG usage, but delays the start of the rapid growth from 2014 to 2015	180 MM DGE	240 MM DGE	(1.3)
soline demand	BCG uses the EIA AEO 2014 forecast for the supply of motor gasoline (averages -0.6%) vs. CARB's assumption of an annual 1.1% decline.	14.0 B Gal	13.6 B Gal	(1.0)
vehicle ity	After CARB and BCG updated their EV forecasts based on current market information, the differences between the two forecasts are relatively small.	1,337 GWh for LDVs	1,629 GWh for LDVs	(0.6)
			Total impact	*(14.0)*

ease if negative) in banked credits through 2020 using the BCG forecasted volumes versus the CARB forecasted volumes 2. Appendix B of the ISOR indicates a median DGE and 61% RNG in the text while the table/model results show 300 MM Gal DGE with 80% RNG.
sis

vable diesel volumes in California have increased, but e limited by blending constraints

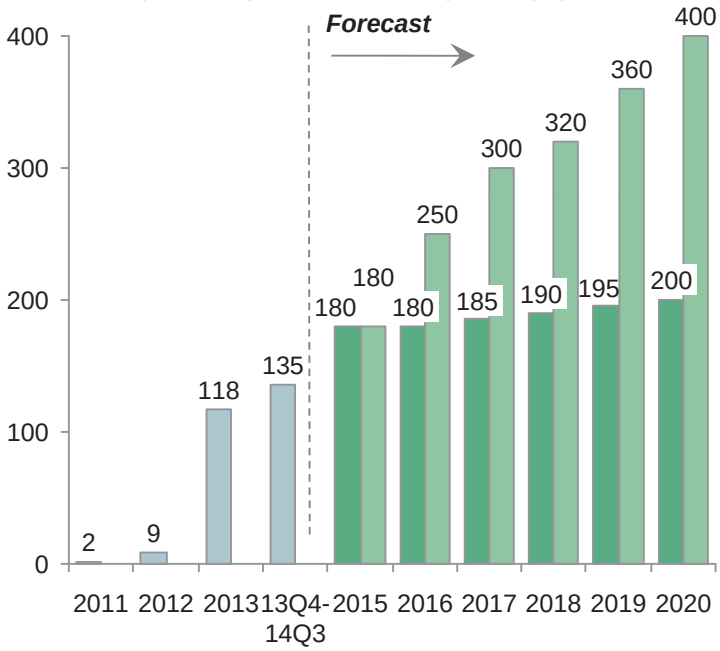
available to California has ased in the last few quarters

D volumes in California (Million gal)



BCG assumes that regulatory issues will limit RD blends to ~5% through 2020

RD volume generating credits in LCFS (Million gal)



Actual | BCG forecast | CARB forecast

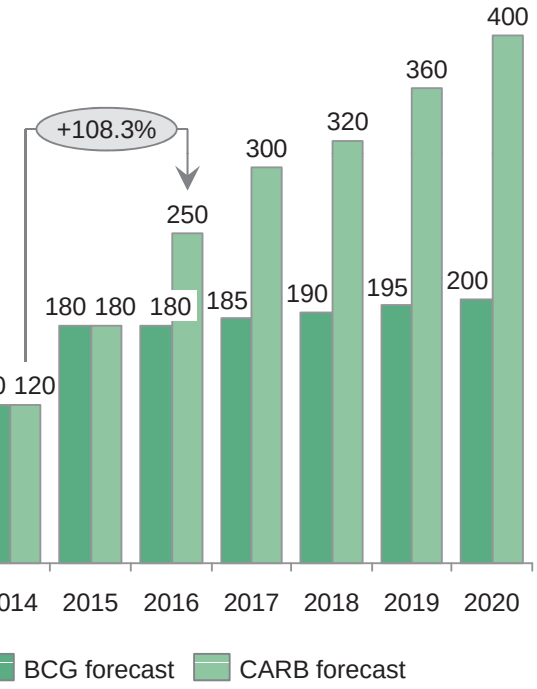
pliance scenario workshop, CARB quarterly LCFS data (as published January 20, 2015), BCG analysis

f blending issues resolved, renewable diesel volumes still be limited due to available RD supply

This is a sensitivity case to evaluate the renewable diesel availability should RD blending logistical issues be resolved

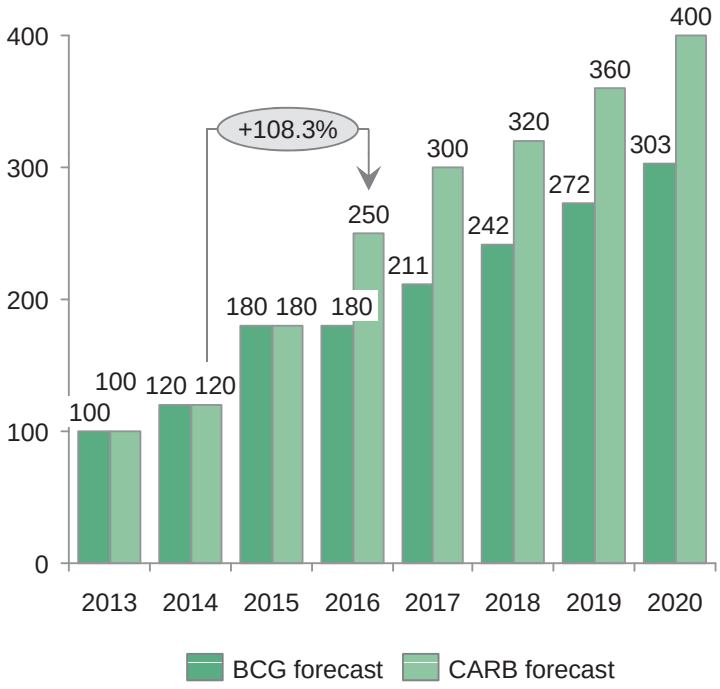
parison of BCG and CARB D volume assumptions

eating credits in LCFS (Million gal)



Comparison if RD blending logistical issues are resolved

RD volume geneating credits in LCFS (Million gal)



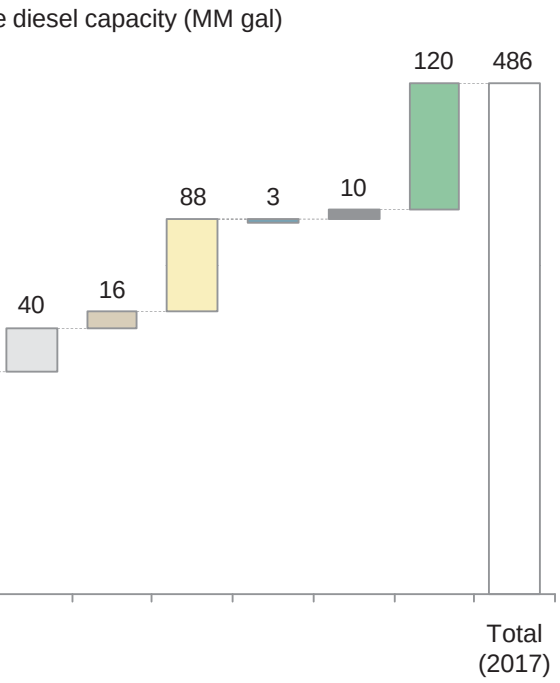
orted in any quarter to date is 45 million gallons
terly LCFS data (as published January 20, 2015), BCG analysis

THE BOSTON CONSULTING GROUP

16

ight available renewable diesel volumes be limited h 2020?

unced US renewable diesel projects



Risk factors for RD availability

Projects not being completed

- 25% of potential US capacity by 2017 is a project announced in summer 2014 with few details
- Some projects being funded with government investment, indicating marginal or worse standalone economics

Fuel under contract

- Some facilities have DOD contracts which will probably limit availability to California

Not all production will be diesel fuel

- Some facilities will produce jet as a portion of their fuel production

Logistics not in place for fuels to move to California

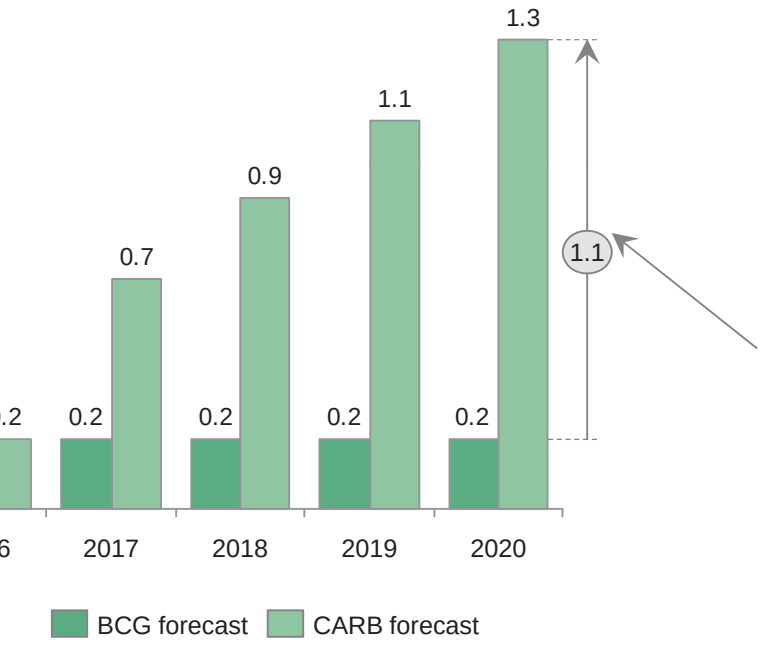
- At least one Gulf Coast plant does not have ability to move fuel to California

search, Biofuels Digest, BCG analysis

has introduced new opportunities to generate s; unlikely to see significant usage by 2020

on of CARB and BCG forecasts redits from new provisions

edits (Million MT)



Key difference is outlook for "refinery credits"

Off-road electricity
BCG and CARB both include ~0.2 MT per year for fixed guideway transit systems and some off-road vehicles

Innovative production methods
Neither BCG nor CARB assume that any of these production methods will generate credits by 2020

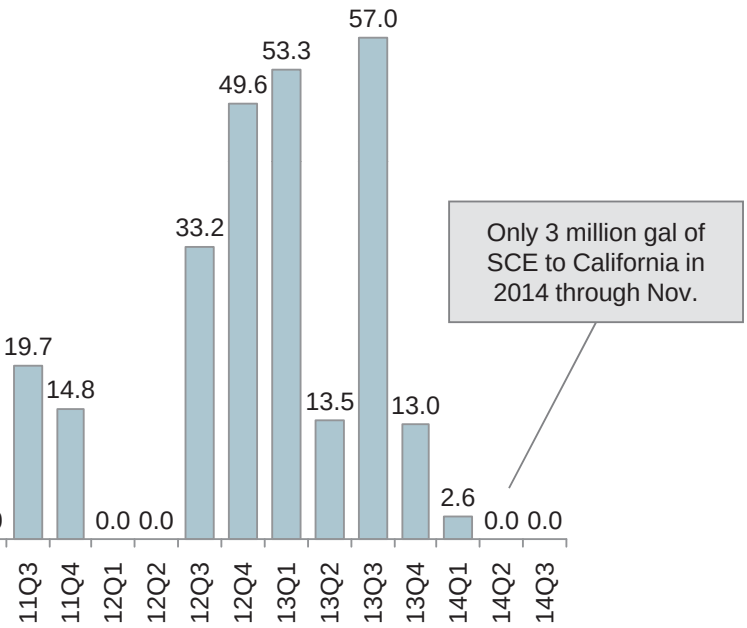
Refinery credits
There are significant regulatory hurdles in getting refining projects approved and relatively low returns for these projects. As a result, BCG blieves that refiners will not have a significant number of qualifying, credit-generating projects by 2020.

R Appendix B, BCG analysis

forecast for sugarcane ethanol availability optimistic hough imports have fallen dramatically

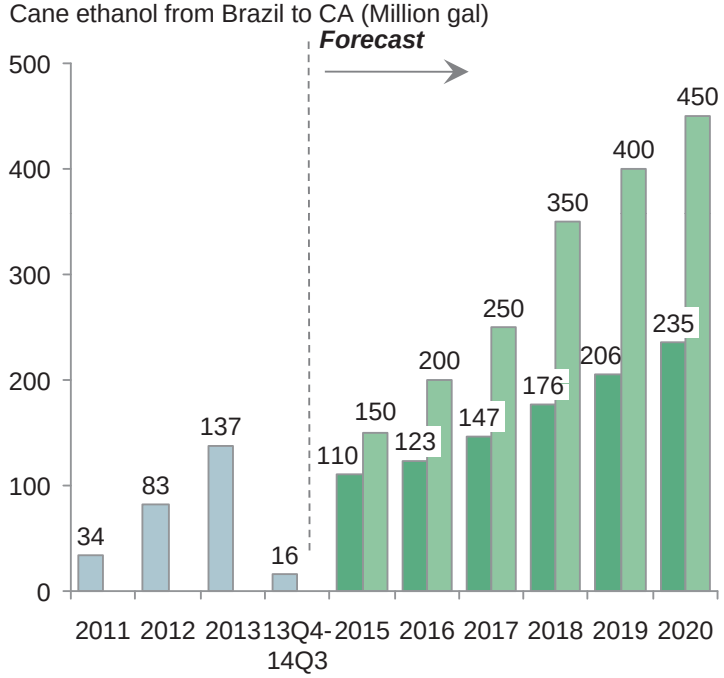
ethanol volumes to CA have n inconsistent, recently zero

ol from Brazil to CA (Million gal)



CARB forecast much more optimistic than BCG's expectations

Cane ethanol from Brazil to CA (Million gal)



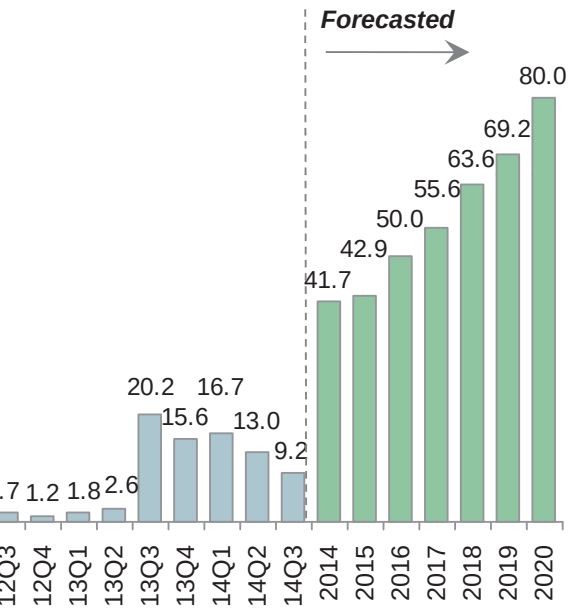
Actual | BCG forecast | CARB forecast

R Appendix B, CARB quarterly LCFS data (as published January 20, 2015), US Census Bureau, BCG analysis

renewable natural gas numbers overstated for 2014, optimistic for future years

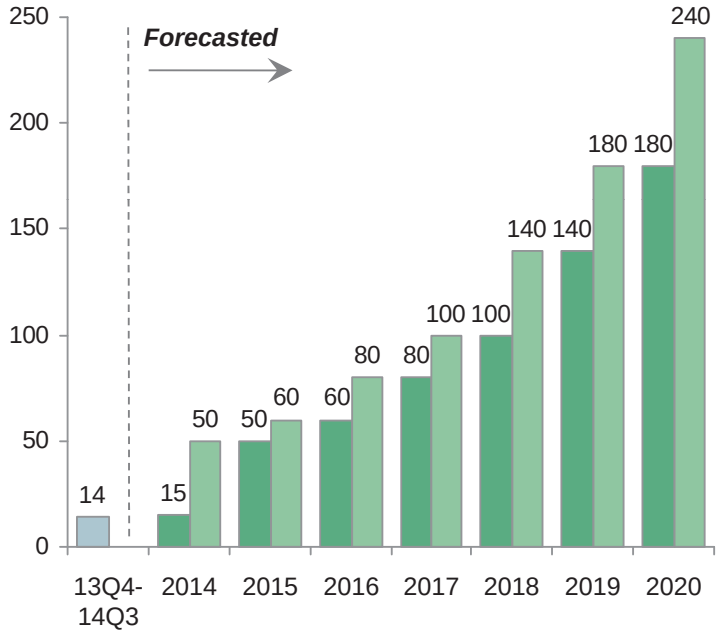
expecting an immediate step change in RNG usage...

e portion of natural gas in LRT[1] (%)



...with 2014-15 volumes 3x that of the last 12 months recorded in LRT

Forecasted NG in LRT (Million dge)



Historical | BCG forecast | CARB forecast

rting tool
B quarterly LCFS data (as published January 20, 2015)

RNG assumptions difficult to assess, pose additional their estimate of available credits

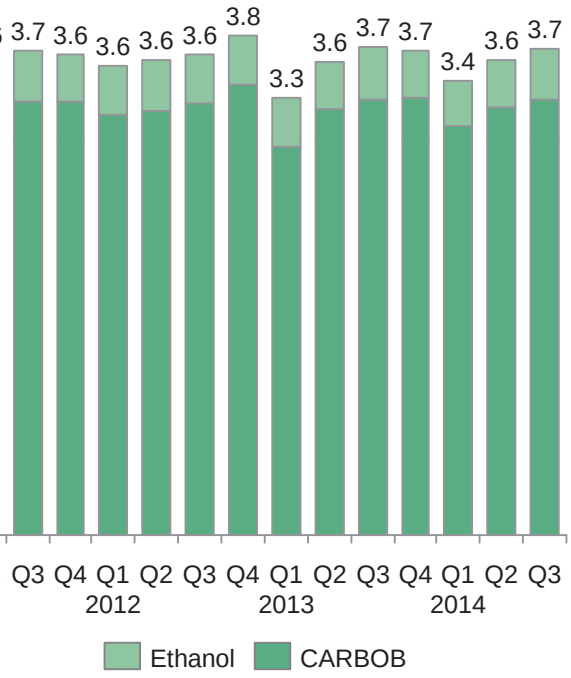
odel assumes rapid growth in renewable natural gas usage for transportation

- B assumes the share of renewable natural gas of total natural gas volume increases 10-15% in 2014 to 80% in 2020
- out access to CARB's market/survey information, BCG has assumed the same growth cted by CARB
- Because 75% of volumes for 2014 have been reported with no evidence of substantial growth, BCG assumes that the rapid growth starts in 2015 (delays growth 1 year)

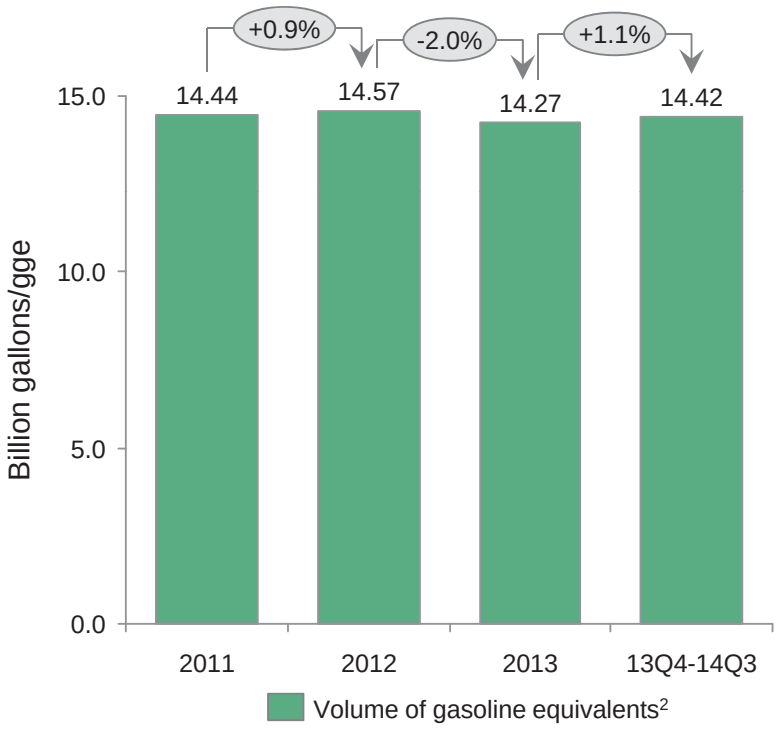
able whether LCFS is incenting production of additional renewable NG or g renewable NG usage from one sector (utility / power generation) to another tation fuels).

ine (and equivalents) volumes have been consistent he first few years of the LCFS

ly volumes of gasoline equivalents m CARB LCFS reporting tool[1]



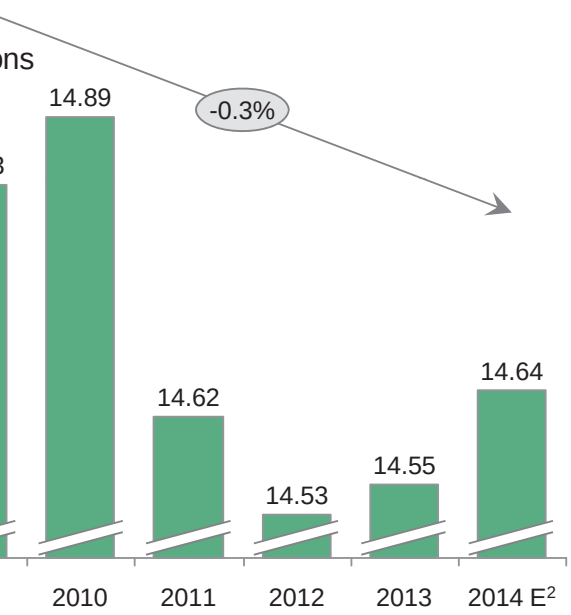
Volumes have stayed within a relatively small range since 2011



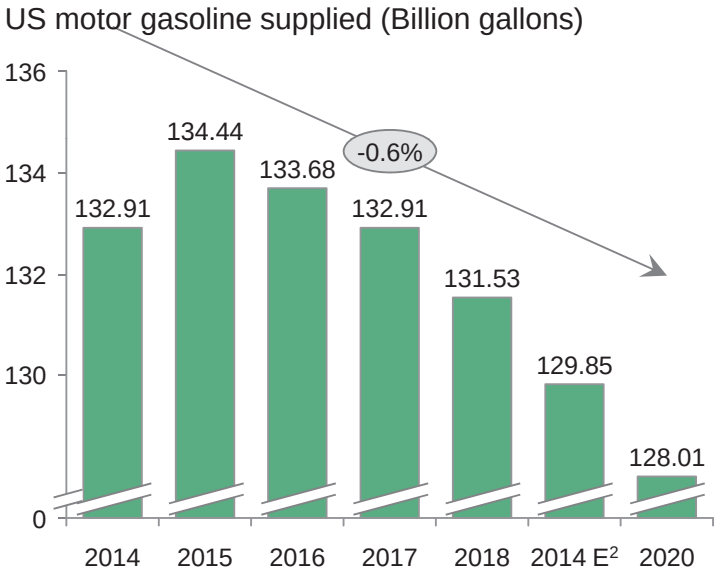
own as it accounts for less than 0.01% of gasoline equivalent volume in each quarter 2. Sum of CARBOB, electricity and ethanol volumes terly LCFS data (as published January 20, 2015)

ine blend[1] consumption is expected to continue ing moderately through 2020

oline blend[1] consumption in ornia has declined ~0.3%/yr



EIA forecasts an average decline in motor gasoline supplied of ~0.6%/yr

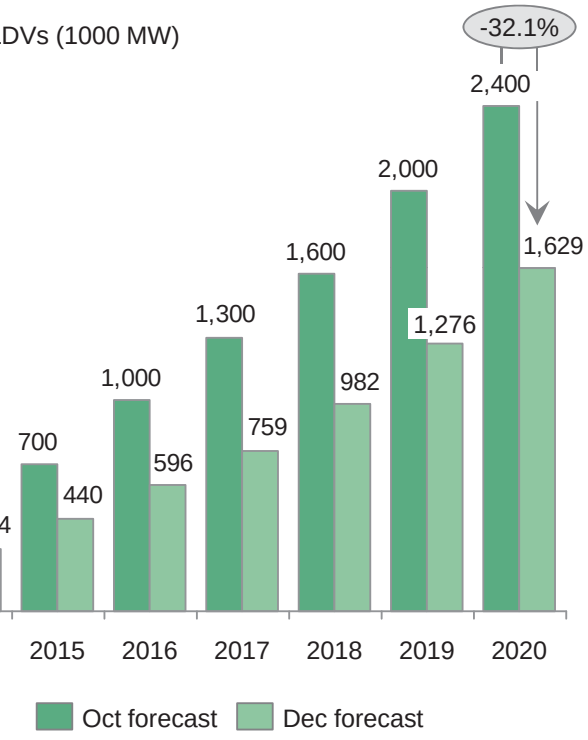


BCG assumes an annual decrease of 0.6% in total gasoline equivalent usage

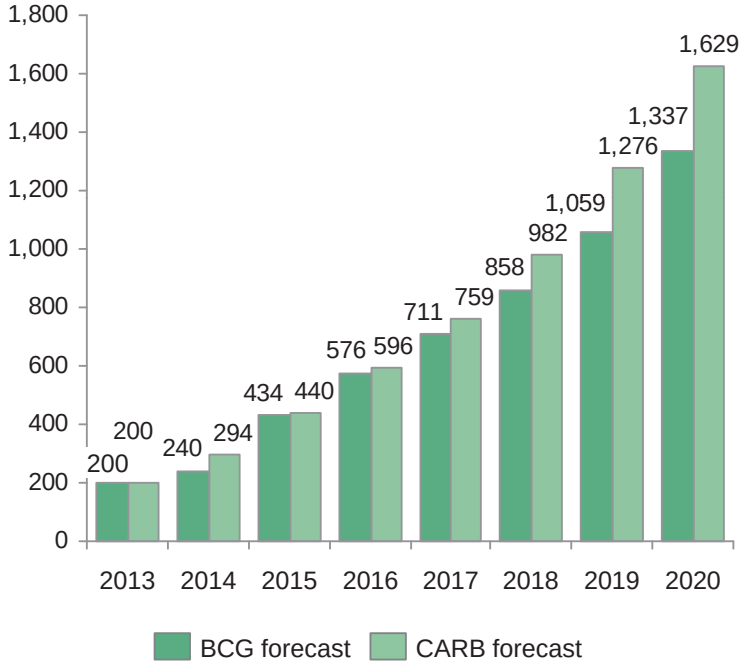
sohol 2. Projected using Jan-Jul 2013 vs. Jan-Jul 2014
d prior to shift in the global crude price may not reflect today's market climate
ghway Administration Motor Fuel Trends

has lowered expectations for EV usage since its er workshop

October, CARB has tempered tations regarding EV usage...



...making expectations of EV usage close to those projected by BCG



in hybrid electric vehicles (PHEV) as well as battery electric vehicles (BEV)
pliance scenario workshop, CARB ISOR Appendix B

la

ew

ring BCG and CARB forecasts

ology

dology for BCG sugarcane ethanol and renewable forecast adjustments

Sugarcane Ethanol

ARB volume

ata through June 2014 indicates 2.6 MM gal

nsus data indicates no further imports of
rough November 2014
ed limited imports in Dec 2014 (~3 MM gal)

with optimistic (EIA 2014 AEO) and
stic (FAPRI) projections of sugarcane
imports to the US. Created a blended
on of 50% EIA and 50% FAPRI.
ed that California could get 25% of US
in 2015 with increases of 5% each year up
by 2020.
cent high of US share to the US West Coast
s ~35%

Renewable Diesel

2013-14
- Used CARB volumes/projection

2015-2016
- Assumed that renewable diesel usage would be limited to 5% of the diesel pool due to logistical issues of supplying blends >5% to market + limited availability

2017-2020
- Assumed that the overall percentage would rise above 5%, ramping up to 6% with isolated usage of R100 or other blends

---

2017-2020 (Sensitivity Case)
- Assumes linear growth in volumes available to California up to a 2020 maximum. This maximum volume includes:
  - 180 million gallons sourced from Singapore
  - California can get 35% of all announced US renewable diesel capacity

New Car Dealers Association, CARB quarterly LCFS data (as published January 20, 2015), CARB ISOR Appendix B, US Census Bureau, BCG analysis

dology for BCG EV and RNG forecast adjustments

EVs

ame increases in efficiency in PHEV/BEV as
CARB in compliance scenario.

n stock
increases of PHEV and BEV stock (more
% for each in 2014)
e continued growth above EIA estimates
gle digit growth in EV stock).
e that stock increases would moderate as
stock increases and tax credits decrease.
sume 25% stock growth 2015-2017
sume 15% stock growth 2018-2020 as
tery costs decline to make EVs marginally
re affordable

Renewable Natural Gas

2014
Given progress to date in 2014, assumed that the CARB forecast of 50 million gallons DGE would not be possible in 2014

2015-2020
Used one year delay from CARB to estimate RNG in BCG forecasts (e.g. 2014 CARB RNG forecast = 2015 BCG RNG forecast)

New Car Dealers Assocation, CARB quarterly LCFS data (as published January 20, 2015), CARB ISOR Appendix B, BCG analysis

BCG

THE BOSTON CONSULTING GROUP

Thank you

bcg.com | bcgperspectives.com

LCFS 40-23

The comment asserts that ARB has failed to comply with statutory requirements with respect to enacting a fuel specification for LCFS, and does not adequately analyze fuels through multimedia analyses. The proposed LCFS Regulation is not a fuel specification as it does not establish any physical or chemical requirements for any fuel. The proposed regulation requires that the average lifecycle CI of gasoline (and gasoline substitutes), and of all diesel (and diesel substitutes), be reduced over time. But even that requirement does not constitute a prescribed physical or chemical requirement for any particular fuel, because the standard is applied to the average of all fuels. The lifecycle CIs include not just the carbon content in the finished fuel, but also the carbon emissions associated with production of the fuel (e.g., indirect land use changes associated with production of certain fuels, as well as transportation of the fuel to market). Therefore, the lifecycle CI of a fuel does not describe or specify the carbon content of that fuel. And individual fuels can continue to be used in California without any change in their lifecycle CI, as long as the average CI declines as prescribed in the regulation for all fuels sold or supplied in California by each regulated party. By contrast, fuel specifications dictate that a specific fuel have specific chemical or physical properties, whether it be its specific gravity, Reid vapor pressure, aromatic hydrocarbon content, or a host of other specific properties and content.

The reference in Health and Safety Code section 43018, subdivision (d)(1), to a fuel specification for "light-duty vehicle exhaust emission standards" is inappropriate because it does not change the fundamental nature of the proposed regulation. Simply put, the proposed LCFS Regulation does not establish a fuel specification.

Because the proposed LCFS Regulation is not a fuel specification, the requirements of Health and Safety Code section 43013, subdivision (e), and Health and Safety Code 43830.8 do not apply. ARB's use of the word "standard" does not turn the proposed regulation into a "fuel specification".

One of ARB's goals for the proposed LCFS Regulation is to encourage innovation of new alternative fuels, new fuel formulations, and new fuel additives that would contribute toward reductions in the CI value of fuels. When these new fuels, new formulations, or new additives are brought forward, they would

individually be evaluated according to all applicable requirements, which may include the requirements referenced above for fuel specifications and for multimedia evaluations. Neither the proposed LCFS nor ADF Regulations add, subtract, or otherwise change the existing statutory or regulatory requirements that apply to fuel specifications and multimedia evaluations.

LCFS 40-24

The comment states that LCFS and ADF should be analyzed as two separate projects. The proposed LCFS and ADF Regulations are interdependent and, together, constitute the whole of the action being considered; therefore, a separated analysis would not provide meaningful information for assessing environmental effects. Because they are interrelated they warrant joint evaluation as two regulatory packages that represent one project. This approach fulfills CEQA's requirement to analyze the whole of an action. The CEQA Guidelines state: "If a public agency must make more than one decision on a project, all its decisions subject to CEQA should be listed." ((Title 14 of the California Code of Regulations [14 CCR], hereafter "CEQA Guidelines," section 15124(d)(2)). Also, "[t]he term 'project' refers to the activity which is being approved and which may be subject to several discretionary approvals by governmental agencies. The term "project" does not mean each separate governmental approval." (CEQA Guidelines 15378(c)). This issue is addressed on page 2 of the Draft EA, as follows:

> The proposed LCFS and ADF Regulations will be considered by the Board in separate proceedings. However, the two regulations are being analyzed as one project under CEQA because they are interrelated in two important ways: 1) the proposed ADF Regulation defines specifications for biodiesel, which is among the low-carbon fuels that LCFS encourages, and 2) compliance responses by fuel producers and suppliers would be influenced concurrently by both regulations. Assessing them together captures the compliance responses, which are the physical actions reasonably expected to occur in response to the proposed regulatory action, without regard to whether they are attributable to the LCFS, ADF, or a combination of the two proposed regulations. This approach is consistent with CEQA's requirement that an agency consider the whole of an action when it assesses a project's environmental effects, even if the project consists of separate approvals (Title 14 of the California Code of Regulations [14 CCR], hereafter "CEQA Guidelines," Section 15378(a)).

In addition, Chapter 7, Alternatives Analysis, in the Draft EA describes a scenario in which the ADF is not adopted (Alternative 1), and one where the ADF Regulation is adopted along with re-adoption of a Low Carbon Fuel Standard Regulation without updates (Alternative 2).

Another example of how the two regulations are linked is how they work together to maintain reductions in emissions of nitrogen oxides (NOx), such that long-term impacts would be beneficial. Adoption of the ADF Regulation reduces NOx emissions associated with implementation of the proposed LCFS Regulation. Therefore, to evaluate them separately would result in inaccuracies regarding NOx emission impact analysis. Because the two regulations operate together in an interrelated manner, they are appropriately evaluated as one project under CEQA and to do otherwise would be in conflict with CEQA requirements for providing evaluation of a complete project description.

LCFS 40-25

The comment questions whether the environmental review of the two regulations can be completed in one CEQA "project." The comment states that ARB has cited CEQA Guidelines 15378(a) to support the approach of combining LCFS and ADF into one project for environmental review purposes under CEQA. The commenter also cites CEQA Guidelines 15378(c), which states that a project can include an activity that requires more than one discretionary approval by one or multiple government agencies. These guidelines are correctly referenced. The ADF and LCFS regulations are interrelated, as explained in response to comment **LCFS 40-24**. Thus, it is appropriate to analyze both LCFS and ADF as part of the same EA. Because the two regulations are so closely related, the commenter's legal argument – premised on the existence of separate, independent actions – is not applicable to this situation. Please see response to comments **LCFS 40-24** and **LCFS 40-26**.

LCFS 40-26

The commenter refers to two court cases to support the assertion that LCFS and ADF should not have been analyzed in one EA. In *Tuolumne County Citizens for Responsible Growth, Inc. v. City of Sonora* (2007), 155 Cal.App.4th 1214, 1230-31, the Court of Appeals concluded that the shopping center and the adjacent road widening projects constituted one project under CEQA. The commenter's attempt to distinguish the *Tuolumne* case fails. The case is similar to the present situation because in *Tuolumne* one part of the project, the shopping center, was dependent on approval of the other portion, the road widening. Here, the LCFS and ADF

are interrelated as described above. (*See also POET, LLC v. California Air Resources Board* (2013) 218 Cal.App.4th 681.)

The commenter also cites *El Dorado Union High School District v. City of Placerville* (1983) 144 Cal.App.3d 123, 129-130, to support its opinion that the ADF and LCFS are separate processes and may produce significantly different impacts. But the case has no bearing here and does not address whether the ADF and LCFS may be evaluated in the same EA. In *El Dorado Union High School*, the City of Placerville certified an environmental impact report for a residential development project and approved a zoning change. About ten months later, the City approved a tentative subdivision map for the same development and relied on this same EIR to support the approval. The court did not decide the definition of a project under CEQA or hold that separate EIRs should have been completed for the zoning and subdivision map approvals. Rather, the court determined only that the City's action in submitting a separate notice of determination for the subdivision map approval triggered the statute of limitations for a party challenging that action. The court noted, "[the City's] decision to file two notices [one after approving the zoning change and a second after approving the subdivision map], whether or not proper under CEQA, should not foreclose a challenge to the EIR as it relates to the subdivision map, which was not before City when it filed the first notice." (*Id.* at 130.)

The ADF Regulation is proposed, in part, in response to the *POET* court decision, which required ARB to consider NO_X emissions associated with alternative diesel fuels that might result due to the LFCS. ARB has developed measures to ensure NO_X emissions associated with biodiesel does not increase as a result of the proposed re-adoption of the LCFS. The proposed ADF regulation includes these measures through blending requirements (see Chapter 2, Project Description of the Draft EA).

The LCFS and ADF are linked and appropriately analyzed under the same EA.

LCFS 40-27

The comment suggests that it is not clear which regulation, ADF or LCFS, would result in the impacts discussed in the Draft EA. However, impact conclusions throughout Chapter 4 of the Draft EA describe the significance conclusion of the impact under discussion and identify the regulation that would result in those impacts. We note that the ADF alone has no potentially significant impacts; it is primarily the LCFS that is expected to change fuel providers'

behavior. Furthermore, LCFS would incentivize lower CI values of biofuels and other alternative diesel fuels, while ADF allows for a pathway to commercialize alternative diesel fuels and provides specifications to reduce NO_X emissions associated with biodiesel. These two regulations are linked, as described under response to comment **LCFS 40-26**, and the compliance response scenario considers what may occur upon implementation of these regulations (see Section 2.G of the Draft EA for a discussion of the reasonably foreseeable compliance scenario evaluated in Chapter 4 of the Draft EA).

The impact analysis and mitigation measures discussed in the Draft EA are based upon a compliance response scenario (see Section 2.G Compliance Response Scenario in the Draft EA). As stated, "[t]he compliance responses described here are based on a reasonable range of assumptions and therefore provide a sound basis for evaluating the proposed action's reasonably foreseeable environmental impacts." The compliance response scenario addresses the actions that could result from implementation of the proposed LCFS and ADF Regulations, which would generally include land use changes, changes to fuel-associated shipping patterns, and additional infrastructure needs. In the conclusion, and at end of each impact discussion, the EA connects specific impacts to the proposed regulations.

LCFS 40-28

In connection with its incorrect argument that two EAs are required (see response to comment **LCFS 40-24** and **LCFS 40-26**), the comment states that CEQA requires the environmental review in a document must be "written in a manner that will be meaningful and useful to decision-makers and to the public." See response to **LCFS 40-29**.

LCFS 40-29

The comment refers to the case *Laurel Heights Improvement Association v. Regents of University of California* (1988) 47 Cal.3d 376, and implies that the EA is neither meaningful nor useful. ARB disagrees. The Draft EA consists of eight chapters: 1) Introduction and Background; 2) Project Description; 3) Environmental and Regulatory Setting; 4) Impact Analysis and Mitigation Measures; 5) Cumulative and Growth-Inducing Impacts; 6) Mandatory Findings of Significance; 7) Alternatives Analysis; and 8) References. The content of these chapters complies with CEQA Statues and Guidelines, as well as ARB's certified regulatory program. In sum, the EA provides the public and the decision makers with detailed information about the project's possible impacts.

LCFS 40-30 The comment cites case law regarding alternatives analysis. The comment is noted. In addition, CEQA Guidelines section 15126.6 describes requirements for consideration and discussion of alternatives. Chapter 7 of the Draft EA provides an overview of requirements for alternatives discussion and evaluation, and illustrates that several project alternatives were considered in the EA.

LCFS 40-31 The comment states that the purpose of an alternatives analysis is to allow informed decision-making, and the onus for analyzing a sufficient range of alternatives falls squarely on the agency. This comment is correct.

Section 15126.6 (c) of the CEQA Guidelines addresses the selection of a range of reasonable alternatives. It explains, "[t]he range of potential alternatives to the proposed project shall include those that could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects. The EIR should briefly describe the rationale for selecting the alternatives to be discussed. The EIR should also identify any alternatives that were considered by the lead agency but were rejected as infeasible during the scoping process and briefly explain the reasons underlying the lead agency's determination. Additional information explaining the choice of alternatives may be included in the administrative record. Among the factors that may be used to eliminate alternatives from detailed consideration in an EIR are: i) failure to meet most of the basic project objectives, (ii) infeasibility, or (iii) inability to avoid significant environmental impacts." These requirements were followed in Chapter 7 of the Draft EA, which addresses six alternatives.

LCFS 40-32 The comment is that the Draft EA does not analyze a sufficient range of alternatives. ARB disagrees with this comment because Section 7.C of the Draft EA, "Description of Alternatives" presents three alternatives that are considered in detail as well as three alternatives that were considered but rejected from detailed consideration (Section 7.C.4 of the Draft EA). The EA's alternatives analysis complies with CEQA because the EA evaluates a reasonable range of alternatives and explains why certain alternatives were rejected as infeasible. *See* CEQA Guidelines, section 15126.6; and the Draft EA, Ch. 7.

LCFS 40-33 The comment notes that the Draft EA presents a "No Trading Case Alternative," but does not describe it further. The No Trading Case Alternative was referenced due to a clerical error; it was not one of

the alternatives analyzed in the Draft EA. The No Trading Case Alternative was briefly considered as an option during development of the project alternatives. It was conceptually developed by ARB staff and not suggested through public comment. It was intended to provide a more stringent approach than the one in which fuel providers generating deficits for one class of fuel – gasoline or diesel – needed to comply using credits generated in connection with substitutes for the same class of fuel; credits were not fully fungible. ARB staff ultimately determined that the Original Benefits Scenario (described in Section 7.C.4.a of the Draft EA) provided similar information that would better inform the public and decision makers.

Accordingly, text on page 130 of the Draft EA has been modified as follows:

> …. These alternatives are described below, followed by ~~two action alternatives:~~ the Gasoline-Only Compliance Curve Alternative ~~and No Trading Case Alternative~~.

LCFS 40-34

The comment states that the titles provided for the project alternatives are misleading. This comment is noted.

The commenter asserts that Alternative 1, No Project: No Proposed Diesel Fuels Regulation Approval, and Alternative 3: Gasoline-Only Compliance Curve Alternative, are the same alternative. This assertion is incorrect. Under Alternative 1, no regulation would be adopted, and no CI reductions would be required; under Alternative 3, gasoline and its substitutes would be subject to a declining CI standard and the CI of diesel and its substitutes would not be regulated. Please see Chapter 7 of the Draft EA for more information.

The CEQA Guidelines include two general project alternatives: no project and alternative location. The alternatives analysis considered both a “no ADF alternative” and a “no LCFS amendments” alternatives. Because the Proposed Regulations cover the state of California, where ARB has jurisdiction, alternative locations are not feasible.

In addition to Alternatives 1, 2, and 3, three alternatives have been considered, but rejected for detailed consideration: Original Benefits Case Alternative, Growth Energy Alternative, and the National Biodiesel Board Alternative. These alternatives are discussed in Section 7.C.4 of the Final EA. Under CEQA, ARB is not required to

consider every conceivable alternative, but only a reasonable range of alternatives to the proposed project. CEQA Guidelines section 15126.6. Concerning the suggestion that a "different ADF regulation" should have been considered, please see the response to comment LCFS 40-35, below.

LCFS 40-35

The comment suggests that an alternative version of ADF should have been analyzed in the Draft EA, but does not identify an alternative to the ADF proposal that should have been analyzed. The EA analyzes two alternatives that did not involve adoption of an ADF regulation at all: the no project alternative and the gasoline-only compliance curve alternative. In addition, ARB explained in the EA that it considered but rejected two alternative forms of the ADF regulation that were proposed to ARB. These were rejected for reasons stated in the EA, but fundamentally would not have avoided any significant impact identified in the EA. See section 7.C of the EA.

The primary objective of the proposed ADF Regulation is to establish a comprehensive path to bring new or emerging diesel fuel substitutes to the commercial market in California as efficiently as possible while preserving or enhancing public health, the environment, and the emissions benefits of the State's existing diesel regulations. The proposed ADF Regulation also establishes specific rules governing the use of biodiesel fuel to ensure its use would meet the program goals of protecting public health and the environment.

LCFS 40-36

The comment states that additional alternatives should have been analyzed to comply with CEQA requirements; this comment does not suggest any additional alternatives that should have been evaluated. The EA's evaluation of alternatives and ARB's outreach effort to seek public input regarding alternatives meets CEQA's requirements and fostered meaningful public participation and informed decision making. The range of alternatives in the EA is governed by a "rule of reason," and the EA need "set forth only those alternatives necessary to permit a reasoned choice," where the alternatives could feasibly attain most of the basic objectives of the project. CEQA Guidelines section 15126.6(f).

In addition to significant public outreach on the LCFS Regulation, ARB staff made a concerted outreach effort to seek public input regarding the alternatives for LCFS, as follows:

- May 20, 2014: Staff posted the upcoming May 30, 2014, Public Workshop notification on the LCFS website, which included a solicitation of alternatives.
- May 23, 2014: Staff posted the Solicitation of Alternatives for Analysis in the LCFS Standardized Regulatory Impact Assessment (SRIA) and Under the California Environmental Quality Act (CEQA) on the LCFS website.
- May 30, 2014: Staff solicited public input and alternatives for analysis in the SRIA during the May 30, 2014, Public Workshop.
- June 5, 2014: Staff extended the deadline for the submission of alternatives for analysis in the SRIA.

In response to these outreach efforts, five alternatives to the LCFS proposal were submitted by interested parties. The announcements for public workshops regarding ADF were posted on the ARB website and distributed through an email listserve that included over 7,000 recipients. All materials presented at the workshops were also posted on the ARB website. The most recent workshops include:

- February 13, 2014: Public Workshop to discuss biodiesel use in extreme non-attainment areas and other concepts.
- April 17, 2014: Public Workshop to discuss the regulatory strategy of the ADF proposal.
- July 1, 2014: Public Workshop to discuss data from recently completed studies.

In addition to continuing efforts to solicit feedback from stakeholders about alternatives, exemptions, and alterations of the ADF and LCFS proposals, a formal alternatives solicitation process was implemented. A solicitation letter was also sent via an email listserve and posted on the respective regulation websites.

LCFS 40-37

The comment notes that the EA analyzed the effects of the proposed LCFS and ADF Regulations on the emissions inventory rather than concentrations of pollutants. ARB staff's analysis relied on changes to the total emissions inventory rather than concentrations of pollutants because the emissions-to-concentrations analysis takes place on a local level and would require complex modeling that would add only marginally to the analysis. The distribution of fuels under the proposed LCFS and ADF Regulations takes place Statewide and the combination of the distribution and the associated decreases in emissions are adequate to support the analysis which concludes the ADF and

LCFS programs would result in beneficial impacts (see Impact 3.b, Long-Term Operational Air Quality Emissions).

The comment notes that ozone formation is non-linear, and therefore questions the beneficial impacts determination of the EA. The comment is correct that reductions in NOx do not always guarantee reductions in ozone in all areas of California due to the complex reactions which form ozone. However, the staff analysis concluded NOx is reduced over time which would lead to benefits to air quality due to particulate matter (PM) reductions, and in combination with other NOx reduction measures would lead to ozone reductions. The beneficial air quality determination of the EA is primarily based on PM reductions both from direct PM emission reductions and indirectly from NOx reductions. Impacts to volatile organic compounds (VOCs) were not included because the fuels in question were determined largely to not impact VOC exhaust emissions which are controlled by exhaust control catalysts.

Comment letter code: 43_OP_LCFS_POET

Commenter: Joshua Willter

Affiliation: POET LLC

The following letter was submitted to the LCFS Docket during the 45-day comment period.

This page intentionally left blank.

POET
HUMAN + NATURE
O / 605.965.2200 4615 N. LEWIS AVE. SIOUX FALLS, SD 57104

February 17, 2015

By Electronic Mail

Clerk of the Board
California Air Resources Board
1001 I Street, 23rd Floor
Sacramento, CA 95812

Re: Proposed Amendments to the California Low-Carbon Fuel Standards Regulation and the Proposed Regulation of the Commercialization of Alternative Diesel Fuels

Dear Madam:

POET LLC, a member of Growth Energy, concurs in the comments being filed today by Growth Energy, including the environmental analysis under the California Environmental Quality Act offered by Growth Energy, as well as the alternative to the above-captioned proposed amendments and regulations that have been proposed by Growth Energy. Please file this letter in the two separate dockets for the the proposed amendments to the California Low-Carbon Fuel Standards ("LCFS") regulation and the proposed regulation of the commercialization of alternative diesel fuels

LCFS 43-1

POET LLC expects to file additional comments prior to the close of the record in the LCFS proceeding.

Thank you for your consideration and assistance.

Sincerely,

Shailesh Sahay
Regulatory Counsel

Revised POET CEQA concurrence 17 feb

This page intentionally left blank.

Comment Letter 43_OP_LCFS_POET Responses

LCFS 43-1 The commenter's concurrence with a letter submitted by Growth Energy on the LCFS and ADF Regulations is noted. Comments in the Growth Energy letter are addressed elsewhere in this document, including in responses to **LCFS 46-1** through **46-299**.

This page intentionally left blank.

Comment letter code: 44_OP_LCFS_P66

Commenter: Daniel Sinks

Affiliation: Phillips 66

The following letter was submitted to the LCFS Docket during the 45-day comment period.

This page intentionally left blank.

H. Daniel Sinks
Fuels Issues Advisor
3900 Kilroy Airport Way Suite 210
Long Beach, CA. 90806
Phone 562-290-1521
e-mail h.daniel.sinks@p66.com

44_OP_LCFS_P66

February 17, 2015

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

Via electronic submittal to: http://www.arb.ca.gov/lispub/comm/bclist.php

Re: **Notice of Public Hearing to Consider a the Low Carbon Fuel Standard (LCFS) – Phillips 66 Company Comments**

Dear Clerk of the Board,

Phillips 66 Company (Phillips 66) appreciates the opportunity to provide these comments. Phillips 66 will be directly impacted by the by the "re-proposed" Low Carbon Fuel Standard (LCFS) regulations as we are a "regulated party" under the existing regulations and will continue to be a "regulated party" as defined by these proposed regulations. Phillips 66 owns and operates refineries in the State of California. In addition, we have pipeline, terminal, and marketing assets in the State that distribute fuels produced at our refineries. We are a member of the Western States Petroleum Association (WSPA) and fully support the comments submitted by WSPA.

LCFS 44-1

Phillips 66 has been engaged with CARB since the inception of the LCFS and throughout this and previous regulatory proceedings. Our staff has participated in the workshop process, participated in the "workgroup" process, held a seat on the LCFS Advisory Panel, participated in trade association (WSPA) meetings with ARB staff, has held individual private meetings with ARB staff, and has provided written comments on every regulatory proceeding.

Based upon our experience as a regulated party under the existing LCFS rules, we focus our comments in this re-adoption proceeding on three main topics:

1) the Compliance Schedule;
2) the Cost Containment Mechanism; and
3) LCFS Credit Generation from Refinery Projects.

Each of the three topics contains a Phillips 66 recommendation that we respectfully ask the Board to consider and subsequently then direct staff to reexamine their current proposals.

Compliance Schedule: Phillips 66 does not believe the compliance schedule proposed by staff is feasible or sustainable. The compliance scenario presented by staff over-estimates the near term credit build and is overly optimistic in the amount of time it will take to bring advanced fuels and vehicles to commercial scale. In the staff's own scenario, there are not enough annual credits to

LCFS 44-2

cover deficits in the 2018/2019 timeframe (and beyond) and compliance is dependent upon a massive credit build in the early years (something that has not materialized).

The downside of adopting staff's unrealistic compliance schedule is that staff will continue to return to the Board every couple of years with amendments that "kick the can down the road" and do not address the fundamental issue of feasibility. Such an approach provides little in the way of regulatory certainty and makes planning business and investment decisions difficult (if not impossible) on the regulated parties. Phillips 66, therefore, respectfully asks the Board to direct staff to develop a realistic compliance schedule that is based upon reasonable forecasts of fuel availability, vehicle penetration rates, needed fuelling infrastructure build-out and is cost-effective.

LCFS 44-2 cont.

Cost Containment – Credit Clearance Market: Phillips 66's believes that a cost containment mechanism is NOT a suitable replacement for a feasible regulation. Staff's proposed cost containment scheme, a Credit Clearance Market, contains an initial price cap on credits of $200 per credit. The staff report lacks sufficient detail regarding how this cap or ceiling price was derived and we request that staff provide a basis and rationale for the $200/crredit.

In addition, under the proposal, participation in the credit clearance market is mandatory for parties who end the year in a deficit situation. Under the existing regulations, regulated parties are allowed to carry over a 10% deficit provided they "pay-back" those deficits the following year. There may be planning or operational reasons why a regulated party may wish to carry deficits from one year to the next. We request this provision remains in the regulation and that participation in the Credit Clearance Market be voluntary for those parties in deficit.

LCFS 44-3

Staff evaluated various cost containment mechanisms before arriving at their recommendation to adopt the Credit Clearance Market. To our knowledge, staff did not evaluate the potential use of Cap & Trade credits for this purpose. Phillips 66 proposes that in lieu of adopting these proposed additional and complex regulations, the Board direct staff to instead allow Cap & Trade credits to be used for LCFS compliance in those circumstances where the Credit Clearance Market would otherwise be triggered.

LCFS Credits for Refinery GHG Reduction Projects Phillips 66 fully supports the ability to generate LCFS credits from refinery greenhouse gas (GHG) reduction projects. However, the proposed thresholds and restrictions risk eliminating many potential projects. We have identified the following elements that make the proposal problematic:

a. Limiting onsite increases of air pollutants unreasonably excludes offsets of criteria and air toxic pollutants.
b. The 0.1 gCO2e/MJ threshold is too stringent: a "tons reduced" threshold should be allowed (this concept is proposed for "innovative crude recovery" so it is only equitable to add a comparable provision here).
c. Investments should not be limited to capital or onsite projects.
d. The biofeedstock 10% threshold is too restrictive and should be eliminated
e. Application of a 50% discount in the number of credits for "less efficient" facilities serves as a dis-incentive. All reduction projects should be allowed full credit.

LCFS 44-4

Phillips 66 respectfully requests the Board to direct staff to work with refiners to streamline the process and eliminate the barriers contained in the proposal.

Thank you for considering our comments. Please feel free to contact me if you have questions regarding our comments.

Sincerely,

<H. Daniel Sinks>

Comment Letter 44_OP_LCFS_P66 Responses

LCFS 44-1 The commenter's support for comments provided by WSPA is noted.

This page intentionally left blank.

Comment letter code: 45_OP_LCFS_Dillard

Commenter: Joyce Dillard

Affiliation: Individual

The following letter was submitted to the LCFS Docket during the 45-day comment period.

This page intentionally left blank.

45_OP_LCFS _Dillard

You state:

> ***3. Additional Infrastructure Needs***
>
> *Because credits could be generated through the use of solar-generation of steam, electricity, and heat in oil fields, development of these types of facilities would be incented. Potential compliance responses associated with these methods could result in modifications to* ***existing crude production facilities*** *to accommodate solar, and wind electricity, heat, and/or steam generation.* ***These would be located within crude oil production facility sites.***
>
> And
>
> *These projects could include the modification of existing or new industrial facilities to capture CO2 emissions, along with construction of new infrastructure,* ***such as pipelines, wells, and other surface facilities within or near the emitting facility to enable the transport and injection of CO2 into a geological formation for sequestration.*** *The transport distances and pipeline construction requirements for the captured CO2 would vary depending on the locations of specific industrial sources of the captured CO2 and proposed underground formations, recognizing, however, that pipeline cost could reasonably limit the distance of CO2 transport. CCS would be required to be onsite at locations of oil or gas production facilities to obtain credits through the proposed LCFS.*

Comments:

LCFS ISOR report states:

> *Revised Annual Crude Average CI Calculation*
> *The crude lookup table lists field-specific CI values for crudes produced in and offshore of California. Regulated parties, however, are often supplied California crude in pipelines carrying crude blended from many fields.* ***Because neither staff nor the regulated parties have data that maps crude oil volumes from California fields to pipeline blends, it is not possible to match reported California crude names with CI values from the lookup table.***
>
> ***Instead of using California crude names and volumes reported by refineries, staff proposes, in calculating the Annual Crude Average CI value, that volume contributions for California State fields will be based on oil production data from the California Department of Conservation, and volume contributions for California Federal Offshore fields will be based on oil production data from the Bureau of Safety and Environmental Enforcement.***

LCFS 45-1

Data that maps crude oil volumes from fields to pipeline blends is not available, and therefore, it is not possible to as accurately estimate CI values for California pipeline blends as for fields.

LCFS 45-1 cont.

You have no basis in fact of the Crude Oil Volumes from oil field to pipeline and cannot determine any benefit.

Sequestration requires an Earthquake Fault Zone and municipal Circulation Elements are a necessity. Land Use Elements are also a consideration due to any proximity to population, housing and schools. The science for migration in rock formations is in the research stage, as we understand it.

LCFS 45-2

There may be no benefit if the risk is too high.

Joyce Dillard
P.O. Box 31377
Los Angeles, CA 90031

Comment Letter 45_OP_LCFS_Dillard Responses

LCFS 45-1 The comment reproduces a section of the ISOR that discusses the revised annual crude average CI calculations, then states that there is “no basis in fact of the Crude Oil Volumes from oil field to pipeline and cannot determine any benefit.” This comment is unclear; however, it does not appear to address either the contents of the EA or environmental issues associated with the Proposed Regulation. No further response can be provided.

LCFS 45-2 The comment states that sequestration requires consideration of Earthquake fault zones, municipal Circulation Elements, and land use planning. The Draft EA addresses impacts that could result from development of carbon capture and sequestration (CCS) projects, including impacts on seismic activity (Impact 7.b). As discussed, the specific long-term effects of potential CCS projects are largely unknown, due to the uncertainty of locations or geologic settings. Mitigation Measure 7.b discusses the need to obtain permits, including a Class II permit from the California Division of Oil, Gas and Geothermal Resources, and Class VI permits from U.S. Environmental Protection Agency. To obtain these permits, the project proponent would be required to conduct various evaluations, such as engineering studies, a geologic study, and injection plans. Requirements for these permits are likely to include isopach maps, cross sections, and a representative electric log that identifies all geologic units, formations, freshwater aquifers, and oil or gas zones. However, because ARB lacks the authority to grant these permits, this impact is considered in this EA to be potentially significant and unavoidable. Please also see Impact 9.c: Long-Term Operational Hazards Related to Carbon Capture and Sequestration and Impact 10.c: Long-Term Impacts on Hydrology and Water Quality Related to Carbon Capture and Sequestration Projects.

This page intentionally left blank.

Comment letter code: 46_OP_LCFS_GE
17_OP_ADF_GE

Commenter: Joshua Willter

Affiliation: Growth Energy (single letter submitted in both LCFS and ADF rulemakings)

The following letter was submitted to the LCFS and ADF Dockets during the 45-day comment period. The comment letter is 306 pages long. Only pages 1 – 54, 230 – 233, and 243 – 298 contain environmental comments and are reproduced here.

This page intentionally left blank.

growth energy
America's Ethanol Producers

777 North Capitol Street, NE, Suite 805, Washington, D.C. 20002
PHONE 202.545.4000 FAX 202.545.4001

Growth

46_OP_LCFS_GE

17_OP_ADF_GE

February 17, 2015

By Electronic Mail

Clerk of the Board
California Air Resources Board
1001 I Street, 23rd Floor
Sacramento, CA 95812

Re: Proposed Amendments to the California Low-Carbon Fuel Standards Regulation and the Proposed Regulation of the Commercialization of Alternative Diesel Fuels

Dear Madam:

Growth Energy, an association of the nation's leading ethanol manufacturers and other companies who serve the nation's need for alternative fuels, is submitting to you the enclosed materials in response to the Executive Officer's notices of proposed amendments to California Low-Carbon Fuel Standards regulation and of the proposal to adopt a regulation for the commercialization of alternative diesel fuels. These materials also include environmental comments being submitted to the Air Resources Board and the Executive Officer pursuant to the California Environmental Quality Act and the Board's implementing regulations.

The Executive Officer has created separate rulemaking files and Board hearing agenda items for these two proposals. In view of the substantial overlap between these two proposals, including in the CARB staff's environmental assessment documentation, I ask that all of these materials, including the appendices and exhibits, be included in each rulemaking file and be considered by the Board in connection with each agenda item.

Growth Energy may file additional materials in one or both rulemaking files for consideration in connection with one or both agenda items at a later time, as permitted by the California Government Code.

If there are logistical questions concerning these submittals, please contact Mr. James M. Lyons of Sierra Research, Inc., at 916-444-6666.

Thank you for your consideration and assistance.

Sincerely,

David Bearden

David Bearden
General Counsel and Secretary

STATE OF CALIFORNIA

AIR RESOURCES BOARD

PROPOSED AMENDMENTS TO THE CALIFORNIA LOW CARBON FUELS STANDARD REGULATION AND THE PROPOSED REGULATION ON THE COMMERCIALIZATION OF ALTERNATIVE DIESEL FUELS

GROWTH ENERGY'S RESPONSE
TO THE NOTICES OF PUBLIC HEARINGS DATED DECEMBER 16, 2014
2015 CAL. REG. NOTICE REG. 13, 45 (JANUARY 2, 2015)

FEBRUARY 17, 2015

For further information contact:
Mr. Chris Bliley
Director of Regulatory Affairs
Growth Energy
CBliley@growthenergy.org
202-545-4000

Executive Summary

On January 2, 2015, the Executive Officer of the California Air Resources Board commenced the formal process of proposing amendments to the California low-carbon fuel standard ("LCFS") regulation and the adoption of a new regulation to govern commercialization of alternative diesel fuels used to comply with the LCFS regulation (the "ADF regulation"). Growth Energy shares CARB's goal of promoting alternative fuels that have lower greenhouse gas impacts than fossil fuels. In fact, promotion of this goal is central to Growth Energy's purpose. Unfortunately, Growth Energy believes that CARB's execution of the LCFS program as proposed would run counter to this goal. The proposal if finalized would promote the wrong fuels based on flawed, incorrect science, and as a result impose significant costs without accompanying greenhouse gas reductions. Thus, Growth Energy opposes adoption of the proposed amendments to the LCFS regulation and the currently proposed ADF regulation. Each regulation is unnecessary to achieve the environmental benefits sought by the California Legislature in the Global Warming Solutions Act of 2006, which is the statute on which the Executive Officer is basing his proposal.

The LCFS regulation is no longer needed to achieve the greenhouse gas reductions sought in the 2009 LCFS regulation, and Growth Energy has proposed a better alternative to the LCFS through the expansion of the existing cap-and-trade program. Since the Board first adopted the LCFS regulation in 2009, much has changed in efforts by the state and federal government to reduce greenhouse gas ("GHG") emissions from motor vehicles. Growth Energy presented a proposed alternative to the LCFS regulation to CARB staff in June 2014. Following review of Growth Energy's proposal, the CARB staff agreed with Growth Energy that Growth Energy's proposal would likely achieve the same level of GHG emissions reductions as the 2009 LCFS regulation through 2020. Growth Energy's proposal had none of the unintended negative environmental consequences of the 2009 LCFS regulation, which have been the subject of litigation, and would have eliminated the need for California businesses and consumers to pay for the LCFS program ─ costs which the CARB staff now says may range up to about 12 cents per gallon by 2020.

LCFS 46-1

The new justification for the LCFS regulation ignores the federal renewable fuels program. The CARB staff rejected Growth Energy's proposed alternative to the LCFS regulation in the fall of 2014 because it claimed that by enforcing LCFS requirements now, CARB could prepare the California fuels market for further GHG reductions after 2020. The CARB staff theorized that only an LCFS program can adequately assure the diversification of the sources and methods of producing renewable fuels with low carbon emissions needed to achieve GHG reductions after 2020. When it rejected Growth Energy's proposal last fall, the CARB staff did not properly account for the beneficial effects of the federal renewable fuels standards ("RFS") program in stimulating fuels diversification and in the commercialization of cellulosic renewable fuels. The CARB staff still has not done so.

By disrupting the national market for renewable fuels, the LCFS regulation may increase global greenhouse gas emissions. Under the new LCFS regulation, corn ethanol produced at Midwest biorefineries will likely be displaced in large part by sugarcane ethanol from Brazil. Midwest corn ethanol biorefineries will be forced to choose between curtailing or shutting down production, or finding other markets for the ethanol that can no longer be sold in California. Because external economic factors constrain the output of the Brazilian sugarcane ethanol industry, and may continue to do so, the practical effect of the new LCFS regulation may be the shipment of Brazilian ethanol to California and Midwest ethanol to Brazil. The ethanol would travel on oceangoing tankers powered with fossil fuels. Intercontinental shipments of ethanol in response to California's regulation would have the unintended effect of increasing global GHG emissions.

LCFS 46-2

Table of Contents

Page

Comments of Growth Energy on Proposed Amendments to the California Low Carbon Fuels Standard Regulation and the Proposed Regulation on the Commercialization of Alternative Diesel Fuels

Growth Energy respectfully submits these comments on the proposed amendments to the low-carbon fuels standard ("LCFS") regulation and the proposed regulation on the commercialization of alternative diesel fuels. Growth Energy is an association of the leading ethanol producers in the United States and other companies that serve America's need for renewable fuels. As such, Growth Energy shares in a core goal of the LCFS program – the promotion of alternative fuels that lower transportation-sector greenhouse gas emissions, among other benefits. Growth Energy's comments for the California Air Resources Board ("CARB" or "the Board") are contained in this summary document and a number of appendices and exhibits. Growth Energy is combining in these comments its response to the notices of proposed rulemaking published for the LCFS regulation and the alternative diesel fuel ("ADF") regulation, which are both scheduled for a public hearing later this week, as well as its response to the consolidated draft Environmental Assessment ("the draft EA") for the LCFS and ADF proposals.[1]

Part I of these comments outlines some of the key statutory provisions that govern the LCFS and ADF rulemakings and identifies the CARB staff's serious shortcomings in complying with the same. Part II summarizes the analysis contained in the appendices to Growth Energy's comments on the lifecycle emissions analysis used in the LCFS regulatory proposal and the impacts of the LCFS proposal on consumers, businesses, and federal law and policy, as well as related issues. Part III and its accompanying appendices address the draft EA and other issues

LCFS 46-3

[1] The public hearing notices dated December 16, 2014, and the draft EA were posted for public review and comment by the Executive Officer on January 30, 2014.

involving the environmental impacts of the two proposals and outline the Board's duties based on the record under the California Environmental Quality Act ("CEQA").[2] Part IV summarizes an alternative to the LCFS regulation that Growth Energy presented to the CARB staff, evaluates the CARB staff's response to Growth Energy's proposal, and describes the Board's legal obligations under the Government Code in light of the current record. Part IV also presents recommendations to facilitate the transparency and external review of the two current regulatory proposals.

LCFS 46-3 cont.

I. STATUTORY FRAMEWORK AND BACKGROUND

The Board's consideration of the LCFS amendments and the proposed ADF regulation is governed by the California Government Code, the California Health & Safety Code, and CEQA, as well as the California and federal Constitutions. Pertinent requirements of CEQA and CARB's certified regulatory program to implement CEQA that apply to the draft EA are examined in detail in Part III and Appendix J of these comments. Because they are relevant to every aspect of these two rulemakings, it is important at the outset to identify three key provisions of the Global Warming Solutions Act of 2006 ("AB 32") and the Government Code that apply here.

LCFS 46-4

Any regulation adopted by the Board must be consistent with and reasonably necessary to accomplish the purposes of AB 32. *See* Cal. Gov't Code § 11342.2. Three provisions of AB 32 are important to the Board's review of the CARB staff's proposal in order to determine whether the proposal is consistent with AB 32. First, regulations to implement AB 32 must not "interfere with … efforts to achieve and maintain federal and state ambient air quality standards" to the extent feasible, in addition to being adopted in a manner that complies with CEQA. Cal. Health & Safety Code § 38562(b)(4). Second, the emissions reductions that CARB attributes to an AB 32

LCFS 46-5

[2] Growth Energy may file additional materials not directly pertinent to the draft EA but relevant to other issues presented in the rulemaking prior to the start of the public hearings this week.

regulation must be "real, permanent, quantifiable, verifiable and enforceable." *Id.* § 38562(d)(1).[3] Third, AB 32 directs that the Board "shall" rely upon "the best available economic and scientific information" when adopting regulations to implement AB 32. *See* Cal. Health & Safety Code § 38562(e). For the reasons explained in these comments and the appendices, the proposed amendments to the LCFS regulation do not comply with those three central provisions of AB 32, and therefore the Board should not adopt them.

LCFS 46-5 cont.

In addition, the Executive Officer cannot demonstrate that the LCFS amendments are "reasonably necessary" to meet the purposes of AB 32, as the Government Code requires. As the CARB staff admitted during the Department of Finance's review of the proposed amendments last fall, the LCFS regulation is likely not necessary in order to reduce greenhouse gas ("GHG") emissions prior to 2020; another, less burdensome alternative identified by Growth Energy would achieve those reductions and would not have the counterproductive impact on the California environment that the LCFS regulation will create.[4] In earlier comments to the CARB staff during development of the new LCFS regulation, Growth Energy explained that the limited purposes of the LCFS regulation were already accomplished by other programs. Having been presented with Growth Energy's alternative to the LCFS regulation, CARB cannot properly claim that no alternative to the LCFS program would be "as effective and less burdensome to affected private persons and equally effective in implementing the statutory purpose or other provision of law" — an averment required by section 11346.5(a)(13) of the Government Code, and which is important in protecting the public from unnecessary regulation. Remarkably, the Executive Officer's

LCFS 46-6

---

[3] Notably, the requirements in subsection (d) of section 38562 are not qualified by the limitation in subsection (b), *i.e.*, "to the extent feasible."

[4] Regarding those impacts, *see* Part III and Appendix I (Declaration of James M. Lyons).

December 2014 notice proposing the LCFS amendments does not even refer to the alternative measure proposed by Growth Energy, which was presented to the CARB staff in June 2014.[5]

LCFS 46-6 cont.

The Legislature heightened the importance of evaluating alternatives to proposed regulations in 2011, when it amended the Government Code in order to require agencies to present their regulatory proposals to the Department of Finance for early review of costs, benefits, and alternative methods of accomplishing an agency's regulatory objectives. The LCFS and ADF rulemakings are among the first to be governed by the 2011 amendments, contained in SB 617. For the LCFS regulation, the CARB staff disabled meaningful stakeholder input into the SB 617 review by severely limiting the time permitted for regulated parties to participate, and by failing to fully disclose all the estimated benefits or costs of the proposed regulation (an omission that continues to this day). The shortfall in the SB 617 process for the ADF rulemaking was even greater: the version of the ADF regulation that the CARB staff submitted to the Department of Finance differed in material ways from the version of the ADF regulation that the CARB staff had under active consideration at the time of its SB 617 submission to Finance. Thus, the agency that the Legislature intended to have an active role in the development of major regulations in California ─ the Department of Finance ─ has never formally reviewed the key features of the ADF regulation. Unless the Board itself directs the CARB staff to comply with SB 617, it will be left to another agency (the Office of Administrative Law) to correct this egregious violation of SB 617.

LCFS 46-7

ADF 17-1

In addition to mandating early review of regulatory proposals by the Department of Finance, the Legislature requires transparency in the rulemaking process, so that the public can

LCFS 46-8 cont.

[5] *See* Appendix F and related exhibits.

participate effectively in that process. *See, e.g.*, Cal. Gov't Code § 11347.3; Cal. Health & Safety Code § 39601.5. The public rulemaking file required by section 11347.3 of the Government Code is critical to both transparency and public participation. Section 11347.3 requires, in essence, that the public have the same access to all the data and analysis used by an agency in developing regulations, as well as all external input provided to an agency in connection with the adoption or amendment of a regulation.

As indicated in Part IV of these comments, there are substantial questions concerning the Executive Officer's compliance with section 11347.3, in light of the sparseness of the CARB staff's documentation for key parts of its LCFS and ADF proposals. The CARB staff also waited until nearly the last possible moment to open the rulemaking file, which had the effect if not the purpose of limiting public analysis of the empirical and analytical basis for its proposals. While section 11347.3 of the Government Code applies to all California administrative agencies subject to the California Administrative Procedure Act (the "APA"), section 39601.5 of the Health & Safety Code was added to the Board's enabling statute in 2009 by AB 1085, when the Legislature learned of significant shortcomings in transparency in earlier rulemakings. Section 39601.5 compels CARB to provide "all information" on key aspects of its regulatory analysis "before the public comment period for any regulation" commences under the Government Code. It is unclear how the Executive Officer tried to comply with section 39601.5 in these rulemakings. What is clear, however, is that critical information about the assumptions and data on which the LCFS and ADF proposals are based has never been provided to the public.

LCFS 46-8 cont.

II. REGULATORY ANALYSIS

The use of lifecycle analysis ("LCA") in assessing GHG emissions is at the heart of the LCFS regulation. The Legislature has directed that programs like the LCFS regulation rely on the "best available economic and scientific information"; notably, this mandate applies to the carbon

LCFS 46-9

intensity ("CI") values that CARB assigns to the various renewable fuels in the LCFS regulation, as well as to all other parts of the rulemaking.[6] The use of the most scientifically defensive CI values is critical to the rulemaking effort. The CI values provide what the 2009 Initial Statement of Reasons (ISOR") for the LCFS regulation called "signals" to the downstream fuel industry that will direct them to achieve reductions in the CI of the fuels they sell in the most cost-effective manner. Insofar as the intent of the LCFS regulation is to reduce GHG emissions, the regulation must establish "the maximum technologically feasible and cost-effective" method of doing so. Cal. Health & Safety Code § 38561(a). If the CI values send the wrong "signal" to the downstream regulated parties, then the LCFS regulation will result in the use of pathways that may increase GHG emissions above the levels that would result if the best possible CI values had been assigned to various renewable-fuel pathways in the regulation. As one witness affiliated with the University of California stated at the April 2009 Board hearing on the LCFS regulation:

> [I]f we make a mistake in one direction in estimating these numbers, we'll use too much of a biofuel that's actually higher carbon [than] we thought and will therefore increase global warming. And if we use numbers that are too low, then we'll use too little of a biofuel that's lower carbon than we thought and will therefore increase global warming.

Transcript of Public Meeting of the Air Resources Board, April 23, 2009, at 73-74. As explained in Appendices A, B, and C to these comments, and as summarized below, the "signals" that CARB's new California GREET 2.0 and indirect land-use change models provide for corn-starch, corn-stover and sugarcane ethanol do not reflect the best available scientific and economic

LCFS 46-9 cont.

[6] *See* Cal. Health & Safety Code § 38562(e). The Legislature has not directed CARB to use carbon intensity as a regulatory mechanism; that is a choice the Board made in the 2009 LCFS regulation and that the CARB staff proposes to continue.

information, and therefore do not provide the accurate "signals" to the downstream industry that are needed to maximize GHG reductions while minimizing costs. To adapt the 2009 formulation of the issue, quoted above: the "numbers" for sugarcane ethanol are "too low" and as a result, "too little" corn-starch and corn-stover ethanol would be used in California gasoline, if the Board adopts the staff's proposal. (*See* Section A.1 & 2 below.)

LCFS 46-9 cont.

In addition, if the currently-proposed regulation were to be adopted, the displacement of corn ethanol that would result will severely interfere – once again as in earlier years of the LCFS program – with the federal renewable fuels standard ("RFS") program, in violation of federal law. No purpose is served by the State's conflict with federal law, because as also explained below, the regulation of CI at Midwest corn-starch ethanol biorefineries serves no beneficial purpose; contrary to the staff's claims in the current rulemaking, those biorefineries cannot and will not attempt to change their production methods solely to achieve lower CI scores in response to the LCFS regulation. In that particular respect the LCFS program violates an important tenet of AB 32, because it does not achieve "real" reductions in GHG emissions,[7] despite claims to the contrary. (*See* Section B below.)

LCFS 46-10

A. The CARB Staff's Lifecycle Emissions Analysis and its Consequences

1. Indirect Land-Use Change

From its inception, one of the most controversial aspects of the LCFS program has been its attempt to incorporate the theory of indirect land-use change ("ILUC") into regulation.[8] The

LCFS 46-11

---

[7] *See* Cal. Health & Safety Code § 38562(d)(1).

[8] It remains Growth Energy's position that the ILUC theory and the methods used to quantify the impacts of biofuel usage on land change, as well as the emissions model used by CARB to estimate emissions from land change, are too unreliable for use in regulation.

concept of ILUC stands at the intersection of environmental science and economics; having made the decision to try to use the ILUC theory in the LCFS program, CARB can be expected to comply with AB 32, and to use the "best available" scientific and economic information. As explained in Appendix A of these comments, the CARB staff has continued to ignore efforts by stakeholders to improve the quality of CARB's ILUC and indirect-emissions models, as well as recommendations of the Expert Working Group ("EWG") that CARB established when it first adopted the LCFS regulation. CARB must now finally address or adopt each of the recommendations presented in Appendix A, and in Growth Energy's other appendices to these comments, or explain fully why it is not doing so. *See* Cal. Gov't Code § 11346.9(a)(3). Insufficient time to address the recommendations in Appendix A is not sufficient justification for rejecting any of them; Growth Energy and other parties offered those recommendations before the staff published its current proposal and, in some instances, *at least four years ago*. (*See* Appendix A at A-2 and Table 1.) In the text below, Growth Energy summarizes some of the key deficiencies in the new ILUC analysis offered by the CARB staff for the Board's review.[9]

LCFS 46-11 cont.

These are among the recommendations in Appendix A:

- *Price-yield response factor*s. The CARB staff's ILUC analysis for corn-starch ethanol uses a range of price-yield values, despite recommendations from the

LCFS 46-12

[9] Each Appendix to the main text of Growth Energy's comments are a fully incorporated part of Growth Energy's comments. The Board must respond fully to each objection and recommendation in the appendices to the main text of these comments, regardless of their placement, or, at a minimum, explain why it believes each of these objectives or recommendations to be "irrelevant." *See* Cal. Gov't Code § 11346.9(a)(3). To ensure compliance with that requirement of the Government Code, California courts will conduct *de novo* review using independent judgment. *Cf. POET LLC v. California Air Resources Bd*. (2013) 218 Cal. App. 4th 681, 747-48. Particularly when the facts concerning CARB's actions in the regulatory process cannot be a subject of genuine dispute, "the independent standard of appellate review" applies. *Id.* at 748.

LCFS 46-13

authors of the model that CARB uses, as well as the EWG, that the most scientifically defensible value is 0.25. In the ISOR for the LCFS regulation, the Executive Officer relies on a non-peer-reviewed data review by a researcher at the University of California-Davis retained by CARB to support a lower price-yield value. In addition to lacking full documentation, the Davis reviewer appears to have made unexplained, selective use of other research, by Dr. J.F.R. Perez at Purdue University. The CARB staff has not supplied critical missing information from the Davis review requested by Growth Energy, and at this juncture, Growth Energy has no choice but to question whether the Davis review used reliable methods. Certainly, the Executive Officer cannot claim that the staff's work on price-yield responses has been transparent, nor that it is based on the "best available" information: information that is not made available to the public during a rulemaking governed by the California APA is akin to having no information at all.[10]

LCFS 46-12 cont.

- *Multiple cropping*. Last year, researchers at Iowa State University ("ISU") published a study that compared the results of ILUC modeling using GTAP (the modeling system used by the CARB staff) with real data. The study showed that over the last 10 to 15 years, there has been no net land conversion from forest and pasture to cropland in many regions of the world. (*See* Appendix A, note 5.) The ISU study confirms that increases in crop prices (a theoretical result of biofuels mandates like the LCFS regulation) will result in multiple cropping. The CARB

LCFS 46-14

[10] If the Board directs the Executive Officer to provide the missing information concerning the Davis review, it must follow the procedures in section 11347.1.

staff has ignored that study in its rulemaking proposal and supporting materials. The CARB staff has also ignored a November 2014 submission by Growth Energy that demonstrated how the ISU work could be adapted to correct the results of GTAP. Since at least 2009, the CARB staff has known about the inability of GTAP to account for multiple cropping; Growth Energy supplied a method to correct that deficiency. If the CARB staff did not agree with Growth Energy's approach, it should have developed and applied its own. Choosing instead to completely ignore the ISU study violates the Legislature's requirement to use the "best available" information. If the staff's position is that it had too little time or resources to include the ISU work in its new proposal, then the solution is simple: the Board should give the staff the resources it needs and direct the staff to return to the Board, before the Board attempts to act on the current LCFS proposal.

LCFS 46-14 cont.

- *CRP Land.* A lack of time or resources to update GTAP is also not a valid reason for the CARB staff's steadfast refusal to include the effects of the Conservation Reserve Program ("CRP") land in mitigating the land-use-related emissions impacts that the CARB staff attributes to corn-starch ethanol. In March 2014, Growth Energy supplied CARB with direct evidence from U.S. Department of Agriculture statistics showing that CRP land conversion has occurred in the last five years. The GTAP system already includes computer code to "access" CRP land, as Appendix A points out. In other words, CARB has a model that can account for CRP land conversion and was provided with CRP conversion data almost a full year ago. But apparently nothing has been done with this issue in the

LCFS 46-15

CARB staff's new proposal, and the reasons why the staff has not done so are not clear in the materials provided to the public.

LCFS 46-15 cont.

- *The AEZ-EF and CCLUB models*. The CARB staff's current LCFS proposal uses a model called the "Agro-ecological Zone Emission Factor" model (or "AEZ-EF") to estimate GHG release caused by various theoretical land transitions. In 2013, the researchers at the Argonne National Laboratory ("Argonne") released an updated version of an alternative model that serves the same purpose as AEZ-EF called the "Carbon Calculator for Land Use Change from Biofuels Production" model (or "CCLUB"). The 2013 CCLUB model includes more detailed emissions-related information for the United States than the AEZ-EF model. The land-use change emissions estimated with AEZ-EF and CCLUB differ substantially. (*See* Appendix A, Table 2.) Although the CARB staff has claimed in at least one stakeholder discussion to have evaluated CCLUB, there is no indication of its having done so in the AEZ-EF documentation, the ISOR for the current regulatory proposal, or the staff's accompanying materials. In order to determine whether the CARB staff is using the "best available" science, the Board and stakeholders are entitled to know why the CARB staff has chosen to use AEZ-EF rather than CCLUB.

LCFS 46-16

The potential magnitude of the errors in the CARB staff's ILUC analysis, and thus in the "signals" concerning the CI of corn-starch ethanol created by the proposed new LCFS regulation, are large. These false signals threaten to undermine the very purpose of the LCFS by promoting fuels that will not necessarily reduce greenhouse gas emissions and may even increase emissions. Having now been provided with Appendix A to these comments ─ which largely restates various

LCFS 46-17

objections to the staff's current approach and corrective recommendations that Growth Energy has previously presented[11] — the Board can and must address these issues. If CARB relies on information not currently in the rulemaking to explain its reasons for not accepting Growth Energy's objections and recommendations, it must place that information in the rulemaking file and allow sufficient time for public review and comment. (*See* note 9 above.) If no such information is forthcoming, then the alternate explanation is that the Board is relying on conjecture and unsupported assumptions, rather than the "best available" information. Alternatively, if the Board is convinced that more time and resources are needed to address the issues presented in Appendix A, it should either suspend the LCFS program or maintain the regulatory status quo until the staff is prepared to bring a new proposal back to the Board.

LCFS 46-17 cont.

2. California GREET 2.0

In Appendices B and C, Growth Energy comments on the portions of California GREET 2.0 ("CA GREET 2.0") used in the CARB staff's new LCFS proposal to generate direct-CI values pertaining to corn and sugarcane ethanol. There are several issues identified in Appendices B and C that CARB must address:[12]

- *Impacts of land-use change on methane emissions*. Enteric fermentation, which occurs in the digestive system of ruminant animals, produces methane, which AB 32 treats as a greenhouse gas. The models used in LCA analysis that attribute the creation of additional

LCFS 46-18

---

[11] Some of the relevant earlier submissions by Growth Energy are included in Appendix A. Other stakeholders may have advanced similar objections and recommendations, or commented on the same issues. It is impossible to know if that has occurred, however, because the CARB staff has apparently interpreted the Government Code not to require it to have placed all such submissions in the rulemaking file for this proceeding. *See* Part V below.

LCFS 46-19

[12] *See* note 8 above.

cropland to biofuel mandates also posit that the increase in cropland will reduce the land area available for grazing animals (unless additional land is cleared for grazing); one result of that reduction in grazing area, or a need to clear more land, will be an increase in livestock prices, a reduction in demand for meat, and smaller herds. As Appendix B notes, EPA's LCA analysis has accounted for this indirect reduction in methane emissions in the RFS program's LCA analysis. The CARB staff, however, has not done so in CA GREET 2.0 or in other parts of its new LCFS proposal, even those this omission has been repeatedly called to the staff's attention. Unless the CARB staff has a sound theoretical or empirical basis for disagreeing with EPA's judgment that a sound LCA-based program should account for the reductions in total methane emissions that will result from any land-use changes predicted from biofuels policies, the CA GREET 2.0 model should be modified to come into line with EPA's approach.

LCFS 46-18 cont.

- *Credit for reductions in methane emissions resulting from the use of DGS*. Livestock fed with a coproduct of corn-starch ethanol production, called distillers grain solubles ("DGS"), experience lower rates of enteric fermentation and therefore release less methane. Accordingly, Argonne's current GREET model (called "GREET 1-2013") gives "credit" to corn-starch ethanol production that includes the production of DGS. By contrast, CA GREET 2.0 does not, ostensibly because the CARB staff does not consider the feeding of animals to fall within the LCA system boundary for corn-starch ethanol. In addition to running counter to the judgment of Argonne's experts, who included a DGS credit for reductions in methane emissions, the CARB staff's approach is arbitrary. The entire ILUC theory is itself based on economic assumptions that are untestable; if the theory itself is

LCFS 46-20

sound enough for inclusion in a regulatory program, then there is no reason to exclude the credits for DGS production recognized by Argonne.

LCFS 46-20 cont.

- *Backhaul emissions.* In a regulatory program involving multiple fuel pathways, like the LCFS regulation, the LCA analysis must treat pathways that use different feedstocks in a consistent manner, unless there is sufficient basis to treat them differently. As Appendix C points out, of all the liquid fuels included in CA GREET 2.0, only one (ethanol made from sugarcane) is not charged with so-called "backhaul emissions," which are intended among other purposes to account the GHG emissions attributed to a vessel that has transported liquid fuel to a given destination after it departs for another port. In the case of sugarcane ethanol, which reaches the United States via ocean tankers, the omission of backhaul emissions has a significant impact on its assigned CI value. (*See* Appendix C, section 6.1.[13]) Consistency in the LCA analysis and in the regulatory process generally should require producers of sugarcane ethanol to account for those emissions in their applications, unless they can accurately and affirmatively show for purposes of their pathway application that no such backhaul emissions exist.[14]

LCFS 46-21

- *Accuracy of inputs for shipping emissions for Brazilian sugarcane ethanol.* Basic information used in the LCA analysis must be accurate. As Appendix C indicates, CA

LCFS 46-22

---

[13] A screen-shot of the relevant workbook from CA GREET 2.0 is included as an Exhibit to these comments.

[14] If the premise for assigning no backhaul emissions for sugarcane ethanol from Brazill is a belief that vessels that would carry sugarcane ethanol to the United States from Brazil would not leave the United States without a cargo, then (barring some explanation) the same premise should apply to the water transport of renewable diesel from the Far East, corn ethanol produced and used in the United States after barge transport, sugarcane ethanol transported by barge, and other fuels transported by barge that are included in GREET 2.0.

LCFS 46-21 cont.

GREET 2.0 assumes that all sugarcane ethanol from Brazil is delivered in 22,000-ton shipments ─ an assumption that is not supported by the available data. (See Appendix C, section 6.2.) CA GREET 2.0's assumption likely understates GHG emissions from inbound ocean transport by 100 percent. CA GREET 2.0 also uses unrealistic, across-the-board assumptions about the relationship between oceangoing vessel power requirements and vessel speed. (*Id.*, section 6.4.) The appropriate course is to modify CA GREET to include default values based on the relevant real-world data (presented in Appendix C), which may be modified for pathways based on verifiable and enforceable certifications by the pathway applicant.

LCFS 46-22 cont.

Appendices B and C identify additional inconsistencies, errors and failures to use the best available information in CA GREET 2.0. Two of the world's leading biofuels experts, Bruce Dale and Seungdo Kim of Michigan State University, have identified additional errors in CA GREET 2.0 for corn ethanol, as documented in Appendix B. Such errors violate the Legislature's mandate for the use of the "best available" information in AB 32 regulations, and those errors were presented and fully documented to the CARB staff in November 2014, shortly after a draft of CA GREET 2.0 was released for public review. The impact on the direct CI emissions factors is significant, especially for corn-stover ethanol, and those errors must be addressed without further delay. Likewise, Appendix C indicates that CA GREET 2.0 does not reflect actual sugarcane farming practices, along with other errors that must also be corrected now, before the rulemaking proceeds further. (See Appendix C, sections 2-5.) Unless those errors are corrected, the new LCFS regulation will provide significantly inaccurate "signals" to downstream regulated parties, and will not maximize the program's goals in a cost-effective manner.

LCFS 46-23

* * *

In sum, the CI values assigned to corn and sugarcane ethanol are not based on reliable data and methodologies, and need to be corrected before CARB tries to move forward with the LCFS "re-adoption" process. Although the CARB staff may believe that some or all the issues identified above cannot be addressed now, given their current regulatory schedule and claimed inadequate level of resources, the Board cannot accept such a position. The Board has discretion in setting the schedule to hear items for approval and to allocate CARB's resources, but under AB 32 it has no discretion to adopt or enforce regulations that are not based on the "best available economic and scientific information." Cal. Health & Safety Code § 38562(e). Again, applying CIs that are not based on the best available economic and scientific information threatens to undermine the very purpose of the LCFS.

LCFS 46-24

B. Impacts of the Current LCFS Proposal

The incorrect regulatory "signals" created by the CI values assigned to corn and sugarcane ethanol will skew the California renewable fuels market away from corn-starch ethanol, and toward sugarcane ethanol. Corn-starch ethanol will not be able to compete with sugarcane ethanol using scientifically unreliable CI values. Among other consequences, this means that the potential increase of 13 cents per gallon of liquid fuel in 2020, estimated by the CARB staff if LCFS credits cost $100 per credit, will not be spent to achieve reductions in the CI of California motor fuels in the most cost-effective manner possible and may not lead to GHG reductions at all.[15]

LCFS 46-25

[15] The CARB staff's 13-cent-per-gallon estimate appears in the Attachment to the Form 399 (Fiscal Impact) report signed on December 15 and 16, 2014, by two CARB staff members, and which Growth Energy located in the rulemaking file at CARB in early January 2015. CARB uses the $100 per credit estimate in the ISOR for the LCFS. *See* LCFS ISOR at VII-1. According to the ISOR, the estimated fuel price increase for gasoline in 2020 using the $100 per credit estimate is 12 cents per gallon. *See id*. at VII-5, Table VII-5. While the CARB staff calls the $100 per credit estimate "conservative," considers the 12-cent-per-gallon estimate to "represent the upper bound of fuel price impacts," and urges that its estimates not be used to "determine the impact of credit prices on the final retail price of transportation fuels," *see id*.,

Despite the lack of corollary benefits, the new LCFS regulation will result in the displacement of corn-starch ethanol produced in the Midwest with other fuels. The staff has published an "illustrative compliance scenario" which projects a reduction in corn ethanol use in California gasoline from the current (2014) level of 1,250 million gallons per year to 700 million gallons per year in 2020, with an increase in consumption of cane ethanol equal to about 64 percent of that reduction. That scenario means a reduction in the use of Midwest corn ethanol in California of about 550 million gallons per year as of 2020, relative to today, equivalent to the entire output of about seven typical-sized ethanol plants.[16]

The CARB staff has based its analysis of the economic impact of the LCFS regulation from 2016 to 2020 ─ which is an analysis that is mandatory for any rulemaking governed by the APA, and whose reliability must be affirmed by the rulemaking agency before a final rule can be adopted[17] ─ on estimates of the prices of LCFS credits from 2016 to 2020. The primary case used in CARB's economic impact analysis uses, as indicated above, a $100 per credit price; the staff's analysis also examines economic impacts using lower credit prices. As explained in Appendix D, if sugarcane ethanol pathways achieve CI levels of 40 g/MJ, and corn-starch ethanol pathways achieve CI levels of 70, credit prices as low as $23 would be sufficient to induce a switch from

LCFS 46-25 cont.

---

the staff has not fully explained why it considers the $100 per credit to be "conservative" or why it believes the 12-cent-per-gallon increase to "represent the upper bound."

[16] According to data published by the Renewable Fuels Association, the average output of operating corn-starch ethanol biorefineries in the United Sates is about 76 million gallons of ethanol per year. *See* www.ethanolrfa.org/pages/statistics.

[17] *See* Cal. Gov't Code § 11346.5(a)(13) (requiring a determination of cost-effectiveness in an initial regulatory proposal); id. § 11346.9(a)(4)(same, in the Final Statement of Reasons for regulatory action). An agency cannot determine the cost-effectiveness of a regulation without estimating the costs of the regulation, as well as its benefits. As for the CARB staff's estimates of the benefits of the proposed new LCFS regulation, see Part IV below.

Midwest corn ethanol to imported sugarcane ethanol, assuming that the latter is available for sale to the downstream market in California. (That is an assumption that the CARB staff has made in its compliance and economic impact analyses.) As Appendix D, prepared by Edgeworth Economics, states, the CARB staff's "scenario indicating a substantial decline in the use of Midwest corn ethanol in California and an increase in the use of imported cane ethanol is therefore not only plausible, but probable if sufficient ethanol is available from Brazil, even at modest credit prices well below CARB's projected level of $100." CARB must explain whether, and if so, why, it considers this dramatic shift in the sourcing of ethanol for the California market (which its own staff's economic impact analysis confirms) to be irrelevant to its statutory mandates or objectives, and to the policies that it pursues as a matter of discretion.

LCFS 46-25 cont.

Much, if not all, of the Midwest corn ethanol eliminated from the California market would be ethanol produced at biorefineries that generate renewable fuel that is certified under the federal Renewable Fuel Standard (RFS) with the specific intent of reducing national greenhouse gas emissions, thereby putting the LCFS program into direct conflict with federal law and policy.[18] In addition to the economic impacts on corn-starch ethanol business operations, the U.S. corn-starch ethanol producers who are currently attempting to finance the development of cellulosic ethanol production capabilities at plants located in the United States may have fewer resources available for those development efforts; in that respect, the LCFS program will further interfere with the goals and purposes of federal biofuels law and policy, which include the commercialization of cellulosic ethanol. Unless there is a significant expansion in domestic demand for ethanol, the increased imports of Brazilian cane ethanol, combined with the proposed LCFS regulation's

LCFS 46-26

LCFS 46-27

[18] 42 U.S.C. 7545(o)(2)(A)(i)

LCFS 46-26 cont.

generous allowance of credit to California electric utilities,[19] will result in a combination of (i) lost production or even shutdowns at Midwest biorefineries, and (ii) increased logistics costs as those American biorefineries seek foreign markets (potentially, and ironically, in Brazil, where ethanol is not subject to the LCFS regulation). If the Board believes that any other outcome or combinations of outcomes for the Midwest corn ethanol industry from the LCFS regulation will occur, it should explain them and estimate their likelihood of occurrence.[20]

LCFS 46-27 cont.

The second outcome ─ corn ethanol export outside the United States to make up volume lost in California ─ will not produce reductions in global GHG emissions.[21] To the extent the first outcome (loss of any commercially practicable way to offset the reductions in California demand) occurs, then the LCFS regulation will have particularly grim consequences for the Midwest corn ethanol industry and those who depend on it. As Appendix D indicates:

> On average, U.S. corn ethanol facilities employ approximately 0.8 employees per million gallons of ethanol produced, or about 61 employees for a typical plant. A reduction in ethanol demand of 550 million gallons per year therefore would result in a direct loss of approximately 440 jobs at ethanol refineries. In addition to these direct effects, the regions that host ethanol production facilities would experience additional reductions in economic activity stemming from reduced purchases of locally-sourced inputs (the "indirect" impact) and reduced spending by facility employees and local vendors (the "induced" impact). These additional economic impacts are generated by the "multiplier" effect, which results from the recycling of business revenues and household income within the local region. Plausible estimates for the overall multiplier effect for employment applicable to the ethanol industry range from about 2 (indicating a total impact on employment equal to two

LCFS 46-28

---

[19] *See* Section C below.

[20] Note that this analysis of potential outcomes from the LCFS regulation assumes for present purposes that corn-starch ethanol pathways achieve the CI levels projected by the CARB staff. As to the realism of those projected reductions in CI levels, see Part III.A below.

LCFS 46-27 cont.

[21] In addition to producing no net GHG emissions reductions, the second outcome will impose substantial direct costs on the Midwest corn ethanol industry. Appendix D estimates that the additional logistics costs for the transport of Midwest corn ethanol to a market like Brazil at approximately 10 cents per gallon.

LCFS 46-28 cont.

> times the direct employment impact) to about 7. Applying a figure of 4 to the direct employment impacts calculated above implies a loss of approximately 1,760 jobs in ethanol producing regions.

If CARB disagrees with that assessment or considers those outcomes to be irrelevant to its mission, the Board needs explain why those impacts in the Midwest are overstated, or why those impacts are irrelevant.

LCFS 46-28 cont.

III. ENVIRONMENTAL ANALYSIS

Two different statutes ─ AB 32 and CEQA ─ make it critical for the Board to develop a complete understanding of the environmental issues presented by the CARB staff's ADF and LCFS proposals. First and foremost, the purpose of AB 32 is to reduce GHG emissions, *see, e.g.*, Cal. Health & Safety Code § 38562(a); regulations that do not reduce GHG emissions are not "necessary" to meet the purposes of AB 32 and would violate the Government Code.[22] In addition, among other relevant requirements, including the obligation to rely on the "best available" scientific and economic information, *id.* §38562(e), AB 32 directs that to the extent feasible, the Board's GHG regulations not interfere with efforts to meet and maintain federal and state air quality standards. *See id*. § 38562(b)(4). Under CEQA and the Board's implementing regulations, the Board's obligations to protect the environment are, if anything, even more exacting: CARB "shall not" adopt or approve any action "for which significant adverse environmental impacts have been identified during the review process." if there are "feasible mitigation measures or feasible alternatives available which would substantially reduce such adverse impact." 17 C.C.R. § 60006.

LCFS 46-29

LCFS 46-30

As explained below, the CARB staff's two proposals do not meet the criteria of either AB 32, or of CEQA and the Board's implementing regulations. First, the CARB staff's LCFS proposal

LCFS 46-31

---

[22] *See* Cal. Gov't Code § 11342.2 ("no regulation adopted is valid or effective unless … reasonably necessary to effectuate the purpose of the statute").

assumes that the current LCFS regulations have actually reduced net GHG emissions into the atmosphere; in fact, there is no evidence that the LCFS regulations have done so, to date, and the available evidence demonstrates that there have been no such GHG reductions. Second, and building its first false premise about the efficacy of the current LCFS program, the staff's LCFS proposal invites a further assumption that the new LCFS regulations will achieve further reductions in net GHG emissions, but remarkably, the *staff has offered no definitive quantitative estimate of those GHG reductions.* That proposal also makes unrealistic assumptions about how portions of the affected industries will respond to the new regulation, and fails to account for ways in which the new regulation will increase, rather than decrease, GHG emissions, as well as criteria pollutants. The proposed new LCFS regulation cannot properly be treated as a regulation that meets the purposes of AB 32 because there is no reliable demonstration that the regulation will reduce GHG emissions, and the proposal is therefore not authorized by AB 32 and is invalid under the Government Code. In addition, and in conflict with section 38562(b)(4) of the Health & Safety Code, the CARB staff has ignored alternative, "feasible" methods of obtaining the same GHG reductions that it once attributed to the LCFS regulation through 2020. (*Id*.)

LCFS 46-31 cont.

LCFS 46-32

LCFS 46-33

LCFS 46-34

The staff's two proposals (for the new ADF regulation and for the revised LCFS regulation) also conflict with the requirements of CEQA and cannot be adopted. CARB is obligated to mitigate the significant adverse environmental impacts of the LCFS regulation recognized by the Court of Appeal in *POET v. California Air Resources Bd*. (2013) 218 Cal. App. 4th 681, that will result from the use of biodiesel fuels. As explained in Appendices I and J and as summarized below, the CARB staff's two proposals and the draft EA do not properly mitigate those impacts, or comply in other important respects with CEQA and the Board's implementing regulations.

LCFS 46-35

A. The LCFS Regulation and GHG Emissions

We begin with the facts and analysis that are pertinent to an analysis of the LCFS proposal under AB 32, before turning to the CEQA analysis.

1. Background on Corn-Starch Ethanol Production: Past and Current Practices

The first step in understanding the environmental consequences of the proposed new LCFS regulation relevant to AB 32 is to consider the impacts of the current regulation, first adopted under AB 32 in 2009. The ISOR for the new proposed LCFS regulation claims that "[o]ver the first three years of the LCFS, there has been a steady decline in the average CI of the mix of biofuels used in California. Concurrently, there has been a great expansion of the applications for fuel-pathway CIs." (LCFS ISOR, App. B at B30.) On that basis, the "ARB staff expects these trends to continue and actually accelerate as the stringency of the LCFS increases and credits become more valuable." (*Id*.) The ISOR cites no facts in support of the staff's expectation, and its claim that there has been a "steady decline in the average CI of the mix of biofuels sold in California" is contradicted by the relevant evidence from the corn-starch ethanol industry. These are the pertinent facts: [23]

LCFS 46-36

1. Ethanol produced from corn starch is the principal renewable fuel produced in the United States, and has been the primary alternative fuel blended into gasoline in California, both before and after the implementation of the current LCFS regulation. Members of Growth Energy and other producers in the U.S. corn ethanol industry have strong commercial incentives to

LCFS 46-37

[23] Because Growth Energy does not have access to confidential business information of its members or any other firms in the ethanol industry, it bases these comments on information in the public record. *See* Appendix E (Declaration of Erin Heupel, P.E. (hereinafter "Heupel Decl.").

maximize yield from the feedstock they purchase and to minimize energy usage, and thus to minimize GHG emissions. Next to corn costs, energy costs are the largest variable cost in producing corn ethanol.

2. A corn-starch ethanol plant costs millions of dollars to build. Most corn-starch ethanol is produced in the Midwest, at plants that are carefully sited in order to have ready access to their feedstock, as well as competitively priced natural gas, electricity, or other sources of energy to run the plant. Ethanol plants cannot directly control and document how farmers grow and harvest corn, which the farmers grow not only to sell to ethanol plants, but also to other customers, on the best possible commercial terms for the farmers. The companies that survive and prosper in the corn ethanol industry are those whose plants are designed from the beginning for maximum efficiency in feedstock conversion and minimum energy consumption.

3. The competitive pressure to reduce energy consumption, and not regulation, is what drives reductions in GHG emissions at corn ethanol biorefineries. For example, the current LCFS regulation has been in full effect since 2011; based on the information in the public record available to Growth Energy, ***no biorefinery*** selling ethanol for blending into gasoline has made ***any*** significant changes in its production methods, feedstocks, methods of transport, or any other factor relevant to GHG emissions, in order to specifically obtain a lower CI value for purposes of the California LCFS regulation. To be sure, as the ISOR claims, numerous plants have obtained approval for plant-specific "pathways" with lower CI values than might have otherwise been assigned to them under the California regulation. Those facilities, however, have obtained approval for those pathways by documenting production methods adopted for competitive reasons and federal policy reasons, completely independent of the California LCFS regulation.

LCFS 46-37 cont.

Thus, when the ISOR claims that there has been a "great expansion" in the number of applications for new alternative-fuels pathways, in the case of Midwest corn-starch ethanol plants, it is confusing what are essentially paperwork exercises ─ when applicants are documenting production processes, methods and energy sources that have been adopted for commercial reasons ─ with reductions in CI levels driven by regulation. Because the record of "great expansion" in pathway applications appears to be one of the principal bases for predicting that the new LCFS regulation will result in reductions in the future, it is important for the CARB staff, and ultimately the Board, to identify any evidence that contradicts what Growth Energy has concluded from the information available in the open record.[24] Any such evidence should be then be placed in the rulemaking file pursuant to section 11347.1 of the Government Code for public review and comment. If, on the other hand, the CARB staff has no evidence the current LCFS regulation has driven reductions in the CI levels of corn ethanol plants in the Midwest, and the Board decides to act in reliance on the staff's speculation, then candor should require the Board to admit as much before work is completed on the new regulation.

LCFS 46-37 cont.

Of course, not all corn-starch ethanol plants that were able to participate in the California market before 2011 have been able to remain in that market, because not all such plants have been able to document production processes, methods and energy usage that would qualify them for competitive CI values. When they have been able to remain in the market, they must generally

LCFS 46-38

---

[24] As Appendix E indicates, Ms. Heupel of POET LLC, for her part, was able to describe the business and regulatory practice at her company in the open record. If the CARB staff believes that it cannot put any information that corroborates its position owing to concerns about business confidentiality, and that contradicts Growth Energy's understanding of how corn starch ethanol biorefineries have gained lower-CI pathways to date, it should so indicate, and include a description of its efforts to obtain permission from the owners of the putatively confidential information in the open record.

LCFS 46-39

sell their product for less than what plants with lower CI values can obtain.[25] The CARB staff has admitted as much.[26] " Some of the plants that could not document the production technologies, processes, methods, and energy inputs that the CARB staff would reward with lower CI values had previously sold a substantial volume of ethanol in California," as one industry participant has stated, and "[t]he LCFS regulation forced some of those plants entirely out of the California market."[27] As the same industry participant has explained:

LCFS 46-38 cont.

> The effect of the LCFS regulation has been to "de-commoditize" the corn ethanol market, for purposes of California -- *i.e.*, ethanol is no longer a fully fungible commodity in California, in which producers can prevail by offering the best commercial terms. Plants that were optimized for shipment of ethanol to California when they were built, but that can no longer sell their ethanol in California, now must find buyers outside California. On an industry-wide basis, the LCFS regulation has led to "fuel shuffling" that has likely increased the number of miles that Midwest corn ethanol had to travel in 2011 in order to get from the production facilities to customer destinations.

LCFS 46-40

Whiteman Decl. ¶ 18. Importantly, as that individual concludes:

> For all the disruptions in the California ethanol market created by the LCFS regulation, there has been no reduction in the overall amount of corn ethanol produced in the United States, or used as a motor fuel in this country or overseas. …. The overall production levels for corn ethanol last year, and for the foreseeable future, depend on macroeconomic factors (including demand for gasoline) that are independent of the LCFS regulation.

---

[25] Growth Energy relies here on other public information. *See* Appendix E (Declaration of Robert Whiteman (hereinafter "Whiteman Decl.").

[26] *See* Whiteman Decl. ¶ 17. Mr. Whiteman is a senior official in one of the largest ethanol marketing businesses in the United States, and would qualify as an expert on corn-starch ethanol marketing based on his knowledge, skill, experience and training.

[27] *Ibid.*

Id. ¶ 20.[28] The CARB staff also agreed, in the 2009 rulemaking, that "fuel shuffling" would be one result of the current LCFS regulation. When taken together, the totality of the evidence thus establishes this important point: ***the current LCFS regulation has not resulted in any reductions in GHG emissions from corn starch ethanol,*** whose use in gasoline has been the downstream fuel industry's principal method of complying with the LCFS regulation.

LCFS 46-40 cont.

In sum, and contrary to what may be the position taken in the ISOR for the new regulatory proposal, there has to date been no "real" reduction, see Cal. Health & Safety Code § 38562(d)(1), in the "average CI in the mix of biofuels used in California," at least with respect to liquid biofuels used in gasoline. Here again, if the CARB staff has any actual evidence contradicting Growth Energy's understanding of how the LCFS regulation has affected the corn-starch ethanol business to date, it must provide that evidence for review under the Government Code, or instead admit that it is asking the Board to rely on unsupported opinion.

LCFS 46-41

2. Prospects for Future Reductions in the Carbon Intensity of Corn-Starch Ethanol

The ISOR also claims that the new LCFS regulation will continue the "trend" towards lower CI levels "as the stringency of the LCFS increases and credits become more valuable." (LCFS ISOR, App. B at B30.) The ISOR continues as follows:

> A two-step process was used to reflect how the trend to lower CI fuels will impact credit generation between 2016 and 2025. First, estimates of "pool-average" CIs for fuels with many different pathways were made based on the range of fuel-pathway CIs (FPCs) approved for use. The fuels studied were corn ethanol (150 FPCs), Cane Ethanol (21 FPCs), and Corn-Sorghum Ethanol (20 FPCs). In each case, the CIs of the lowest 50 percent of FPC CIs were averaged together, and this CI was then assigned (after appropriate adjustments to reflect iLUC changes) as the CI of that fuel category in 2016. Once a starting point for a fuel category's CI was determined for 2016, the CI was further lowered to reflect that higher credit values and continued plant improvements will lead to lower average CI with time. A

LCFS 46-42

[28] Mr. Whiteman prepared his Declaration in 2012.

> conservative adjustment of a one percent decrease in CI values for each category was uniformly applied to at least partially recognize this effect.

Id. at B30-31. As the ISOR adds in a footnote, "For example the average CI of corn-derived ethanol under this method changes from 82.2 grams/MJ to 70.0 grams/MJ." Significantly, the ISOR here concedes that a substantial part of the industry current serving California ─ some or all producers who are in the upper half of the current FPC distribution ─ have no future in the California market. Also significantly, the ISOR offers no technical analysis or informed expert opinion to support the speculation that remaining ethanol production processes will achieve *on average* the first lower-CI level (for corn ethanol, 70.0 grams/MJ), and then year-over-year reductions.

LCFS 46-42 cont.

In addition to lacking any apparent support, other than speculation by the authors of the ISOR, the ISOR's prediction for the future cannot be squared with what is currently known about industry conditions and the requirements of the proposed new LCFS regulation. As noted above (*see* Part II.B) and explained in Appendix D, at relatively modest LCFS credit prices, the LCFS regulation will shift demand for ethanol from corn-starch pathways to sugarcane pathways, and that shift will occur in the first year of the new program (2016). Here are some of the key facts that the ISOR's speculation about future "trends" does not address:

LCFS 46-43

- The U.S. corn ethanol industry currently has enough production capacity to serve the Nation. The most competitive Midwest corn ethanol plants in operation today are built and sited for optimal logistics and energy usage in the first years of production, and not for significant future optimization.[29]
- In addition to energy, the corn feedstock is a major cost factor in corn-starch ethanol production, and corn-starch ethanol plants "cannot directly control and document how

[29] See Appendix E (Heupel Decl.).

farmers grow and harvest corn, which the farmers grow not only to sell to ethanol plants, but also to other customers, on the best possible commercial terms for the farmer."[30]

- Corn-starch ethanol plants are also assigned by the LCFS a large ILUC emissions factor, which they are powerless to change.

- Corn-starch ethanol plants can therefore work with only a fraction of their production processes — chiefly, energy, for which they are already likely optimized — to achieve lower CI scores.

- Any costs incurred to reduce the CI score of the ethanol that corn ethanol plants would produce would have to be recovered in the California market against competition from sugarcane ethanol and electricity. The deeper the reductions in CI, assuming any such reductions were possible, the greater the costs, and the longer the period needed to remain competitive in California.

Against that backdrop, Growth Energy credits the opinion expressed in Appendix E that in order to remain in the California market, "even a very efficient Midwest corn ethanol plant would have to find and implement further efficiencies or energy reduction opportunities not driven by the nationwide market and recover the costs of the necessary changes, over a very short time frame.… Rather than incur those costs, U.S. corn ethanol plants will try to compete in markets outside California."[31] Here again, if the CARB staff has any basis either to disagree with the prediction of market exist, or to support its belief in the "trend" that the ISOR predicts, it needs to provide the information (be it facts, expert opinion, or any other type of evidence) for public comment. If the CARB staff cannot do so, then as indicated above, candor requires the Board to admit that the predicted future operation of the LCFS regulation in the ISOR is based on unsupported conjecture, at least with respect to corn-starch ethanol.

LCFS 46-43 cont.

[30] Heupel Decl. ¶ 10.

[31] *Id.* ¶ 11.

This issue — how the new LCFS regulation will affect the supply of cornstarch ethanol to California — needs to be addressed clearly, directly, and empirically. Corn starch ethanol remains a part of the CARB staff's compliance scenarios for many years; if corn starch ethanol cannot meet the expectations of the ISOR, then the viability of the new LCFS program as depicted in the ISOR is in serious jeopardy. If the absence of the corn starch ethanol from the California market triggers use of the cost-containment provision, as the costs of LCFS credits skyrockets, then LCFS program will not achieve the GHG reductions that CARB might otherwise attribute to the program.

LCFS 46-43 cont.

3. Greenhouse Gas Emissions and Related Impacts of the New LCFS Regulation

Despite the ejection of corn-starch ethanol from the California renewable fuels market, the new LCFS regulation will not reduce, and will likely increase, net global GHG. As explained above, "fuel shuffling" is one likely outcome of the new LCFS regulation (accompanied by potential shutdowns of biorefineries in the Midwest). To date, the fuel shuffling caused by the LCFS regulation has been confined, in the case of ethanol, to the continental United States. The new LCFS regulation will make fuel shuffling an intercontinental phenomenon, as California begins to draw sugarcane ethanol in large quantities from production sites in Brazil. As explained in Appendix G, one result of the new regulation will be increases in GHG emissions caused by the transport of large volumes of Brazilian sugarcane ethanol to the California market. Looking solely at the GHG emissions increases that should be attributed to oceangoing tankers, fuel shuffling emissions will fall in the range of 385,000 to 735,000 tons of GHG emissions per year, under the assumptions described in Appendix G.[32] If the CARB staff or the Board have any disagreement with those estimated GHG shuffling losses, it should explain them and their basis.

LCFS 46-44

---

[32] *See* Appendix G. Those estimates are based on necessary corrections to the CA GREET 2.0 model, described in Appendix C. Even if those corrections are not made, GHG emissions from

For its own part, the CARB staff apparently has no current estimate of the net GHG emissions impacts of the LCFS regulation ─ at least, none that it was prepared to publish. The ISOR contains a table (Table IV-2) that contains some estimates of "Projected LCFS GHG Emissions Reductions." The ISOR prefaces that table, however, with this important qualification:

> These estimates do not include a reduction to eliminate the double counting of the Zero Emission Vehicle Mandate, the federal Renewable Fuel Standard Program, the Pavley standards, or the federal Corporate Average Fuel Economy Program. (LCFS ISOR at IV-2)

LCFS 46-45

That is a breathtaking admission. Growth Energy is not aware of any other major regulation that the Board has ever been asked to approve without a net emissions reduction estimate for the pollutant or substance of primary concern (here, GHG emissions). For all that the Board and the public can tell, the programs that the ISOR has failed to include would leave the LCFS program with *de minimus* GHG emissions reduction benefits. Certainly, the current analysis before the Board does not meet the most basic tests for regulatory approval under AB 32; the GHG reductions that the proposed new LCFS regulation are not "quantifiable." Cal. Health & Safety Code § 38562(d)(1). Nor, of course, can the Board claim that the LCFS regulation would be "cost-effective," *see id.* § 38562(a), because there are no quantified GHG emissions reductions benefits to be placed into a ratio with the costs of the proposal. CARB cannot approve the new LCFS program proposed in the ISOR, without contorting the statutory language to allow it to impose costs on the public without first quantifying the GHG reduction benefits for which the public must pay.

LCFS 46-46

---

the transport of sugarcane ethanol by oceangoing tankers will rise by approximately 150,000 tons per year. *Id*. at 1.

There is no escaping the requirements of the rulemaking provisions in AB 32, and certainly none in other parts of the statute. AB 32 begins with legislative findings about the importance of addressing global warming, and urges coordination of California regulatory efforts with those of other jurisdictions. *See* Cal. Health & Safety Code § 38501(a),(b),(c),(f). Yet even if GHG reductions from the new LCFS program could be quantified, those reductions were assumed to be substantial, and they were assumed to extend nationwide ─ in other words, if every goal suggested by the statute's legislative findings were fulfilled ─ the end result would produce no appreciable effect on global warming. As explained in Appendix H, the difference in ambient temperatures could barely be resolved (in the third decimal place) by 2050, using the generally-accepted modelling system developed to assess the impacts of policies on global temperatures, and would be too small to be measured in the real world. In the 2009 LCFS rulemaking the CARB staff acknowledged this point, and suggested that the benefit to the LCFS program as a means of addressing climate change would lie in the export of the regulation outside California. Appendix H demonstrates that even under such an assumption, the LCFS program would not produce changes in the global climate. The LCFS program neither conforms with the rulemaking requirements of AB 32 nor serves the statute's highest aspirations.[33]

LCFS 46-47

B. California Environmental Quality Act ("CEQA") Analysis

The core of Growth Energy's CEQA comments on the LCFS and ADF regulations is contained in Appendix I and its attachments, in Appendix J, and the other appendices specifically

LCFS 46-48

[33] These observations on the lack of any change in the global climate resulting from the new LCFS program should not be taken to indicate that any regulation adopted under color of AB 32 could ever be exempt from the specific rulemaking requirements in section 38562 and other provisions of AB 32 that limit and specify CARB's authority.

referenced therein. The Board is required to consider detailed responses by the staff to each part of the Growth Energy's CEQA comments.[34]

LCFS 46-48 cont.

1. Impacts of the Proposed Regulations on Criteria Pollutants

The ISOR for the ADF regulation estimates that the biodiesel use allowed by the ADF regulation, which will occur as part of efforts to comply with the LCFS regulation, will increase emissions of oxides of nitrogen ("NOx") by 1.35 tons per day in 2014 and according to the ISOR, will drop to 0.01 ton per day by 2023. Here are some of the salient problems in the ISOR for the ADF regulation and in CARB's draft EA, as explained in Appendix I and its attachments:

ADF 17-2

- The ISOR and its related documents do not describe the total diesel NOx emissions inventory on which the assessment is based. — ADF 17-3
- The CARB staff has erroneously concluded that the use of biodiesel in "New Technology Diesel Engines (NTDEs)" equipped with exhaust aftertreatment devices to lower NOx emissions will not lead to increased NOx emissions. The CARB staff has also incorrectly apply ratios of on-road vehicle travel by NTDEs from the now obsolete EMFAC2011 model to account for the amount of biodiesel used in all NTDEs including those found in non-road equipment. — ADF 17-4
- The CARB staff has incorrectly subtracted NOx reductions from the use of "renewable diesel fuel" from increases in NOx increases from biodiesel when assessing the environmental impact of ADF regulation. — ADF 17-5
- A conservative but reliable assessment of the NOx emission impacts of biodiesel use under the ADF that uses the latest CARB emissions models and corrects the flaws in the staff analysis has been performed for Growth Energy and is summarized in Appendix I (Lyons). The results of that assessment indicate that NOx increases from biodiesel will be much larger than those estimated by CARB staff and that the magnitude of the impacts will not decline as forecast by CARB staff. — ADF 17-6
- In addition, the assessment performed for Growth Energy demonstrates that the ADF regulation will lead to significant increases in NOx emissions in the South Coast and San Joaquin Valley air basins which are already in extreme non-attainment of the federal ozone NAAQS and moderate non-attainment of the federal fine particulate NAAQS. — ADF 17-7

---

[34] *See* 17 C.C.R. § 6007(a)

- Inconsistencies and conflicts in the treatment of diesel and biodiesel fuels in the ADF and LCFS regulations create the potential for biodiesel blends to actually contain as much as 5 percent more biodiesel by volume than will be reported to CARB under the ADF regulation.

ADF 17-8

- Other errors in the CARB staff's environmental assessment include incorrectly selecting 2014 as the baseline year for the environmental analysis, a lack of documentation and use of unsupported assumption in determination of the NOx control level for biodiesel, and an unnecessary delay in the effective date for the implementation of mitigation requirements under the ADF regulation.

ADF 17-9

- Last year, during the development of the ADF and LCFS regulations, the CARB staff declined to adopt a proposed alternative to the ADF regulation submitted by Growth Energy. Given that the Growth Energy alternative was designed to mitigate all potential increases in NOx emissions, it yielded greater and more timely environmental benefits than the staff proposal. The Growth Energy alternative would have required the same mitigation methods as the ADF proposal but simply expanded the circumstances under which those methods must be applied; Growth Energy's proposal had a cost-effectiveness equal to that of ADF proposal.

LCFS 46-49
ADF 17-10

2. CARB's Certified CEQA Program

CARB's certified program under CEQA does not excuse it from its obligations to address those serious deficiencies in the ADF proposal and the draft EA. Although "[e]nvironmental review documents prepared by certified programs," such as that adopted by CARB, "may be used instead of environmental documents that CEQA would otherwise require," "[c]ertified regulatory programs remain subject . . . to other CEQA requirements." *City of Arcadia v. SWRCB* (2006) 135 Cal.App.4th 1392, 1421-22. CEQA documents prepared under certified regulatory programs are considered to be the "functional equivalent" of the documents CEQA would otherwise require. *Mountain Lion Found. v. Fish & Game Comm.* (1997) 16 Cal.4th 105, 113.

LCFS 46-50

Agencies with qualifying certified regulatory programs are excused only from complying with the requirements found in Chapters 3 and 4 of CEQA (*i.e.*, Pub. Res. Code, §§ 21100-21154) in addition to Public Resources Code § 21167. Pub. Res. Code, § 21080.5, subd. (c). "When conducting its environmental review and preparing its documentation," however, "a certified

LCFS 46-51

regulatory program is subject to the broad policy goals and substantive standards of CEQA."[35] The CEQA Guidelines implementing section 21080.5 provide that, "[i]n a certified program, an environmental document used as a substitute for an EIR must include '[a]lternatives to the activity and mitigation measures to avoid or reduce any significant or potentially significant effects that the project might have on the environment.'" (*City of Arcadia, supra*, 135 Cal.App.4th at 1422 [quoting CEQA Guidelines, § 15252(a)(2)(A)]. CARB's functional equivalent document is the "staff report," which "shall be prepared and published by the staff of the state board." 17 C.C.R., § 60005(a).[36] The regulations require the staff report to be "published at least 45 days before the date of the public hearing" on the rulemaking, and to "be available for public review and comment." (*Id.*) Staff reports must be prepared "in a manner consistent" "with the goals and policies of" CEQA, and "shall contain":

> a description of the proposed action, an assessment of anticipated significant long or short term adverse and beneficial environmental impacts associated with the proposed action and a succinct analysis of those impacts. The analysis shall address feasible mitigation measures and feasible alternatives . . . which would substantially reduce any significant adverse impact identified.

17 C.C.R. § 60005(b).

LCFS 46-51 cont.

The regulations also provide that an action "for which significant adverse environmental impacts have been identified during the review process shall ***not*** be approved or adopted as

LCFS 46-52

---

[35] Kostka & Zischke, *Practice Under Cal. Env. Quality Act* (2005) § 21.10] ["Kostka & Zischke"] [citing *City of Arcadia, supra*, 135 Cal.App.4th at 1422; *Sierra Club v. State Bd. of Forestry* (1994) 7 Cal.4th 1215; *Californians for Native Salmon & Steelhead Ass'n v. Dept. of Forestry* (1990) 221 Cal.App.3d 1419; *Envt'l Protection Info. Ctr. v. Johnson* (1985) 170 Cal.App.3d 604, 616].)

[36] In this case, CARB's staff report is accompanied by a draft EA.

proposed if there are feasible mitigation measures or feasible alternatives available which would substantially reduce such adverse impact." *Id*. § 60006. "Feasible" means "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors, and consistent with the state board's legislatively mandated responsibilities and duties." *Id*) If CARB receives comments raising "significant environmental issues associated with the proposed action," staff must "summarize and respond to the comments either orally or in a supplemental written report. Prior to taking final action on any proposal for which significant environmental issues have been raised, the decision maker shall approve a written response to each such issue." *Id*. § 60007.

LCFS 46-52 cont.

3. CEQA Analysis

Turning to the merits of CARB's current environmental analysis, and as explained in Appendix J, the draft EA does not comply with CEQA in several material respects.

LCFS 46-53

First, the draft EA fails to consider the significant environmental effects associated with the version of the LCFS regulation currently in effect. Although the proposed LCFS regulation is nearly identical in structure to the current LCFS regulation, the draft EA fails to describe or identify impacts associated with the whole of the "project" under CEQA by ignoring recognized significant impacts associated with the existing regulation. Ignoring such impacts is inconsistent with the writ issued by the superior court in *POET, LLC v. California Air Resources Board* (2013) 218 Cal.App.4th 681 ("*POET*"), and results in a vague and incomplete project description. The draft EA also fails to state what environmental baseline is being used in its analysis, although the substantive discussions in the EA suggest a baseline of 2014 is being used. A 2014 baseline is inconsistent with Section 15125(a) of the CEQA Guidelines because it does not accurately reflect when CARB commenced its environmental review of the LCFS regulations (2007), and obscures the amount of NOx emissions caused by the increased usage of biodiesel resulting from the LCFS

LCFS 46-54

LCFS 46-55

regulation. And even if CARB were able to credibly argue the current LCFS regulation is a different "project" than the nearly identical LCFS regulation proposed for "re-adoption," (1) analysis of pre-2014 impacts would nevertheless be required as "cumulative impacts," and (2) any attempt to ignore prior impacts would constitute impermissible piecemealing or segmentation of environmental review.[37]

LCFS 46-55 cont.

The draft EA's analysis of criteria pollutant emissions caused by the proposed regulations is also incomplete. The draft EA fails to analyze or discuss emissions of any criteria pollutants, other than NOx. But even the discussion of impacts associated with NOx emissions, however, is misleading and fails to consider additional NOx emissions caused by increased biodiesel usage. CARB cannot argue increased renewable diesel fuel usage will offset NOx increases associated with biodiesel. This increase is speculative, and there is no mitigation, legally-binding requirement, or other performance standard to ensure those offsets will occur. The draft EA's analysis of criteria pollutant emissions is also incomplete because fails to analyze known sources of NOx emissions, including emissions associated with biodiesel use in "New Technology Diesel Engines" (NTDEs). Notably, if a more credible analysis of NOx increases using generally accepted techniques is employed, estimated NOx emissions are calculated to be far more severe than that disclosed in the draft EA, and could total as much as 9.73 tons per day statewide in 2020, and 2.39 tons per day (or 872.35 tons per year) in 2020 in the San Joaquin Valley air basin alone. This figure is vastly higher than the 10 tons per year threshold of significant adopted by the San Joaquin Valley Air Pollution Control District for projects under CEQA, and results in emissions

LCFS 46-56

LCFS 46-57

LCFS 46-58

[37] The two regulations under consideration are also internally inconsistent, as Appendix I explains. To avoid an unstable and inaccurate project description, and to avoid additional NOx impacts associated these inconsistencies (including but not limited to the blending of "Alternative diesel fuel" mixed with "CARB diesel"), the regulations must be revised and reconciled.

that directly violate the mandate of AB32. Cal. Health & Safety Code, §§ 38562 (b)(4), 38570 (b).

LCFS 46-58 cont.

The draft EA also recognizes the proposed LCFS regulation would result in the construction of new or modified facilities to meet demand for fuels created by the regulations, including processing plants for agriculture-based ethanol, cellulosic ethanol, and biomethane. The draft EA, however, only generally describes the impacts associated with this increase in develop, although it is feasible to calculate the projected additional emissions associated with such development. Although the draft EA performs no analysis of the impacts associated with these facilities, it finds the impacts to be significant and unavoidable. This is impermissible; a lead agency cannot simply label an impact "significant and unavoidable" without first providing a discussion and analysis. *Berkeley Keep Jets Over the Bay Comm. v. Bd. of Port Comm'rs* (2001) 91 Cal.App.4th 1344, 1370.

LCFS 46-59

The failure to quantify the impacts associated with such new construction also violates CEQA because it forecloses mitigation. If the impacts were quantified, CARB could meaningfully explore ways to develop mitigation to reduce such impacts or modify the regulation to reduce those impacts. Instead, the draft EA merely sets forth "recognized practices" that are "routinely required" to avoid or minimize impacts, without requiring the implementation of any specific measure, or even evaluating whether any such measures – if incorporated – would actually reduce or minimize the impact. This is improper under CEQA because the proposed mitigation measures are not required or otherwise enforceable, there is no discussion as to the efficacy of any measure, there is no quantification of the benefits associated with any measure, and the specific mitigation to be employed is deferred to a later time.

LCFS-46-60

The draft EA also fails to identify and analyze environmental impacts associated with fuel shuffling, which CARB has elsewhere recognized as a reasonably foreseeable consequence of the LCFS regulation. For one component of the LCFS regulation – shuffling of ethanol alone by ship – shuffling would result in at least an additional 150,000 tons per year of CO2 equivalent emissions using CARB's own models, and an additional 385,000-735,000 tons per year using more accurate models. These figures do not even take into account ethanol shuffling by other modes of transportation, or crude oil shuffling. There is likewise no analysis as to whether fuel shuffling would result in increases in criteria pollutants either in-state or out-of-state.

LCFS 46-61

The draft EA also fails to adequately analyze project alternatives. For example, the draft EA rejects the Growth Energy alternative, even though the alternative would significantly reduce NOx emissions associated with biodiesel. The draft EA also impermissibly rejects consideration of a Cap & Trade Alternative, even though that alternative would result in none of the numerous impacts the EA found to be significant and unavoidable. The CEQA Guidelines specifically recognize that comments raised by members of the public on an environmental document are particularly helpful if they suggest "additional specific alternatives . . . that would provide better ways to avoid or mitigate the significant environmental effects," CEQA Guidelines, § 15204, and CARB may not limit its project objectives in a way to foreclose consideration of any and all projects, with the exception of the project under consideration. It was exactly this type of pre-judgment that the Court of Appeal warned against in the *POET* decision in its discussion of *post hoc* environmental review, and impermissible delegation of environmental review authority.

LCFS 46-62

In sum, CEQA places the burden of environmental investigation on government rather than the public," and the draft EA falls well short of a complete and accurate investigation of the environmental effects of the proposed regulations. *Sundstrom v. County of Mendocino* (1988) 202

LCFS 46-63

Cal.App.3d 296, 311. As a result of these failures, the EA must be revised substantially, and recirculated for public review, prior to CARB's consideration of the proposed regulations for adoption.

LCFS 46-63 cont.

IV. THE BOARD'S GOVERNMENT CODE AND RELATED OBLIGATIONS

Addressing the deficiencies in the draft EA and the CARB staff's related environmental materials identified in Part III above and in Appendices I and J will require significant time and resources, if the Board decides to proceed with rulemaking based on the currently proposed regulations. Simultaneously with that effort, the Board also needs to consider whether there are less burdensome alternatives to the current staff proposals, as the Government Code requires, and also address serious problems in the transparency of the current rulemaking process. CARB's tasks under CEQA and the Government Code substantially overlap, because Growth Energy has proposed an alternative to the current LCFS regulation that would eliminate the need for NOx mitigation and thus greatly simplify the CEQA effort, while also reducing the costs and burdens of attaining the identified goals of AB 32.

LCFS 46-64

A. The Analysis of Alternatives under the Government Code

The Legislature regularly gives California administrative agencies wide discretion in achieving the purposes of the statutes it enacts, but it also requires that agencies avoid unnecessary or unduly burdensome regulation. Agencies cannot first propose regulations unless they have determined that no alternative to their own proposal would be "as effective and less burdensome to affected private persons and equally effective in implementing the statutory purpose or other provision of law." *See* Cal. Gov't Code § 11346.5(a)(13). Nor can an agency finally adopt its own proposal unless it can properly affirm and explain, with "supporting information," that "no alternative" that it has considered "would be more effective and less burdensome to affected

private persons than the adopted regulation, or would be more cost effective to affected private persons and equally effective" in meeting a legislative objective. *Id.* § 11346.9(a)(4).

There is no question that the proposed LCFS and ADF will impose costs on "private persons" and businesses in California, of as much as 13 cents per gallon by 2020, depending on the costs of LCFS credits. (*See* Part II.B above.) Growth Energy responded to the staff's call in the spring and summer of 2014 pursuant to SB 617 for the submission of alternatives to the current LCFS regulation, and what was understood about the developing proposed amendment to the LCFS regulation, as well as the developing proposed ADF regulation.[38] The threshold question that the Board must therefore address is whether it considers itself bound by the Government Code to consider Growth Energy's proposed alternatives to what the CARB staff has now proposed. If the Board believes it has no such obligation, Growth Energy requests that CARB explain its reasons, and specify the deficiencies in Growth Energy's proposed alternatives.

LCFS 46-65

1. The Apparent Goals of the LCFS Program

Assuming that the Board agrees that it needs to consider Growth Energy's alternatives under the Government Code, the next task is to determine what benefits the CARB staff is claiming for its LCFS proposal. In that regard, the SB 617 process in 2014 was illuminating. Growth Energy's proposal would have required, depending on the CARB staff's view on the need to control upstream GHG emissions associated with the use of biofuels in California, an amendment to the current AB 32 cap-and-trade regulation applicable to the transportation fuels section.[39] The

LCFS 46-66

[38] *See* Appendix F.

[39] *Ibid.*

CARB staff responded as follows in the Consolidated Standardized Regulatory Impact Statement ("CSRIA") for the LCFS and ADF proceedings:

> ARB is required to analyze only those alternatives that are reasonable and that meet the goals of the program as required by statute. An initial assessment of the program indicates the goals of the LCFS proposal can be achieved by keeping the program '…separate of the AB 32 Cap-and-Trade system initially (at least first 10 years) in order to stimulate innovation and investment in low-GWI [global warming intensity] fuel (or transportation) technologies.' Due to the strong justifications that the Cap-and-Trade program alone generates neither the CI reductions nor fuel in the transportation sector, this alternative will not be assessed in this document.

CSRIA at 27 (footnote omitted.). Importantly, the CSRIA conceded that Growth Energy's proposed alternative would "likely" achieve the same "estimated GHG emissions reductions" as the current regulation in the period up to 2020. (*Id*. at 26-27.)

The deficiency in the Growth Energy proposal, according to the CSRIA, was not that it created a GHG emissions reduction shortfall at any point prior to the end of the current regulatory horizon; instead, the problem is that the Growth Energy proposal did not rely on the same purported strategy of fuels diversification and achievement of GHG emissions reductions as proposed by CARB. As Appendix A of the CSRIA explained:

> Transportation in California was powered almost completely by petroleum fuels in 2010. … Transitioning California to alternative, lower-carbon fuels requires a very focused and sustained regulatory program tailored to that goal. … In the absence of such a program, post-2020 emissions reductions would have to come from a transportation sector that would, in all likelihood, have emerged from the 2010-2020 decade relatively unchanged. ***In the absence of an LCFS designed to begin the process of transitioning the California transportation sector to lower-carbon fuels starting in 2010, post-2020 reductions would be difficult and costly to achieve.*** This is why the primary goals of the LCFS are to reduce the carbon intensity of California fuels, and to diversify the fuel pool. A transportation sector that achieves these goals by 2020 will be much better positioned to achieve significant GHG emissions reductions post-2020.

LCFS 46-66 cont.

CSRIA at 27 (emphasis added). In essence, the CSRIA claimed that fuels diversification and carbon intensity requirements were necessary in order to make post-2020 greenhouse gas reductions less costly and less difficult to achieve. The text of AB 32 does not itself require the use of a fuels diversification strategy or CI indexes to achieve GHG reductions, and certainly does not mandate the use of regulations intended to reduce the carbon intensity of transportation fuels to achieve greenhouse gas reduction, in order to achieve "the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions." Cal. Health & Safety Code § 38562(a). If the Board believes otherwise, Growth Energy requests that CARB identify the statutory text within AB 32 that requires the creation of a fuels diversification strategy or the use of CI regulations to reduce GHG emissions.[40]

LCFS 46-66 cont.

Assuming the CARB staff's position on the need for a LCFS program now (*i.e.*, from the present time until 2020) must be linked back to the purpose of AB 32 (which is to reduce GHG emissions), the staff's position seems to be that the regulation of the carbon intensity of transportation fuels is necessary now in order to reduce the costs or difficulties of achieving greenhouse gas reductions after 2020. Certainly, the CARB staff cannot defend its current proposal on the basis of any GHG reductions it will achieve: as noted in Part III.A.3 of these comments, the CARB staff has apparently abjured any effort to quantify the GHG reductions that the new LCFS regulation will achieve, either before or after 2020. In other words, the current LCFS program, stripped to its essential purposes, is not a measure to achieve any quantity of GHG

LCFS 46-67

---

[40] The CSRIA identified a white paper published in 2008 by researchers at the University of California (Davis) as support for the CARB staff's position on the need for CI-based regulations. If CARB believes that the 2008 white paper bears on the scope of its authority or discretion under AB 32, it should explain why.

LCFS 46-66 cont.

emissions reductions over an identified time period; it is a measure to prepare California to achieve some unspecified quantity of GHG reductions at some time in the future.

LCFS 46-67 cont.

2. The Requirements of Section 11346.9(a)(4)

As also indicated in Part III.A.3 of these comments, absent some "quantifiable" GHG emissions reductions, a regulation adopted under color of AB 32 is not within the scope of CARB's authority; the proposed new LCFS regulation is therefore invalid under section 11342.2 of the Government Code. Even CARB were to take a different view of the scope of its authority under AB 32, the Board would still need, under the California APA, to prove that Growth Energy's alternative does not meet the criteria of section 11346.9(a)(4).[41] The CARB staff has given the Board no basis for claiming to have so proved. Several points are important on this issue.

LCFS 46-68

First, as Growth Energy pointed out in its SB 617 proposal last year, the federal renewable fuels program provides for the production and sale of cellulosic and "advanced" biofuels in the same time frame as the LCFS regulation. While the federal program does not require the use of electricity or hydrogen as a transportation fuel, the California motor vehicle emissions control and zero-emission vehicle programs (also noted in Growth Energy's proposal) certainly do.[42] The record in this rulemaking is devoid of any demonstration that the LCFS program will increase fuels diversification more than the federal RFS program and the State's electric-vehicle and related

LDFS 46-69

---

[41] The text of the APA makes it clear that the agency has the burden of proving "with supporting information" that no alternative considered by the agency would meet the criteria of section 11346.9(a)(4). If the Board does not agree that it has that burden, it should explain why not. In addition, the Board should articulate the standard that it believes would apply to judicial review of the determination required in section 11346.9(a)(4), and explain its full basis for choosing that standard.

LCFS 46-68 cont.

[42] *See* Appendix F (Growth Energy's proposed alternative to the LCFS regulation, describing the programs that will achieve the fuels diversification sought by CARB, in the absence of the LCFS regulation).

LCFS 46-69 cont.

programs will. To the contrary, the CARB staff has admitted that it is "unclear to what degree" the LCFS program will require "new production" of "less carbon-intensive fuels … in California or elsewhere."[43] If the record currently contains an analysis that estimates the increase in fuels diversification that the LCFS regulation will achieve compared to the federal RFS program, CARB should identify.

LCFS 46-69 cont.

Second, as should be clear from the ADF ISOR and in the ADF ISOR's accompanying materials, the use of the CI-based regulatory strategy that the CARB staff is recommending will impose costs on the California motoring public, if they bear any costs of the mitigation strategy that the use of the LCFS regulation will require. As Growth Energy has demonstrated in Part III.B and the related Appendices, those costs may be even greater if CARB adheres to its duties under CEQA (though the cost-effectiveness of the mitigation strategy will not change). In addition, the increases in GHG emissions entailed in moving sugarcane ethanol to California (see Part III.A and Appendix G) will likely need to be offset by other types of GHG controls, which will impose additional costs on California consumers and businesses. The CARB staff has not offered any analysis to the Board that explains why those ***present*** costs, along with the direct costs of the LCFS program in the near term, are worth incurring in order to make the ***future*** costs of post-2020 GHG emissions reductions less costly. Conclusory or self-serving statements by businesses who claim that they will construct facilities or produce and market advanced, diversified liquid biofuels are entitled to no weight.

LCFS 46-70

[43] *See* LFCS ISOR Appendix E at E-5.

Third, the long-run, post-2020 plans for GHG reductions developed by CARB call for the phase-out of reliance on liquid biofuels;[44] low-CI liquid fuels, however, are presumably the fuels whose production is in need of diversification, according to the CSRIA. Eventually, the State plans to eliminate gasoline, in particular, from use in California cars and trucks and to fully replace gasoline with electricity. Putting to the side whether CARB's post-2020 strategy is meritorious, the CARB staff has given the Board no basis to explain why CARB should impose costs on California consumers and businesses to foster the use of fuels that (according to CARB) are destined for a diminishing, and no long-term, role in its greenhouse gas reduction strategy.

LCFS 46-71

One other important, procedural point must also be noted here. The demonstration required by section 11346.9(a)(4) that there are no superior alternatives to a proposed regulation (as the statute defines superiority) must be based on "supporting information." At present, there is no such "supporting information" in the rulemaking file of which Growth Energy is aware, perhaps because the CARB staff has looked ahead to the Board's obligations under section 11346.9(a)(4) of the Government Code. If the Board intends to add such information to the rulemaking file in order to try to carry its burden under section 11346.9(a)(4), it must comply with section 11347.1 of the Government Code.

LCFS 46-72

In sum, with regard to the LCFS proposal, CARB is not currently positioned to proceed with final rulemaking because, among other reasons, it cannot discharge its obligations under section 11346.9(a)(4) of the Government Code. If the Board intends to pursue the staff's proposal, it must address the issues raised here, both substantive and procedural.[45]

LCFS 46-73

---

[44] *See* http://www.arb.ca.gov/planning/vision/vision.htm.

[45] If the Board does not agree with Growth Energy's analysis of the obligations of section 11346.9(a)(4), Growth Energy requests that the Board explain its reasons for disagreement.

B. Requirements of Transparency

Section 11347.3 of the Government Code requires CARB to maintain a "file of [the] rulemaking proceeding" for any proposed regulatory action subject to the APA, including the LCFS regulation." The rulemaking file must include, among other items, the following:

> (6) All *data and other factual information,* any studies or reports, and written comments submitted to the agency in connection with the adoption, amendment, or repeal of the regulation.
>
> (7) All data and other factual information, *technical*, *theoretical*, and *empirical studies or reports*, if any, on which the *agency is relying* in the adoption, amendment, or repeal of a regulation, including any cost impact estimates as required by Section 11346.3.

Gov't Code § 11347.3(b)(5),(6) (emphasis added). The entire rulemaking file, including the foregoing material, must be "available to the public for inspection" from the time when the first notice of the proposed rulemaking is published in the California Regulatory Notice Register, *id.* at § 11347.3(a), which here occurred on January 2, 2015.

As the above-quoted text makes clear, rulemakings at CARB must include the creation of a rulemaking file that includes "***[a]ll*** data and other factual information, any studies or reports, and written comments submitted to the agency" in connection with the proposal. Gov't Code § 11347.3(a),(b)(6) (emphasis added). To assure immediate public access to the supporting materials as soon as the 45-day materials are released, the APA requires that the 45-day notice include a statement that the agency on the date of the notice "has available *all* information upon which [the] proposal is based." *Id*. § 11346.5(a)(16) (emphasis added). A separate provision confirms that the agency must in fact make those records, and any other "public records, including reports, documentation, and other materials, related to the proposed action," available. *Id.* § 11346.5(b).

The "written comments" that must be placed in the record are not simply those submitted to the agency in a particular manner or at a particular time, such as during the period between publication of the notice of a public hearing and public hearing -- an agency must put "all" it receives "in connection with" a regulatory proposal in the rulemaking file. The Legislature's choice of words to describe what comments must be placed in the file -- "in connection with" -- sweep with intentional breadth, and require inclusion of any comments that bear on the subject of the regulatory effort. In addition, the period of public availability must "[c]ommenc[e] *no later than* the date that the notice of the proposed action is published." *Id.* § 11347.3(a) (emphasis added). The use of the term "no later than" makes it clear that the Legislature expected written comments submitted in connection with a proposed regulatory action and received before publication of the required notice to be included in the rulemaking file.

LCFS 46-74

Growth Energy has substantial concerns about the completeness of the rulemaking files for the current LCFS and ADF rulemakings, as it did in the prior LCFS rulemaking in 2009. The Court of Appeal made clear in *POET v. CARB* that neglect to include even a limited number of relevant documents in the rulemaking file would violate the Government Code. To avoid further controversy, Growth Energy requests that the Executive Officer or the CARB legal staff consider and respond to the following questions:

LCFS 46-75

ADF 17-11

1. Does the CARB legal staff agree that the rulemaking file for these two proceedings must include external communications submitted to the staff, the Executive Officer or the Board prior to the date when the rulemaking file is formally opened must be included in the rulemaking file, if those communications were submitted in connection with the adoption or amendment of ADF and/or LCFS regulation? Conversely, does the CARB legal staff believe that no such external communications submitted before the rulemaking file would come within the definition of records

LCFS 46-76

required for inclusion in the file, pursuant to section 11347.3(b)(6)? Are there any written guidelines or instructions used by the CARB staff to determine whether a communication submitted before the file is opened must be included in the file? Are there any written guidelines or instructions that the CARB staff uses in order to determine what constitutes "data … other factual information … studies or reports," or "written comments," that should be included in the rulemaking file? Will any such guidelines or procedures be made available?

LCFS 46-76 cont.

2. The ADF rulemaking was opened in 2013 and then pretermitted in 2014. What steps have been taken to assure that that all external submittals (not within the scope of section 11347.3(b)(7) concerning the 2013-2014 regulatory process were included in the ADF rulemaking file opened in January 2015? If the CARB legal staff believes that no such external submittals before January 2015 were required to be included in the "new" rulemaking file, was there any process by which the public could obtain prompt access to those materials?

ADF 17-12

Turning to the requirements of section 39601.5 of the Health & Safety Code, as noted in Part I, the Legislature in AB 1085 directed CARB to provide "all information" on key aspects of its regulatory analysis "before the public comment period for any regulation" commences under the Government Code. Growth Energy requests that the CARB legal staff explain what steps were taken to provide all the information covered by section 39601.5 in connection with the current LCFS and ADF rulemakings. Growth Energy requests that each document or other file made available to the public under section 39601.5 prior to January 2, 2015, in connection with these two rulemakings be identified, along with the date it was made available and the method by which it was made available.

LCFS 46-77

C. The SB 617 Process

As the correspondence included in Appendix F makes clear, the version of the ADF proposal on which the CARB staff invited comment and responses in the SB 617 process in 2014

ADF 17-13

differed materially from the version of the ADF proposal that the CARB staff was discussing with some stakeholders, and that the CARB staff eventually included in the current rulemaking package. Those differences related to the circumstances under which mitigation would be required, and thus both to the environmental impacts and the costs of ADF regulation. Growth Energy believes that CARB did not substantially comply with SB 617 in connection with the ADF rulemaking, and that the Department of Finance failed to perform a mandatory duty to notify CARB and the public of CARB's noncompliance and to require CARB to comply. Growth Energy therefore requests that the Board reopen the SB 617 process, and allow that process to proceed simultaneously with other work on the ADF regulation. If the Board believes there was substantial compliance with SB 617 in the ADF rulemaking process, Growth Energy requests that CARB explain the basis for that belief.

ADF 17-13 cont.

D. External Peer Review

The Executive Officer has indicated that he has sought external scientific peer review in connection with the LCFS rulemaking. The subjects of that peer review effort, however, are unknown, and it is not clear whether the Executive Officer has sought peer review under section 57004 of the Health & Safety Code for the scientific basis and scientific portions of any part of the currently proposed ADF regulation. If no such peer review has been sought and completed, Growth Energy requests an explanation of the reason why none was sought and completed.

ADF 17-14

V. CONCLUSION

Growth Energy appreciates the opportunity to participate in these rulemakings. Growth Energy believes that the current record does not enable the Board to adopt the regulatory proposals presented by the staff, and hopes that the Board will reconsider the staff's decision not to propose the alternative to the LCFS program that Growth Energy offered in the SB 617 process in 2014. If adopted, the current LCFS proposal will have a devastating impact on Growth Energy's

members, who will be forced to exit from the California alternative fuels market. Such an outcome will likely trigger the cost-containment caps in the proposed regulation, and any claimed benefits of the LCFS program will be compromised or lost. By contrast, Growth Energy's alternative proposal will assure the continued supply of reasonably-priced renewable fuel to the California market, and can achieve the same overall GHG reductions as sought by the 2009 LCFS regulation while not creating any increases in criteria pollutants.

Respectfully submitted,

GROWTH ENERGY

February 17, 2015

STATE OF CALIFORNIA

BEFORE THE AIR RESOURCES BOARD

Declaration of James M. Lyons

I, James Michael Lyons, declare as follows:

1. I make this Declaration based upon my own personal knowledge and my familiarity with the matters recited herein. It is based on my experience of nearly 30 years as a regulator, consultant, and professional in the field of emissions and air pollution control. A copy of my résumé can be found in Attachment A.

2. I am a Senior Partner of Sierra Research, Inc., an environmental consulting firm located at 1801 J Street, Sacramento, California owned by Trinity Consultants, Inc. Sierra specializes in research and regulatory matters pertaining to air pollution control, and does work for both governmental and private industry clients. I have been employed at Sierra Research since 1991. I received a B.S. degree in Chemistry from the University of California, Irvine, and a M.S. Degree in Chemical Engineering from the University of California, Los Angeles. Before joining Sierra in 1991, I was employed by the State of California at the Mobile Source Division of the California Air Resources Board (CARB).

3. During my career, I have worked on many projects related to the following areas: 1) the assessment of emissions from on- and non-road mobile sources, 2) assessment of the impacts of changes in fuel composition and alternative fuels on engine emissions including emissions of green-house gases, 3) analyses of the unintended consequences of regulatory actions, and 4) the feasibility of compliance with air quality regulations.

4. I have testified as an expert under state and federal court rules in cases involving CARB regulations for gasoline, Stage II vapor recovery systems and their design, factors affecting emissions from diesel vehicles, evaporative emission control system design and function, as well as combustion chamber system design. While at Sierra I have acted as a consultant on automobile air pollution control matters for CARB and for the United States Environmental Protection Agency. I am a member of the American Chemical Society and the Society of Automotive Engineers and have co-authored nine peer-reviewed monographs concerned with automotive emissions including greenhouse gases and their control. In addition, over the course of my career, I have conducted peer-reviews of numerous papers related to a wide variety of issues associated with pollutant emissions and air quality.

5. This Declaration summarizes the results of analyses I have performed regarding CARB staff's analysis of different aspects of the re-adoption of the Low Carbon Fuel Standard (LCFS) Regulation and Regulation on the Commercialization of Alternative Diesel Fuels (ADFs) as an independent expert for Growth Energy. If called upon to do so, I would testify in accord with the facts and opinions presented here.

6. Based on a review of the Initial Statement of Reasons (ISOR) for the LCFS regulation and the associated appendices, including the draft Environmental Analysis, it is clear that CARB staff failed to quantify the GHG emission reductions associated with the LCFS regulation itself. Rather, staff notes that the GHG reduction estimates provide are inflated as the result of the "double counting" of GHG reductions due to other regulatory programs. LCFS 46-235

7. Further, this review shows that CARB staff failed to perform a complete analysis of the potential air quality impacts associated with the LCFS regulation. More specifically, CARB staff's air quality analysis fails to quantitatively assess the impact of the LCFS and ADF on all emission sources that could be affected nor does it consider all of the pollutants for which emission changes might occur. A summary of the review is Attachment B to this declaration. LCFS 46-236

8. CARB staff rejected a proposed alternative to the LCFS regulation submitted by Growth Energy claiming that it will likely result in the same environmental benefits, but not ensure a transition to lower carbon intensity fuels that CARB staff claims is the main goal of the LCFS regulation. As discussed in detail in Attachment C to this declaration, CARB staff failed to perform any analysis of the Growth Energy Alternative and has provided no support for this finding. Because the Growth Energy Alternative provides greater environmental benefits and is expected to cost less than the LCFS regulation, it must be adopted by CARB instead of the LCFS regulation. LCFS 46-237

9. As part of the development of the ADF regulation, CARB staff examined the impacts of the proposed regulation on emissions of pollutants including oxides of nitrogen (NOx) emitted from heavy-duty diesel engines operating on blends of diesel fuel and biodiesel.

10. NOx emissions directly affect atmospheric levels of nitrogen dioxide, a compound for which a National Ambient Air Quality Standards (NAAQS) has been established. NOx emissions are also precursors to the formation of ozone and particulate matter, which are also pollutants for which NAAQS have been established. Areas of the South Coast and San Joaquin Valley air basins are in extreme and moderate non-attainment of the most recent ozone and fine particulate standards, respectively. LCFS 46-238

11. In the Initial Statement of Reasons (ISOR) for the ADF regulation and its' appendices, CARB staff summarized its analysis of increases in NOx emissions from heavy-duty diesel vehicles over the period from 2014 through 2023. The results of the staff's analysis are most clearly summarized in Table B-1 of Appendix B of the ISOR. This table shows that staff estimate that biodiesel use allowed under the ADF regulation will increase NOx emissions by 1.35 tons per day in 2014 and that the magnitude of this emission increase will drop to 0.01 ton per day by 2023. ADF 17-18

12. I have performed a review of the staff's assessment of the NOx emission impacts of biodiesel use allowed under the ADF regulation presented in ISOR and its' appendices and find it to be fundamentally flawed such that it is not reliable. First, the bases for total diesel NOx emissions inventory is not described in the ISOR or in other ADF 17-19

documents in the record. Second, CARB staff incorrectly assumes that the use of biodiesel in "New Technology Diesel Engines (NTDEs)" equipped with exhaust aftertreatment devices to lower NOx emissions will not lead to increased NOx emissions. Third, CARB staff incorrectly apply ratios of on-road vehicle travel by NTDEs from the now obsolete EMFAC2011 model to account for the amount of biodiesel used in all NTDEs including those found in non-road equipment. Fourth, to assess the overall impact of the ADF regulation on NOx emissions, CARB incorrectly subtracts NOx reductions resulting from the use of "renewable diesel fuel" from increases in NOx emissions resulting from the use of biodiesel.

ADF 17-19 cont.

13. In addition, I have performed a very conservative assessment of the NOx emission impacts of biodiesel use under the ADF that uses the latest CARB emissions models and corrects the flaws in the staff analysis, a summary of which is attached. The results of this assessment indicate that NOx increases from biodiesel will be much larger than those estimated by CARB staff and that the magnitude of the impacts will not decline over time as forecast by CARB staff. In addition, the analysis shows that the ADF regulation will lead to significant increases in NOx emissions in the South Coast and San Joaquin Valley air basins which are already in extreme non-attainment of the federal ozone NAAQS and moderate non-attainment of the federal fine particulate NAAQS. The details of both the review and revised emissions estimates are presented in Attachment D to this declaration.

ADF 17-20

14. In addition to identifying a fundamentally flawed analysis of the increases in NOx emissions from biodiesel use under the ADF, my review indicates that other elements of the staff's air quality and environmental analyses are also fundamentally flawed. These include incorrectly selecting 2014 as the baseline year for the environmental analysis, lacking documentation and using unsupported assumptions in determination of the NOx control level for biodiesel, and unnecessarily delaying the effective date for the implementation of mitigation requirements under the ADF regulation. All of these issues, which are discussed in detail in Attachment E, cause the adverse environmental impacts of the ADF regulation to be greater than purported by CARB staff.

ADF 17-21

15. Another important issue that I have identified with the ADF regulation is that it and the related LCFS and California Diesel regulations contain inconsistent and conflicting definitions and lack provisions requiring the determination, through testing, of the biodiesel content of commercial blendstocks. As a result, there is a clear potential for biodiesel blends to actually contain as much as 5% more biodiesel by volume than will be reported to CARB under the ADF regulation. A detailed discussion of the flaws in the ADF regulation that could allow this to occur is provided in Attachment F. Actual biodiesel levels above those reported under the ADF will lead to larger unmitigated increases in NOx emissions than have been estimated by either CARB staff or me.

ADF 17-22

16. CARB staff has rejected a proposed alternative to the ADF regulation submitted by Growth Energy, claiming that it will result in the same environmental benefits but be more costly than the staff proposal. As discussed in detail in Attachment G to this declaration, this finding is based on the same fundamentally flawed emissions

ADF 17-23

analysis performed by CARB staff that is discussed above. Given that the Growth Energy alternative is designed to mitigate all potential increases in NOx emissions (when assessed in light of a proper emissions analysis) due to biodiesel use under the ADF as soon as the regulation becomes effective, it yields greater and more timely environmental benefits than the staff proposal. In addition, the Growth Energy alternative would require the same mitigation techniques as the ADF regulation, but simply expands the circumstances under which they must be applied, and has an estimated cost-effectiveness equal to that of ADF regulation. Because the Growth Energy Alternative provides greater environmental benefits as cost-effectively as the ADF regulation, it must be adopted by CARB instead of the ADF regulation.

ADF 17-23 cont.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed this 17th day of February, 2015 at Sacramento, California.

JAMES M. LYONS

Attachment B

Review of CARB Staff's Analysis of the GHG and Air Quality Impacts of the LCFS Regulation

In developing the proposed Low Carbon Fuel Standard (LCFS) regulation for re-adoption, CARB staff purports to have performed an analysis of the impacts that the regulation will have on emissions of both greenhouse gases and air pollutants. However, as is documented below, a review the CARB analysis demonstrates that the staff's analysis is incomplete and unsuitable for use in determining whether or not all adverse impacts have been identified and properly quantified, and all mitigation measures have been appropriately considered.

Summary of the CARB Staff Air Quality Analysis

On December 30, 2014, CARB staff released the proposed LCFS regulation language and the accompanying Initial Statement of Reasons (ISOR), Draft Environmental Analysis, and other supporting documents. Staff's analysis of the impact of the LCFS proposed for re-adoption is contained in Chapter IV of the ISOR as well as in Chapter 4.3. of the Draft Environmental Analysis.

LCFS 46-239

In Table IV-2 of Chapter IV of the ISOR, CARB staff provides unsupported estimates of the reduction in GHG emissions associated with the LCFS regulation proposed for re-adoption. However, by CARB staff's own admission, the estimates presented in Table IV-2:

> *…do not include a reduction to eliminate the double counting of the Zero Emission Vehicle mandate, the federal Renewable Fuels Standard program, the Pavley standards, or the federal Corporate Average Fuel Economy program.*

Given that CARB staff has failed to estimate and report the GHG reduction benefits of the LCFS regulation proposed for re-adoption separately from other regulations that also seek to reduce GHG emissions from mobile sources, the Board and the public do not know the actual benefits expected to result from the regulation nor can alternatives to the LCFS regulation be properly evaluated by CARB staff.

LCFS 46-240

Turning to the air quality analysis in Chapter IV of the ISOR, CARB staff provides a general discussion of emissions associated with transportation fuel production at California refineries, as well as ethanol, biodiesel, renewable diesel, and potential cellulosic ethanol facilities. Emission factors in, terms of pollutant emissions per year per million gallons of fuel produced, are provided for some facilities. CARB staff also provides an undocumented analysis of NOx and $PM_{2.5}$ emissions associated with "*...the movement of fuel and feedstock in heavy-duty diesel trucks and railcars"* with and

LCFS 46-241

without the LCFS and ADF regulations in place. No other assessment of the air quality impacts associated with the LCFS is provided in the LCFS ISOR.

LCFS 46-241 cont.

As noted above, the draft Environmental Analysis (EA) for the LCFS and ADF, which is Appendix D to both the LCFS and ADF ISORs, also addresses air quality in Chapter 4.3. Here, short term air quality impacts related to the construction of projects of various types related to the production and distribution of lower carbon intensity fuels under the LCFS are presented. There is, however, no analysis that indicates where these projects will be located within California, nor any quantitative assessment of the emission and environmental impacts beyond the following:

> *Based on typical emission rates and other parameters for abovementioned equipment and activities, construction activities could result in hundreds of pounds of daily NO_x and PM emissions, which may exceed general mass emissions limits of a local or regional air quality management district depending on the location of generation. Thus, implementation of new regulations and/or incentives could generate levels that conflict with applicable air quality plans, exceed or contribute substantially to an existing or projected exceedance of State or national ambient air quality standards, or expose sensitive receptors to substantial pollutant concentrations.*

LCFS 46-242

There is also a general discussion of potential approaches to mitigation, which CARB staff concludes are outside of the agency's authority to adopt. Ultimately, the draft EA concludes that the "short-term construction-related air quality impacts…associated with the proposed LCFS and ADF regulations would be potentially significant and unavoidable."

LCFS 46-243

The draft EA also purports to assess the long-term impacts of the LCFS and ADF regulations, but addresses and attempts to quantify only potential increases in NOx emissions due to the use of biodiesel fuels, and concludes with CARB staff ultimately claiming that the long term impacts of the LCFS and ADF on air quality will be "beneficial."

LCFS 46-244

Review of the CARB Staff Air Quality Analysis

As summarized above, the air quality related analyses performed by CARB staff regarding the proposed LCFS regulation are both limited and cursory. In order to demonstrate that this is in fact the case, one has to look no further than the air quality analysis CARB staff performed in 2009 to support the original LCFS rulemaking.[1]

LCFS 46-245

[1] California Air Resources Board, Proposed Regulation to Implement the Low Carbon Fuel Standard, Volume I: Staff Report: Initial Statement of Reasons, March 5, 2009 and Volume II: Appendices, March 5, 2009. See in particular, Chapter VII of the ISOR and Appendix F.

The first point of note is that in the 2009 ISOR, CARB staff presents quantification of the GHG reductions expected from the LCFS occurring both in California and worldwide in Tables VII-1 and VII-2. While, those estimates have no relevance to the current rulemaking given the differences in the two regulations, fundamental changes in CARB's expectations with respect to how fuel producers will comply with a LCFS regulations, as well as the evolution of methodologies for estimating GHG emissions, provide clear evidence that the GHG emission benefits of the proposed LCFS can and should be explicitly quantified without any "double counting" of the benefits due to other regulatory programs. It should also be noted that in the 2009 ISOR, CARB staff also breaks down the GHG emission benefits expected from specific substitutes for gasoline and diesel fuel.

LCFS 46-246

Turning to the air quality analysis itself, the lack of documentation provided precludes any detailed review of the accuracy of the assumptions and methodologies underlying the analysis or any effort to attempt to reproduce the staff's results. Given this lack of documentation, additional information was requested from CARB. As part of this request, Sierra Research pointed out that pursuant to the requirements of AB 1085, the agency had provided far more detailed information for other recent major rulemakings, including the Advanced Clean Cars program, than it released regarding the LCFS and ADF proposals. Unfortunately, CARB staff choose not to provide any additional information related to the analyses underlying the proposed LCFS and ADF regulations.

LCFS 46-247

Another striking contrast which highlights the superficiality of the air quality analysis performed for the re-adoption of the LCFS can be seen in the treatment of potential emission impacts associated with the development of biofuel production facilities in California. These impacts are particularly important because the form of the LCFS regulation provides incentives to build biofuel production facilities in areas of California that violate federal National Ambient Air Quality standards, rather than in other states that are in compliance with those standards. The incentive for locating biofuel plants in California is to avoid GHG emissions from fuel and/or feed stock transportation which result in higher carbon intensity values.

LCFS 46-248

As noted above, the air quality analysis for the re-adoption of the LCFS presented in section IV of the ISOR provides only estimates for existing California biofuel production facilities and the potential emissions of NO_x, PM_{10}, and volatile organic compounds (VOCs) associated with a hypothetical "northern California" cellulosic ethanol plant. In contrast, in the 2009 ISOR, staff provides a quantitative estimate of the overall number and types of new biofuel production facilities expected to be built in California (Table VII-6 of the 2009 ISOR) as well as a distribution of the number and type of plants expected to be built in eight of the state's air basins and a map showing expected locations. The increases in emissions of not only NO_x, PM_{10}, and VOC, but also carbon monoxide (CO) and $PM_{2.5}$ associated with these biodiesel production facilities were quantified by CARB staff (Table V11-10 of the 2009 ISOR). Again, although the data presented in the 2009 LCFS ISOR are irrelevant with respect to the current re-adoption of the LCFS regulation, the same level of detail and scope of the analysis performed by CARB staff in 2009 should have at a minimum been applied to the current LCFS air quality analysis.

LCFS 46-249

Another issue noted with the air quality analysis performed for the re-adoption of the LCFS is related to emission impacts associated with "fuel and feedstock transportation and distribution."

LCFS 46-250

Attachment B-3

The total impact of the LCFS and ADF on NOx and $PM_{2.5}$ emissions from these activities, which constitute a long term operational impact on air quality, are quantified in Table IV-16 of the ISOR. However, the documentation provided describing how the staff's analysis was performed is insufficient to allow one to either review or reproduce it. Further, these emissions are not addressed in the appropriate section of the draft EA. Given that staff estimates that the LCFS/ADF will increase these emissions, they should be identified and assessed as part of the draft EA, particularly given that staff has concluded that the LCFS/ADF impacts on long term air quality are beneficial without considering fuel and feedstock transportation and distribution emissions. The current analysis of these emissions also falls far short of the level of detail shown in the analysis of the same issue performed by CARB staff in the 2009 ISOR, as can be seen in Table VII-11 where impacts on VOC, CO, PM_{10}, and oxides of sulfur (SO_x) were reported by low CI fuel type.

LCFS 46-250 cont.

Again, as noted above, the only issue addressed with respect to long term LCFS/ADF air quality impacts in the draft EA are potential NOx emission increases due to the use of biodiesel blends. As discussed in detail elsewhere,[2] the analysis upon which the draft EA and its conclusions are based is fundamentally flawed. However, the air quality analysis in the draft EA is also incomplete in that it fails to address long term changes in motor vehicle emissions beyond those associated with biodiesel and renewable diesel. That such impacts should have been addressed for the current rulemaking can be seen from the CARB staff air quality analysis included in the 2009 ISOR and presentation, which included detailed estimates of motor vehicle impacts on VOC, CO, NOx, SOx, PM_{10}, and $PM_{2.5}$ (rather than just NOx and $PM_{2.5}$) as a function of vehicle and fuel type in Table VII-12.

LCFS 46-251

LCFS 46-252

In addition to the above, two other important issues are: 1) CARB staff's failure to even attempt to quantify construction emissions associated with biofuel production facilities in California after finding them to be potentially significant and unavoidable; and 2) to identify and quantify potential emission increases associated with an increase in the number of tanker visits to California ports as the result of the ADF and LCFS regulations. With respect to the former, a California specific tool, CalEEmod,[3] is readily available that could have been used by CARB staff in estimating construction impacts form biofuel plants located in California.

LCFS 46-253

LCFS 46-254

With respect to the latter, it should be noted that although CARB staff concluded in the 2009 LCFS air quality analysis that there would be "little to no change to emissions at ports," that analysis predates the current proposal[4] regarding the assignment of CI to crude oil which are likely to encourage crude oil shuffling; as well as CARB staff assumptions regarding increases in assumed volumes of renewable diesel fuel potentially coming to California from production facilities in Asia, and the potential for direct importation of cane ethanol into California from Brazil. These factors will undoubtedly result in increased tanker operations in California waters the emission impacts of which can be estimated using the Emissions Estimation Methodology for Ocean-Going Vessels available on CARB's emission inventory website. According to this source, 1,919 visits by crude oil and petroleum product tankers are forecast for 2015 with roughly 50% percent of those trips involving southern California ports that are part of the South

LCFS 46-255

[2] Declaration of James M. Lyons filed as comments to the ADF regulation.
[3] California Emissions Estimator Model, Users Guide, Version 2013.2, July 2013.
[4] See proposed section 95489, Title 17 CCR in LCFS ISOR Appendix A.

Coast air basin. The emissions estimated by CARB to be associated with one tanker visit to California are presented in Table 1. As shown, the tanker emissions associated with a single new visit far exceed the NOx, $PM_{2.5}$ and SOx significance thresholds. Given that multiple new tanker visits are likely to result from the LCFS and ADF regulations, these values demonstrate that CARB staff has failed to identify a potentially significant source that will created adverse air quality impacts in its draft EA.

LCFS 46-255 cont.

Table 1
Comparison of Tanker Emissions During A Single Visit to California with South Coast Air Quality Management District Air Quality Significance Thresholds

Pollutant	Significance Threshold (lbs/day)	Tanker Emissions (lbs)
NOx	55	7,700
VOC	55	283
PM_{10}	150	290
$PM_{2.5}$	55	283
SOx	150	1,780
CO	550	629

Attachment C

The Growth Energy Alternative to the Proposed LCFS Regulation is the Least-Burdensome Approach that Best Achieves the Project Objectives at the Least Cost That Must be Adopted

As part of the rulemaking process leading to CARB staff's proposed re-adoption of the LCFS regulation, staff was required to solicit and consider alternatives to the proposed regulation. Growth Energy submitted such an alternative. While CARB staff acknowledged that the Growth Energy alternative could provide equivalent reductions in GHG emissions, the agency rejected it from further consideration or analysis by stating only that it was insufficient to transition California to alternative, lower carbon intensity fuels. As discussed below, CARB staff's premise for rejecting the Growth Energy alternative is incorrect. Further, given that the Growth Energy Alternative achieves the same environmental benefits through reductions in GHG emissions as the LCFS regulation, likely at the same or lower cost, it should have been analyzed by CARB staff, in which case it would have to be adopted as the least-burdensome approach the best achieves the project objectives at the least cost.

LCFS 46-256

Background

On May 23, 2014, CARB published a "Solicitation of Alternatives for Analysis in the LCFS Standardized Regulatory Impact Assessment" which is attached. On June 5, CARB published a response to a request from Growth Energy extending the deadline for the submission of alternatives from June 5, 2014 to June 23, 2014. On June 23, 2014, Growth Energy submitted an alternative regulatory proposal for the LCFS regulation (which is attached) to CARB in response to the agency's solicitation. On December 30, 2014, CARB staff published both the ISOR for the LCFS regulation as well as a document entitled "Summary of DOF Comments to the Combined LCFS/ADF SRIA and ARB Responses," which is Appendix E to the LCFS ISOR. Appendix E discusses the Growth Energy LCFS alternative and CARB's reason for its rejection.

LCFS 46-257

The staff's assessment of the Growth Energy (GE) Alternative published in Appendix E of the LCFS ISOR is as follows (emphasis added):

> *The proposed alternative assumes that the exclusive goal of the LCFS proposal is to achieve GHG emissions reductions without regard to source. If that were the case, this would be a viable alternative to the LCFS and would be assessed in this analysis. It is likely true that the estimated GHG emissions reductions appearing in the 2009 LCFS Initial Statement of Reasons (California Air Resources Board, 2009) could be achieved by the AB 32 Cap-and-Trade Program, along with the other programs cited by Sierra Research and Growth Energy. The LCFS proposal, however, was designed to address the carbon intensity of transportation*

fuels. Transportation in California was powered almost completely by petroleum fuels in 2010. Those fuels were extracted, refined, and distributed through an extensive and mature infrastructure. Transitioning California to alternative, lower-carbon fuels requires a very focused and sustained regulatory program tailored to that goal. The other regulatory schemes the alternative would rely on are comparatively "blunt instruments" less likely to yield the innovations fostered by the LCFS proposal. In the absence of such a program, post-2020 emissions reductions would have to come from a transportation sector that would, in all likelihood, have emerged from the 2010-2020 decade relatively unchanged.

In the absence of an LCFS designed to begin the process of transitioning the California transportation sector to lower-carbon fuels starting in 2010, post-2020 reductions would be difficult and costly to achieve. This is why the primary goals of the LCFS are to reduce the carbon intensity of California fuels, and to diversify the fuel pool. A transportation sector that achieves these goals by 2020 will be much better positioned to achieve significant GHG emissions reductions post 2020.

ARB is required to analyze only those alternatives that are reasonable and that meet the goals of the program as required by statute. An initial assessment of the program indicates the goals of the LCFS proposal can be achieved by keeping the program "…separate of the AB 32 Cap-and-Trade system initially (at least first 10 years) in order to stimulate innovation and investment in low-GWI [global warming intensity] fuel (or transportation) technologies."[16] Due to the strong justifications that the Cap-and-Trade program alone generates neither the CI reductions nor fuel in the transportation sector, this alternative will not be assessed in this document.

LCFS 46-257 cont.

Reference 16 in the above citation is given as:

A Low-Carbon Fuel Standard for California, Part 2: Policy Analysis – FINAL REPORT, University of California Project Managers: Alexander E. Farrell, UC Berkeley; Daniel Sperling, UC Davis. Accessed: 7-15-2015
http://www.energy.ca.gov/low_carbon_fuel_standard/

Discussion

Given that there is no analysis or other support provided by CARB staff for the assertions it makes in rejecting the Growth Energy alternative other than the one reference, which dates to 2007—before either the original LCFS or Cap-and-Trade regulation were adopted was reviewed. The discussion of interactions between a LCFS program with AB32 regulations from the reference is provided below. As can be determined by the reader, the discussion was written before the AB32 regulations were adopted, and the basic concern expressed is that the lower cost of achieving the same GHG reductions from a broader program will be lower than the cost of doing the same from the LCFS

LCFS 46-258

program. Further, the concern expressed regarding lifecycle emission under the LCFS was explicitly addressed in the Growth Energy alternative.

5.2 Interactions with AB32 regulations

RECOMMENDATION 16: The design of both the LCFS and AB32 polices must be coordinated and it is not possible to specify one without the other. However, it is clear that if the AB32 program includes a hard cap, the intensity-based LCFS must be separate or the cap will be meaningless. Including the transport sector in both the AB32 regulatory program and LCFS will provide complementary incentives and is feasible. CARB will soon be developing regulations under AB32 to control GHG emissions broadly across the economy, most likely through a cap-and-trade system plus a set of regulatory policies. Thus, emissions from electricity generation, oil production, refining, and biofuel production are likely to be regulated directly under AB32. These energy production emissions are "upstream" in a fuel's life cycle (while emissions from a vehicle are "downstream"). The recent Market Advisory Committee report recommends including all CO2 emissions from transportation, including tailpipe emissions.

LCFS 46-258

The LCFS regulates consumption emissions—the full life cycle emissions associated with products consumed in California, while it is expected that sector-specific emission caps will be imposed by AB 32 on production emissions—the emissions that are directly emitted within the borders of the state. The different types of boundaries used by these regulations causes certain upstream emissions to be double regulated under the LCFS and AB32. However, the potential for double regulation only applies to fuel production processes in the state of California or other jurisdictions where legislation similar to AB 32 also applies. We agree with the Market Advisory Committee that the LCFS and AB32 regulations will provide complementary incentives and that transportation emissions of GHGs should be included in the AB32 program.

There is no inherent conflict between the LCFS and AB32 caps; both are aimed at reducing GHG emissions and stimulating innovation in low-carbon technologies and processes. However, there are some differences. Most importantly, the LCFS is designed to stimulate technological innovation in the transportation sector specifically, while the broader AB32 program will stimulate technological innovation more broadly. The concerns associated with market failures and other barriers to technological change in the transportation sector (discussed in Section 1.3 of Part 1 and Section 2.3 of Part 2) are the motivation for adopting the sector-specific LCFS. These concerns suggest separating the LCFS from the AB32 emission caps.

The second key difference is that as a product standard using a lifecycle approach, the LCFS includes emissions that occur outside of the state such as

those associated with biofuel feedstock production and the production of imported crude oil. These emissions will not be included in the AB32 regulations.

The third difference is in expected costs. In the absence of transaction costs and other market imperfections, economic theory suggests that a broader cap-and-trade program will be less costly than a narrower one. By allowing more sectors and more firms to participate in a market for emission reductions, one reduces the cost to achieve a given level of emission reductions -- suggesting that the LCFS be linked to the broader AB 32 regulatory system. In addition, commercially available low-carbon options exist in the electricity and other sectors, but not in transportation fuels (see Part 1 of this study, Section 1.3).

The specific regulations and market mechanisms used to implement AB32 are not yet determined, so it is not possible at this time to specify how the LCFS should interact with them. The ARB should carefully consider the differences in incentives and constraints that the combination of rules will create.

LCFS 46-258 cont.

Returning to the issue of diversification of the transportation fuel sector, CARB concerns are directly refuted by Growth Energy's submission. As noted on pages 9 and 10, ethanol will be added to California gasoline, and renewable diesel and biodiesel will be blended into California diesel fuel as the result of the federal RFS program. The range of fuels and feedstocks from which they are produced under the RFS will be diverse. For example, the following fuel/feedstock pathways, among others, are currently recognized by U.S. EPA under the RFS:[1,2,3,4,5]

- Ethanol from
  - Corn
  - Sugar cane
  - Grain sorghum
  - Celluosic materials
- Biodiesel from
  - Camelina oil
  - Soy bean oil
  - Waste oils, fats and greases
  - Corn oil
  - Canola/rapseed oil
- Renewable diesel from
  - Waste oils, fats and greases

LCFS 46-259

[1] EPA-420-F-13-014
[2] EPA-420-F-14-045
[3] EPA-420-F-12-078
[4] EPA-420-F-11-043
[5] EPA-420-F-10-007

- Renewable gasoline from
  - Crop residue and municipal solid waste

- Renewable natural gas from
  - Landfills
  - Digesters

LCFS 46-259 cont.

As can be seen from Appendix B to the LCFS ISOR, these are many of the fuels that CARB staff also expects to be used in California under the LCFS. Similarly, electricity and hydrogen will be used as transportation fuels in California given the states regulatory mandates for the production of vehicles that operate on these fuels under the Advanced Clean Cars program. Further, in later years these fuels are expected to be required in heavy-duty vehicles as CARB adopts regulations under its proposed Sustainable Freight Transport Initiative, the purpose of which is stated by CARB staff as follows:

> *The purpose of the Strategy is to identify and prioritize actions to move California towards a sustainable freight transport system that is characterized by improved efficiency, zero or near-zero emissions, and increased competitiveness of the logistics system.*

It should also be noted that fuel providers in California will still be incentivized to provide these fuels in California under the Growth Energy alternative in order to reduce the number of GHG credits they will be required to retire under cap-and-trade program.

LCFS 46-260

Finally, on pages 15 and 16, Growth Energy's proposal for addressing the loss of upstream emission benefits from the LCFS regulation is explicitly discussed.

Given that the Growth Energy alternative:

1. Provides, as determined by CARB staff, the same GHG reductions as the LCFS regulation; and

2. Is expected to result in lower costs of compliance than the LCFS.

CARB must adopt the Growth Energy alternative as it better achieves the stated project objectives in an equally cost-effective manner.

Attachment D

Review of CARB Staff Estimates of NOx Emission Increases Associated with the Use of Biodiesel in California Under the Proposed ADF Regulation

In developing the proposed Alternative Diesel Fuel (ADF) regulation, CARB staff has performed a statewide analysis of the increase in NOx emissions that is currently occurring in California due to the use of biodiesel, as well as the increases in NOx emissions that can be expected in the future due to the continued use of biodiesel in California under the proposed ADF regulation. As documented below, a review of the CARB staff analysis performed by Sierra Research demonstrates that the staff's analysis is fatally flawed and cannot be relied upon. Given this, Sierra Research has performed an analysis, also documented below, that demonstrates there will be substantial increases in NOx emissions if the ADF regulation is implemented as proposed. The significance in the NOx emissions increase associated with the use of biodiesel under the proposed ADF is clear given the dramatic reductions which CARB, the South Coast Air Quality Management District, and the San Joaquin Air Pollution Control District are seeking given their "extreme" non-compliance status with respect to the federal National Ambient Air Quality Standard for ozone.[1] This significance is also reinforced by a comparison of the estimated increase in NOx emissions from biodiesel under the proposed ADF regulation with the benefits of proposed and adopted NOx control measures intended for implementation on a statewide basis as well as in the South Coast and San Joaquin Valley air basins, respectively.

ADF 17-24

Review of the CARB Staff Analysis

On December 30, 2014, CARB staff released the proposed ADF regulation language and the accompanying Initial Statement of Reasons (ISOR), technical and economic support information, and draft environmental analysis. Staff's analysis of the impact of the proposed ADF regulation on NOx emissions and supporting information and assumptions are contained in Chapters 6 and 7 of the ISOR, as well as Appendix B entitled "Technical Supporting Information."

The first issue that was identified with the staff's emissions analysis is that the information and data supplied by CARB staff are insufficient to determine exactly how the analysis was performed. Specifically, CARB staff provides no source for the values in Table B-1 labeled "Emission Inventory (Diesel TPD)," which are key to the analysis. As illustrated below, a clear understanding of what diesel sources (e.g., on-road heavy-duty, non-road, marine, locomotives, etc.) are included in the "inventory" is critical to assessing the accuracy of the staff's analysis.

ADF 17-25

[1] It should be noted that the CARB statewide analysis fails to provide any estimate of the impacts of increased NOx emissions from the ADF regulation in these air basins, where the agency has stated that massive reductions in NOx emissions are required to achieve compliance with federal air quality standards.

Given the lack of documentation regarding the source of the diesel emission inventory values, additional information regarding this analysis as well as other analyses associated with the ADF and Low Carbon Fuel Standard (LCFS) rulemakings was requested. As part of this request, Sierra Research pointed out that pursuant to the requirements of AB 1085, the agency had provided far more detailed information for other recent major rulemakings, including the Advanced Clean Cars program, than it released regarding the LCFS and ADF proposals. Unfortunately, CARB staff choose not to provide any additional information related to the analyses underlying the proposed LCFS and ADF regulations.[2]

Despite the lack of all the information necessary to fully review the CARB staff analysis, it was possible to discern some key assumptions and the general methodology that was applied. The following key assumptions were identified:

1. Actual biodiesel use and the total demand for diesel fuel and substitutes in California will exactly match that forecast by CARB staff in the "illustrative compliance scenarios" developed as part the LCFS rulemaking;[3]

2. Actual renewable diesel use in California will exactly match that forecast by CARB staff in the "illustrative compliance scenarios" developed as part the LCFS rulemaking;[2]

3. Forty percent of renewable diesel delivered to California will be used directly by refiners to comply with the requirements of CARB's existing diesel fuel regulations[4] while the remaining 60% will be blended into fuel that complies with the diesel fuel regulations downstream of refineries;

4. The use of biodiesel up to the B20 level in New Technology Diesel Engines[5] (NTDEs, which employ exhaust aftertreatment systems to reduce NOx emissions) will not result in any increase in NOx emissions;

5. The use of biodiesel in heavy-duty diesel engines other than NTDEs—which are referred to by CARB staff as "legacy vehicles"—will increase NOx linearly with increasing biodiesel blend content, up to a 20% increase for B100;

ADF 17-26

[2] See attached emails from Jim Lyons of Sierra to Lex Mitchel and other CARB staff from January 2015.
[3] These are presented in Appendix B to the LCFS ISOR.
[4] Sections 2281 to 2284, Title 13, California Code of Regulations.
[5] Proposed section 2293.3 Title 13 CCR (see Appendix A to the LCFS ISOR) defines a New Technology Diesel Engines as:

a diesel engine that meets at least one of the following criteria:

(A) Meets 2010 ARB emission standards for on-road heavy duty diesel engines under section 1956.8.

(B) Meets Tier 4 emission standards for non-road compression ignition engines under sections 2421, 2423, 2424, 2425, 2425.1, 2426, and 2427.

(C) Is equipped with or employs a Diesel Emissions Control Strategy (DECS), verified by ARB pursuant to section 2700 et seq., which uses selective catalytic reduction to control Oxides of Nitrogen (NOx).

6. The blending of renewable diesel downstream of refineries will reduce NOx emissions from legacy vehicles, with each 2.75 gallons of renewable diesel blended offsetting the emissions increase associated with each gallon of biodiesel used; and

7. During the period from 2018 to 2020, 30 million gallons of biodiesel will be blended to the B20 level for use in legacy vehicles each year, and will therefore be subject to the mitigation requirements of the proposed ADF regulation and will not cause an increase in NOx emissions. Furthermore, this volume will increase to 35 million gallons per year from 2021 to 2023.

Based on the above assumptions, CARB staff followed the methodology steps outlined below for estimating biodiesel impacts.

1. The fraction of legacy vehicles in a given year is determined by subtracting the percentage of vehicle miles traveled by on-road heavy-duty vehicles with NTDEs from 100%.

2. The fraction of legacy vehicles from Step 1 is multiplied by the total volume of biodiesel assumed to be consumed in a given year to yield the number of gallons of biodiesel used in legacy vehicles in that year.

3. For years 2018 and later, the amount of biodiesel assumed to be sold as emissions-mitigated B20 in a given year is subtracted from the total volume of biodiesel used in legacy vehicles in that year.

4. The total volume of renewable diesel assumed to be sold in a given year is multiplied by the percentage of legacy vehicles in that year and then multiplied by 0.6 to account for renewable diesel used in refineries to yield the amount of renewable diesel creating reductions in NOx emissions from legacy vehicles in that year.

5. The amount of renewable diesel used in legacy vehicles is then divided by 2.75 to determine the number of gallons of biodiesel for which NOx emissions have been offset for that year.

6. The number of gallons of biodiesel for which NOx emissions have been offset, as determined in Step 5, is then subtracted from the amount of biodiesel used in legacy vehicles, as determined in Step 3, to yield the total number of gallons of biodiesel used in legacy vehicles that cause increased NOx emissions for that given year.

7. The biodiesel volume from Step 6 is multiplied by the assumed NOx increase of 20% for B100 and then divided by the total volume of diesel fuel forecast to be used in that year to get the percentage increase in diesel emissions for that year.

ADF 17-26 cont.

Attachment D-3

8. The value from Step 7 is multiplied by the assumed Diesel Emissions inventory for that year to yield the final estimate of increased NOx emissions due to biodiesel in units of tons per day for the entire state of California.

ADF 17-26 cont.

Using the above methodology, CARB staff estimates that use of biodiesel in California led to a 1.36 ton per day increase in NOx emissions in 2014, and that the proposed ADF regulation will reduce the magnitude of that increase through 2023 down to 0.01 ton per day.[6]

The review of the staff's emission analysis identified two major issues in addition to the lack of documentation regarding how the diesel "Emission Inventory" values used by staff were developed:

1. Assuming that biodiesel use in NTDEs at levels up to B20 will not increase NOx emissions; and

ADF 17-27

2. Assuming that biodiesel NOx emissions are offset by the use of renewable diesel fuel.

ADF 17-28

Beginning with NTDEs, it has been demonstrated[7] that the available data indicate not only that NOx emissions from NTDEs will increase with the use of biodiesel in proportion to the amount of biodiesel present in the blend, but also that the magnitude of the increase on a percentage basis will be much greater than that observed for "legacy vehicles." At the B20 level where CARB staff assumed that there will be no NOx increase, the best current estimate is that NTDE NOx emissions will be increased by between 18% and 22%. CARB staff's failure to account for increased NOx emissions from NTDEs renders the staff's emission analysis meaningless in terms of assessing the adverse environmental impacts of the proposed ADF regulation. Another problem with CARB staff's treatment of NTDEs is that they have incorrectly assumed that the penetration of NTDEs into the on-road fleet is equal to that in the non-road fleet. NTDE penetration rates into the non-road fleet will be delayed due to the later effective date of the Tier 4 Final standards, relative to the 2010 on-road standards, and by the fact that while newer trucks dominate on-road heavy-duty vehicle operation, that effect does not occur in the non-road vehicle population.

ADF 17-27 cont.

Similarly, there are fundamental flaws with CARB staff's assumption that the use of renewable diesel will offset increased NOx emissions due to the use of biodiesel. First, it must be noted that there is nothing in either the proposed ADF regulation or the proposed LCFS regulation that mandates the use of any volume of biodiesel in California, much less the use of the exact ratio of renewable diesel to biodiesel assumed by CARB staff in its emissions analysis. Second, based on a review of the ADF and LCFS ISORs and supporting materials, there is no apparent basis for the staff's assumption that 40% of renewable diesel used in California will be used by refiners to aid in compliance with CARB's existing diesel fuel regulations, and that 60% will be blended downstream of refineries. To the extent that fuel producers choose to blend renewable diesel in California, one would expect them to do so by purchasing renewable diesel for use at their

ADF 17-28 cont.

[6] Table B-1, Appendix B of the ADF ISOR.
[7] "NOx Emission Impacts of Biodiesel Blends," Rincon Ranch Consulting, February 17, 2015.

refineries where they can benefit from the other desirable properties of this fuel beyond its low carbon intensity (CI) value (e.g., high cetane number and fungibility with diesel fuel at all blend levels), rather than by purchasing LCFS credits generated by downstream blenders of renewable diesel fuel.

ADF 17-28 cont.

To illustrate the magnitude of the significance of CARB's flawed assumptions regarding NTDEs and renewable diesel, if one simply and extremely conservatively assumes that NTDE NOx increases will be the same on a percentage basis as legacy vehicles and eliminates the NOx offsets assumed from renewable diesel, the NOx increases expected from biodiesel increase from 1.35 tons per day statewide in 2014 to approximately 3.44 tons per day—a factor of about 2.65. For 2023, estimated NOx emission increases due to biodiesel rise to about 0.87 tons per day, or about 100 times more than the 0.01 tons per day CARB staff estimated. However, as documented below, a more rigorous analysis indicates that far greater increases in NOx emissions are likely.

ADF 17-29

Detailed Analysis of Increases in NOx Emissions from Biodiesel Use

Given the flawed assumptions and undocumented sources of data associated with CARB staff's analysis of the emission impacts associated with biodiesel under the proposed ADF, Sierra Research undertook a detailed analysis of the same issue. The first step in this analysis was identifying the most current methods and tools for estimating NOx emissions from on- and non-road diesel engines operating in California for which biodiesel use is expected to increase NOx emissions.

ADF 17-30

On-Road Heavy-Duty Diesel Vehicles – On December 30, 2014, CARB officially released the final version of the EMFAC2014 model for estimating on-road emissions in California, which has replaced the now obsolete EMFAC2011 model that CARB staff relied upon for certain elements of its emission analysis. In releasing EMFAC2014, CARB staff noted a number of changes intended to improve the accuracy of the model relative to EMFAC2011. First, EMFAC2014 accounts for CARB's adoption of recent mobile source rules and regulations that lower future NOx emission estimates, including the Advanced Clean Cars program and the 2014 Amendments to the Truck and Bus Regulation. In addition, EMFAC2014 now estimates off-cycle emissions of SCR-equipped vehicles (i.e., NTDEs) by reflecting higher NOx emissions during low speed operation and cold starts.[8]

Given the above, Sierra selected EMFAC2014 for estimating NTDE emissions directly in this assessment. It was used to generate annual average NOx emissions, in tons per day, for the South Coast and San Joaquin Valley Air Basins, and the entire state for the years 2015, 2020, and 2023. Emission estimates were obtained for light-heavy-duty, medium-heavy-duty, and heavy-heavy-duty trucks, as well as school, urban, and transit buses. Output by "model year" was used to differentiate NOx emissions of legacy vehicles from those of NTDEs, which were defined as 2010 and later model-year vehicles consistent with the definition in proposed section 2293.2 Title 13, CCR (see Appendix A to the LCFS ISOR).

[8] Email from ARB EMFAC2014 Team, November 26, 2014.

Off-Road Diesel Equipment and Engines – The process of estimating emissions from off-road equipment and engines in California is much less straightforward than for on-road vehicles, as the most recent CARB models have been separated by equipment type and updated at various points in time as part of the rulemaking process associated with the development of regulations for different source categories.

In addition to having been developed and last updated at different points in time, some of the methodologies do not output data with sufficient detail (e.g., emissions by engine model year) to differentiate between "legacy vehicles" and NTDEs, which, in the case of off-road sources, are defined by CARB staff in proposed section 2293.2 Title 13 CCR as being compliant with Tier 4 final emission standards for non-road compression ignition (i.e., diesel) engines under sections 2421, 2423, 2424, 2425, 2425.1, 2426, and 2427 Title 13 CCR.[9] The effective dates of these standards vary as a function of engine power rating, as shown in Table 1. It should be noted that compliance with the Tier 4 Final standards by engines below 50 horsepower in general does not require the use of the SCR technology[10] that CARB has used to define "NTDEs." Therefore, all engines in this category were assumed to respond to biodiesel in the same way as legacy vehicles, despite the fact that they meet Tier 4 final standards and are technically classified as NTDEs by CARB under the ADF regulation. As discussed below, this again reduced the magnitude of the biodiesel NOx impact.

Table 1
Effective Dates of Tier 4 Final Standards

Horsepower Range	Model Year
50-75	2013
76-175	2015
176-750	2014
Over 751	2015

Table 2 summarizes current state of CARB inventory models and methodologies for off-road diesel emission sources by equipment/engine sector[11] and indicates which outputs have sufficient detail to differentiate between emissions from legacy vehicles and NTDEs. As shown, only the general off-road equipment (construction, industrial, ground support, and oil drilling equipment), cargo handling equipment, and agricultural equipment sectors could be included in the Sierra analyses for the South Coast and San Joaquin Valley Air Basins. For the statewide inventory, it was possible to include transportation refrigeration units (TRUs) as well. Given that all diesel emission categories could not be included in the Sierra analysis, it should be noted that the results of the analysis presented below are conservative in that they do not account for the full magnitude of the increase in NOx emissions related to biodiesel use in California.

[9] See ISOR Appendix A.
[10] See *http://www.arb.ca.gov/diesel/tru/tru.htm#mozTocId341892.*
[11] All models can be downloaded at *http://www.arb.ca.gov/msei/categories.htm* .

The CARB off-road emissions inventory tools were configured to include the impacts of the most recent regulatory actions in each sector, and were executed to provide estimates of annual average day NOx emissions for both legacy and NTDE vehicles for calendar years 2015, 2020, and 2023 occurring in the South Coast and San Joaquin Valley Air Basins, as well as the entire state.

Key Assumptions: The Sierra analysis of the emission impacts of biodiesel use in California relies on the following two key assumptions:

1. B5 will be in use on a statewide basis in 2015, 2020, and 2023;

2. At the B5 level, NOx emissions from legacy vehicles will be increased by 1%, and by 5% from NTDEs.

Table 2
Summary of Current California Off-Road Diesel Emission Inventory Methodologies

Category	CARB Model/Database Tool	Capable of Differentiating Legacy Vehicle and NDTE Emissions
In-Use Off-Road Equipment	2011 Inventory Model	Yes
Cargo Handling Equipment	2011 Inventory Model	Yes
Transportation Refrigeration Units	2011 TRU Emissions Inventory	Yes – but not capable of estimating emissions by air basin
Agricultural Equipment	OFFROAD2007	Yes
Stationary Engines	2010 StaComm Inventory Model	No
Locomotives	NA	No
Commercial Harborcraft	2011 CHC/CA Crew and Supply Vessel/CA Barge and Dredge Inventory Databases	No
Ocean-Going Vessels	2011 Marine Emissions Model	No

The assumption regarding B5 was based on the fact that it represents the highest blend allowed under the ADF without mitigation, at least during the summer months. That this assumption is reasonable can be seen by comparing CARB's current and previous assumptions of biodiesel use: in the current LCFS compliance scenario,[3] the staff assumes a range from about B3 in 2015 to about B4 in 2020; in 2009,[12] the staff assumed approximately B1 in 2015 and B5 in 2020; and

[12] CARB, Proposed Regulation to Implement the Low Carbon Fuel Standard, Volume II, Appendices, March 5, 2009.

in 2011,[13] approximately B10 in 2015 and B20 in 2020 were assumed. Furthermore, the Sierra results can be scaled to reflect lower or higher non-mitigated biodiesel levels by multiplying them by the ratio of the assumed biodiesel level to B5.

The assumptions of a 1% and 5% increase at B5 for legacy vehicles and NTDEs, respectively, are based on the analysis of Rincon Ranch Consulting,[7] where 5% represents the mid-point of the range of estimates.

Diesel Emission Inventory and Biodiesel Impacts

The results of the Sierra analysis for the statewide diesel inventory for 2015, 2020, and 2023 are presented in Table 3 along with the undocumented values published by CARB staff.[6] As shown, the Sierra values are lower than those used by CARB staff. This is expected to some degree given that the Sierra analysis does not include, as explained above, some diesel source categories; however, the difference cannot be reconciled given the lack of information made available by CARB staff regarding its analysis.

Table 3
Statewide Diesel Emissions tons/day

	2015	2020	2023
Sierra Analysis	621	436	277
CARB Table B-1, Appendix B ADF ISOR	863	634	496

Table 4 compares the results of Sierra's analysis with the results of the CARB staff's analysis. As shown, the differences are large and are due primarily to two factors: 1) the staff's assumption regarding biodiesel impacts on NTDE NOx emissions, which is contradicted by the available data; and 2) the differences in the assumed levels of biodiesel use. The impact of the latter difference can also be seen in the results presented in Table 4, where results from the Sierra analysis scaled to reflect the lower biodiesel use rates assumed by CARB staff are presented. Again, even with this adjustment, the results of the Sierra analysis indicate much greater NOx impacts under the proposed ADF. Finally, it should be recalled that because of limitations with CARB's emission inventory methods for off-road sources, not all sources of diesel emissions that could be impacted by biodiesel use under the ADF have been accounted for, and the actual impacts will be greater than those shown in Table 4.

ADF 17-31

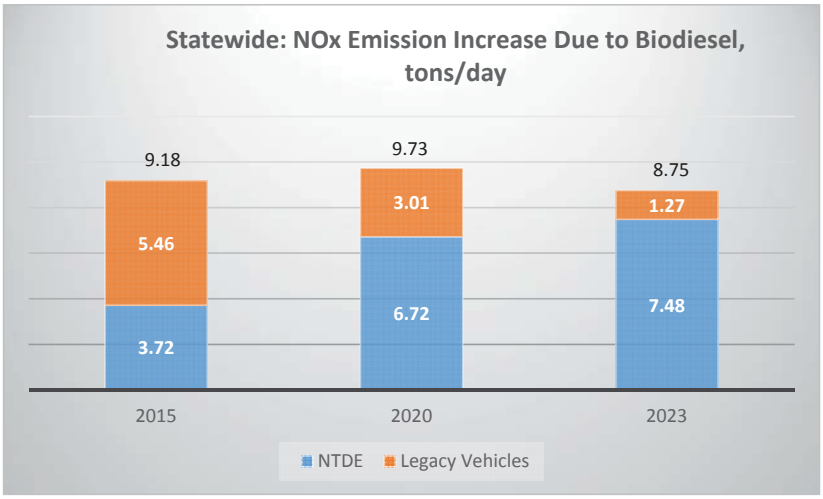
[13] CARB, Low Carbon Fuel Standard 2011 Program Review Report, December 8, 2011.

Table 4 Statewide Increase in NOx Emissions Due to Biodiesel tons/day			
	2015	2020	2023
Sierra Analysis – B5	9.18	9.73	8.75
Sierra Analysis at CARB Assumed Biodiesel Levels from Table B-1	4.70	7.15	6.15
CARB Table B-1, Appendix B ADF ISOR	1.29	0.39	0.01

ADF 17-31 cont.

The results of the Sierra analysis are shown graphically in Figures 1a through c for the entire state as well as the South Coast and San Joaquin air basins, respectively. These figures also show the relative contributions of legacy vehicles and NTDEs to the total estimated for each area and year. As shown, the contributions of NTDEs to increased NOx emissions are substantial in 2015, and dominate the impacts in 2020 and 2023. Further data supporting these results are provided in Tables 6 through 8 at the end of this attachment.

Figure 1a
Results of Sierra Analysis of Statewide NOx Increases
Due to Biodiesel Use under the Proposed ADF Regulation



ADF 17-32

Figure 1b
Results of Sierra Analysis of South Coast Air Basin NOx Increases Due to Biodiesel Use under the Proposed ADF Regulation

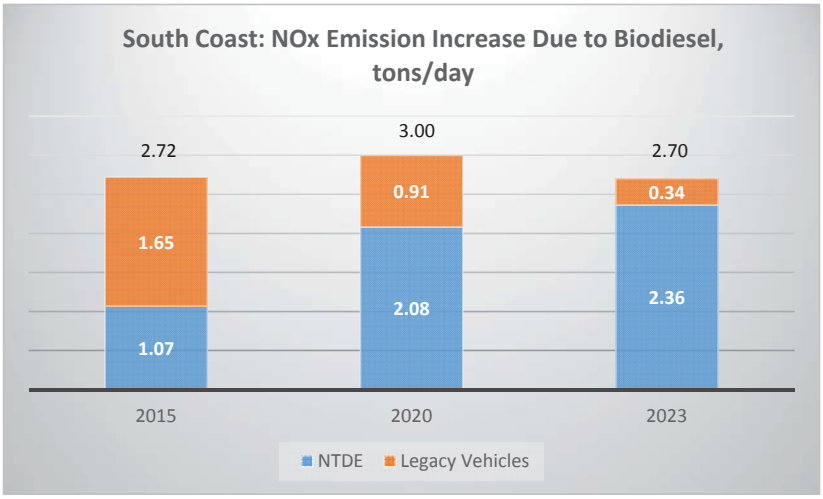
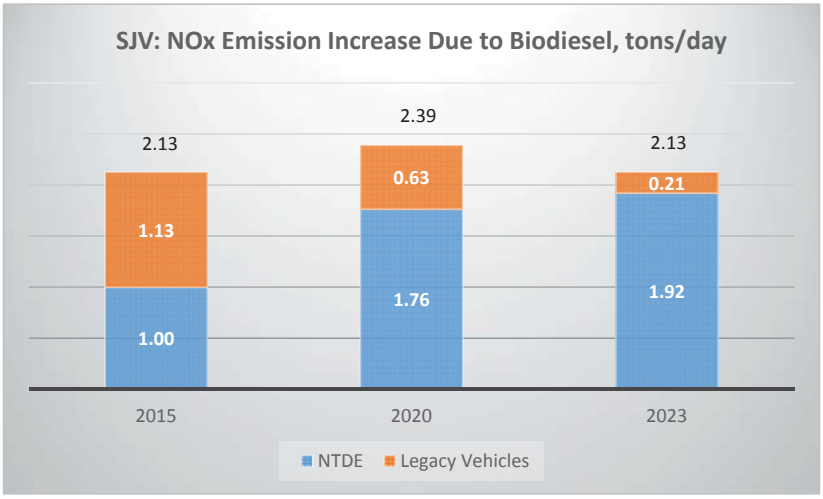


Figure 1c
Results of Sierra Analysis of San Joaquin Valley Air Basin NOx Increases Due to Biodiesel Use under the Proposed ADF Regulation



ADF 17-32
cont.

Attachment D-10

As indicated above, the Sierra analysis uses the results from an assessment of existing data regarding biodiesel impacts on NOx emissions from NTDEs performed by Rincon Ranch Consulting. The key findings of that analysis are shown in Figure 2 (reproduced with permission), which establishes that the available data for biodiesel impacts on NTDE NOx emissions follow a linear relationship just as they do for legacy vehicles.

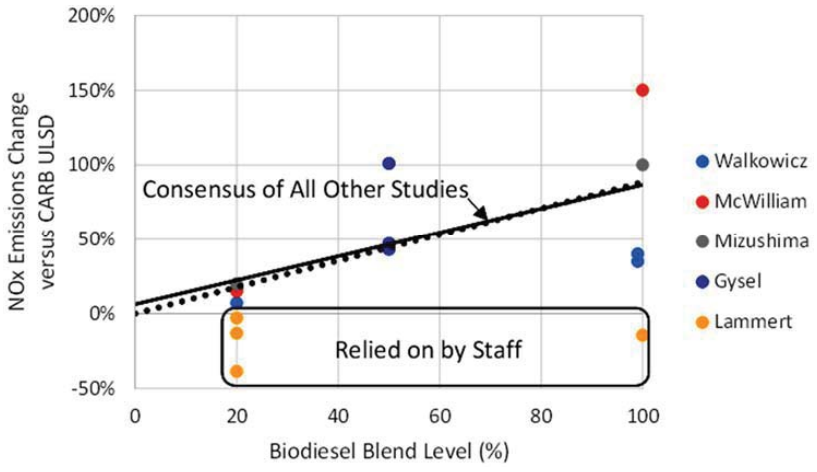
In contrast to the data upon which the Sierra analysis rests, the basis of CARB staff's assumption regarding biodiesel impacts on NTDE emissions rests on the following excerpts from the ADF ISOR:

> *Research also indicates that the use of biodiesel up to blends of B20 in NTDEs results in no detrimental NOx impacts. Therefore, the proposed regulation also includes a process for fleets and fueling stations to become exempted from the in-use requirements for biodiesel blends up to B20 as long as they can demonstrate to the satisfaction of the Executive Officer that they are fueling at least 90 percent light or medium duty vehicles or NTDEs.*
>
> *Staff proposes to take a precautionary approach and in the light of data showing there may be a NOx impact at higher biodiesel blends but not at lower biodiesel blends, staff is limiting the conclusion of no detrimental NOx impacts in NTDEs to blends of B20 and below.*

Clearly, if CARB staff were truly taking a "precautionary approach" to the issue of biodiesel impacts on NTDE NOx emissions, they would also rely on the results of the analysis summarized in Figure 2.

ADF 17-32 cont.

Figure 2
The Impact of Biodiesel on NTDE NOx Emissions



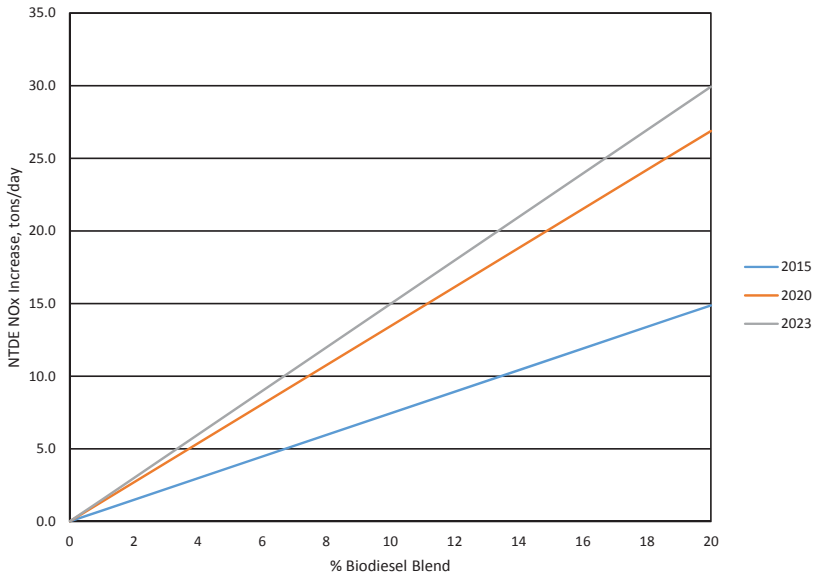
Attachment D-11

The assumption made by CARB staff regarding biodiesel impacts on NDTE NOx emissions has additional ramifications beyond those shown above by the results of the Sierra analysis. As set forth in proposed section 2293.6, Title 13 CCR (see ISOR Appendix A), the mitigation requirements for biodiesel up to the B20 level will be dropped when NTDEs account for 90% of heavy-duty vehicle miles travelled in California (expected by staff to be 2023) and use of B20 without mitigation will be allowed in all fleets of centrally fueled vehicles comprised of more than 90% NTDEs. Given this, use of unmitigated biodiesel blends of up to B20 in NTDEs may be common under the proposed ADF regulation. The potential significance of these provisions of the staff proposal with respect to the potential for NOx increases is shown in Figures 3a through 3c, which illustrate the estimated increases in NDTE NOx emissions as a function of biodiesel content up to B20 for the state, the South Coast air basin, and the San Joaquin Valley air basins, respectively, for the years 2015, 2020, and 2023.

As shown, the potential NOx increases from extensive use of higher level biodiesel blends in NTDEs is quite large. Furthermore, although the results shown in Figures 3a through 3c are maximum potential impacts, they can again be simply scaled for other cases. For example, in order to estimate statewide NOx increases from B20 use in 50% rather than 100% of NTDEs, one would simply multiply the value of 30 tons per day by 0.5 (50/100) to arrive at a 15 ton per day increase. Finally, it should be noted that the values in Figures 3a through 3c reflect both on- and off-road NTDEs as described above for the Sierra analysis of B5 impacts.

ADF 17-33

Figure 3a
Results of Sierra Analysis of Statewide NOx Increases Due to Biodiesel Use in All NTDEs under the Proposed ADF Regulation



Attachment D-12

Figure 3b
Results of Sierra Analysis of South Coast Air Basin NOx Increases Due to Biodiesel Use in All NTDEs under the Proposed ADF Regulation

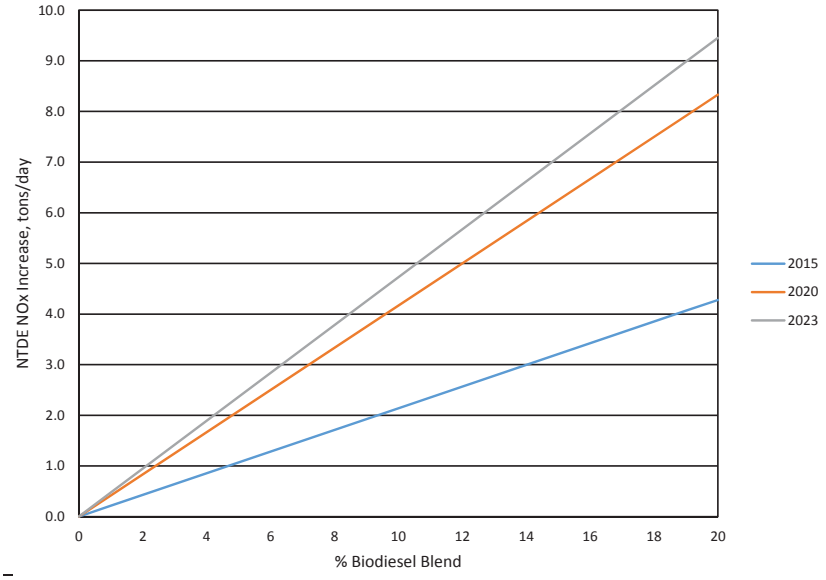
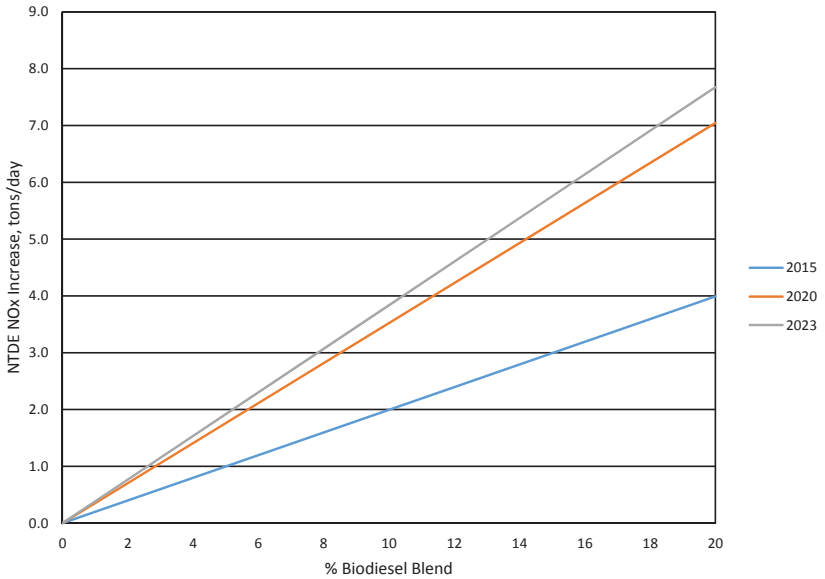


Figure 3C
Results of Sierra Analysis of San Joaquin Valley Air Basin NOx Increases Due to Biodiesel Use in All NTDEs Under the Proposed ADF Regulation



ADF 17-33
cont.

Attachment D-13

Significance of Increases in NOx Emissions Caused by Biodiesel

As illustrated above, the proposed ADF regulations are likely to lead to substantial increases in NOx emissions for the state as a whole, as well as in the South Coast and San Joaquin Valley air basins, which are in extreme nonattainment of the federal standard for ozone and experience the state's highest levels of ozone and other pollutants. The significance of the NOx increases from biodiesel can be seen by comparing those increases with air quality planning documents.

Perhaps the best initial point of reference comes from CARB's "Vision for Clean Air"[14] prepared in conjunction with the South Coast Air Quality Management District and the San Joaquin Valley Unified Air Pollution Control District. This report addresses potential control strategies that will be required to bring these extreme ozone nonattainment areas into compliance. According to the Vision report, NOx emissions will have to be reduced by 80% to 90% from 2010 levels in both the South Coast and San Joaquin Valley areas in order to achieve ozone compliance. Furthermore, in working to identify potential control strategies, the three regulatory agencies chose to focus **only** on ways to reduce NOx emissions (and not hydrocarbon emissions) because, in their words, *"NOx is the most critical pollutant for reducing regional ozone and fine particulate matter."* Given this, CARB staff's proposal to allow any NOx emission increases from the use of biodiesel is difficult to understand.

ADF 17-34

CARB staff's proposal becomes even more difficult to understand when the emission increases from biodiesel are compared to the emission benefits from adopted and proposed control measures. As an illustration, the NOx reductions expected from transportation control measures in the South Coast Basin that are part of the district's Air Quality Plan[15] are compared in Table 5 to estimated NOx emission increases under the ADF based on Sierra's analysis of B5. As shown, the increases due to biodiesel are far larger than the reductions from transportation control measures and completely offset the benefits of those measures that must be implemented as the result of their being included in the Air Quality Plan.

ADF 17-35

Table 5
Comparison of NOx Reductions from South Coast Transportation Control Measures (TCMs) and Estimated NOx Increases from Biodiesel Under the Proposed ADF Regulation

Calendar Year	NOx Reduction from TCMs, tons/day	NOx Increase due to Biodiesel tons/day
2014/2015	-0.7	2.72
2019/2020	-1.4	3.00
2023	-1.5	2.70

[14] California Air Resources Board, Vision for Clean Air: A Framework for Air Quality and Climate Planning, June 27, 2012.
[15] See South Coast 2012 AQMP. Appendix IV C. *http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2012-air-quality-management-plan/final-2012-aqmp-(february-2013)/appendix-iv-(c)-final-2012.pdf*

Similarly, the approximately two ton per day NOx increase estimated from the use of biodiesel in the San Joaquin Valley under the ADF can be compared to planned and implemented NOx control measures,[16,17] many of which have emission benefits on the order of two tons per day or less. Again, it should also be noted that the potential NOx emission increases allowed under the proposed ADF from extensive use of B20 in NDTEs without mitigation are far greater than the fleetwide impacts associated with the use of B5.

ADF 17-35 cont.

[16] San Joaquin Valley Air Pollution Control District, 2007 Ozone Plan and Appendices and Updates.
[17] San Joaquin Valley Air Pollution Control District, 2010 Ozone Mid-Course Review, June 2010.

Table 6
Results of Sierra Research Statewide Analysis

Statewide Total NOx Emissions Inventory, tons/day			
	2015	2020	2023
Trucks (LHD1, LHD2, MHD, HHD, Buses)	493.3	345.0	204.9
Construction/Mining/Drilling	75.8	56.6	43.6
Cargo Handling Equipment (CHE)	4.02	3.13	2.70
Transportation Refrigiration Units (TRU)	13.33	11.25	12.26
Agricultural Equipment	34.35	19.75	13.44
TOTAL	620.8	435.7	276.9
Statewide NTDE NOx Emissions Inventory, tons/day			
	2015	2020	2023
Trucks (LHD1, LHD2, MHD, HHD, Buses)	73.0	127.2	138.2
Construction/Mining/Drilling	0.8	5.5	9.0
Cargo Handling Equipment (CHE)	0.26	0.89	1.22
Transportation Refrigiration Units (TRU)	0.00	0.00	0.00
Agricultural Equipment	0.21	0.85	1.23
TOTAL	74.4	134.4	149.6
Statewide NOx Emissions Increase Due to B5 , tons/day			
	2015	2020	2023
Trucks (LHD1, LHD2, MHD, HHD, Buses)	7.8550	8.5374	7.5764
Construction/Mining/Drilling	0.7916	0.7850	0.7962
Cargo Handling Equipment (CHE)	0.0506	0.0668	0.0757
Transportation Refrigiration Units (TRU)	0.1333	0.1125	0.1226
Agricultural Equipment	0.3520	0.2317	0.1837
TOTAL	9.18	9.73	8.75
Statewide NTDE NOx Emission Increase Due to B5, tons/day			
	2015	2020	2023
Trucks (LHD1, LHD2, MHD, HHD, Buses)	3.6523	6.3596	6.9092
Construction/Mining/Drilling	0.0424	0.2735	0.4507
Cargo Handling Equipment (CHE)	0.0131	0.0444	0.0609
Transportation Refrigiration Units (TRU)	0.0000	0.0000	0.0000
Agricultural Equipment	0.0106	0.0427	0.0617
TOTAL	3.72	6.72	7.48
Statewide Legacy Vehicle NOx Emission Increase Due to B5, tons/day			
	2015	2020	2023
Trucks (LHD1, LHD2, MHD, HHD, Buses)	4.2027	2.1778	0.6672
Construction/Mining/Drilling	0.7492	0.5115	0.3454
Cargo Handling Equipment (CHE)	0.0375	0.0224	0.0148
Transportation Refrigiration Units (TRU)	0.1333	0.1125	0.1226
Agricultural Equipment	0.3414	0.1890	0.1220
TOTAL	5.46	3.01	1.27

Attachment D-16

Table 7
Results of Sierra Research South Coast Air Basin Analysis

South Coast Total NOx Emissions Inventory, tons/day			
	2015	2020	2023
Trucks (LHD1, LHD2, MHD, HHD, Buses)	153.0	107.9	62.3
Construction/Mining/Drilling	28.0	21.5	15.9
Cargo Handling Equipment (CHE)	3.21	2.53	2.20
Agricultural Equipment	2.18	1.23	0.84
TOTAL	186.4	133.1	81.3
South Coast NTDE NOx Emissions Inventory, tons/day			
	2015	2020	2023
Trucks (LHD1, LHD2, MHD, HHD, Buses)	20.8	38.7	42.8
Construction/Mining/Drilling	0.3	2.1	3.3
Cargo Handling Equipment (CHE)	0.24	0.79	1.08
Agricultural Equipment	0.01	0.05	0.07
TOTAL	21.4	41.7	47.3
South Coast NOx Emission Increase Due to B5 , tons/day			
	2015	2020	2023
Trucks (LHD1, LHD2, MHD, HHD, Buses)	2.3624	2.6270	2.3340
Construction/Mining/Drilling	0.2931	0.2993	0.2929
Cargo Handling Equipment (CHE)	0.0416	0.0568	0.0652
Agricultural Equipment	0.0223	0.0144	0.0113
TOTAL	2.72	3.00	2.70
South Coast NTDE NOx Emission Increase Due to B5, tons/day			
	2015	2020	2023
Trucks (LHD1, LHD2, MHD, HHD, Buses)	1.0410	1.9352	2.1385
Construction/Mining/Drilling	0.0161	0.1056	0.1673
Cargo Handling Equipment (CHE)	0.0118	0.0393	0.0539
Agricultural Equipment	0.0006	0.0026	0.0037
TOTAL	1.07	2.08	2.36
South Coast Legacy Vehicle NOx Emission Increase Due to B5, tons/day			
	2015	2020	2023
Trucks (LHD1, LHD2, MHD, HHD, Buses)	1.3213	0.6918	0.1955
Construction/Mining/Drilling	0.2770	0.1938	0.1256
Cargo Handling Equipment (CHE)	0.0298	0.0175	0.0112
Agricultural Equipment	0.0216	0.0118	0.0076
TOTAL	1.65	0.91	0.34

Table 8
Results of Sierra Research San Joaquin Valley Analysis

San Joaquin Valley Total NOx Emissions Inventory, tons/day			
	2015	2020	2023
Trucks (LHD1, LHD2, MHD, HHD, Buses)	103.9	77.1	43.9
Construction/Mining/Drilling	14.0	12.1	9.4
Cargo Handling Equipment (CHE)	0.09	0.06	0.06
Agricultural Equipment	14.81	8.58	5.82
TOTAL	132.8	97.8	59.2
San Joaquin Valley NTDE NOx Emissions Inventory, tons/day			
	2015	2020	2023
Trucks (LHD1, LHD2, MHD, HHD, Buses)	19.7	33.7	35.9
Construction/Mining/Drilling	0.1	1.1	1.9
Cargo Handling Equipment (CHE)	0.00	0.01	0.01
Agricultural Equipment	0.09	0.36	0.53
TOTAL	20.0	35.2	38.4
San Joaquin Valley NOx Emission Increase Due to B5 , tons/day			
	2015	2020	2023
Trucks (LHD1, LHD2, MHD, HHD, Buses)	1.8277	2.1196	1.8769
Construction/Mining/Drilling	0.1459	0.1661	0.1696
Cargo Handling Equipment (CHE)	0.0010	0.0011	0.0011
Agricultural Equipment	0.1517	0.1003	0.0793
TOTAL	2.13	2.39	2.13
San Joaquin Valley NTDE NOx Emission Increase Due to B5, tons/day			
	2015	2020	2023
Trucks (LHD1, LHD2, MHD, HHD, Buses)	0.9857	1.6862	1.7973
Construction/Mining/Drilling	0.0075	0.0560	0.0941
Cargo Handling Equipment (CHE)	0.0001	0.0005	0.0007
Agricultural Equipment	0.0046	0.0182	0.0264
TOTAL	1.00	1.76	1.92
San Joaquin Valley Legacy Vehicle NOx Emission Increase Due to B5, tons/day			
	2015	2020	2023
Trucks (LHD1, LHD2, MHD, HHD, Buses)	0.8421	0.4333	0.0796
Construction/Mining/Drilling	0.1384	0.1101	0.0755
Cargo Handling Equipment (CHE)	0.0009	0.0005	0.0004
Agricultural Equipment	0.1471	0.0822	0.0529
TOTAL	1.13	0.63	0.21

Attachment E

Assessment of CARB's Environmental Analysis and ADF Mitigation Requirements

In developing the proposed Alternative Diesel Fuel (ADF) regulation, CARB staff has performed an environmental analysis and included mitigation requirements intended to eliminate the adverse environmental impacts associated with increased NOx emissions resulting from the use of biodiesel under the ADF. ADF 17-36

The environmental analysis is fundamentally flawed in that staff incorrectly selected 2014 as the baseline year and performed the analysis in light of biodiesel usage levels in that year. As documented below, CARB staff has long been aware that biodiesel use leads to increases in NOx emissions, and promised but failed to act to address those emissions through enactment of an ADF regulation as early as 2009. There is no basis for an agency to use its failure to promptly act to address an environmental issue of which it was clearly aware as grounds to change the baseline for assessing its' proposed effort to address that issue. This is even more apparent given that CARB staff acknowledges that a key function of the LCFS regulation is to incent low carbon intensity fuels including biodiesel which has to date generated 13% of all credits issued by CARB under the LCFS.[1] Given this, the proper baseline for assessing the ADF regulation should be 2009 when CARB first stated it would regulate biodiesel use and when, by CARB staff's own admission, little biodiesel was used in California and NOx emissions were minimal. ADF 17-37

The mitigation requirements of the ADF regulation are equally flawed. First, they are based on CARB's staff's fundamentally flawed emission analysis, and second their implementation is unreasonably delayed until 2018—more than ten years after CARB staff was aware that biodiesel use in California would lead to increased NOx emissions. ADF 17-38

History of the ADF Regulation

Although the U.S. Environmental Protection Agency (EPA) published a report in 2002 showing that biodiesel use increases NOx emissions linearly with increasing biodiesel content,[2] the earliest document found on the CARB website indicates that agency discussions regarding the need to adopt regulations addressing NOx began at least as early as February 2004.[3] This led to the first meeting of the Biodiesel Work Group in April 2004.[4] A summary of that discussion

[1] See Page III-2 of the LCFS ISOR.
[2] See EPA, A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions (available at http://www.epa.gov/otaq/models/analysis/biodsl/p02001.pdf).
[3] See CARB, Public Consultation Meeting Regulatory and Non-Regulatory Fuels Activities at 26-29 (Feb. 25, 2004) (available at http://www.arb.ca.gov/fuels/diesel/022504arb.pdf).
[4] See CARB Ltr. (Mar. 18, 2004) (available at http://www.arb.ca.gov/fuels/diesel/altdiesel/041204altdslwsh.pdf).

published at the time[5] it occurred indicates that topics discussed included ways to mitigate NOx emission increases associated with biodiesel use.

In 2006, CARB published a draft guidance document regarding the use of biodiesel in California,[6] at which time the agency simply decided not to address increased NOx emissions until biodiesel use became more widespread.[7] At that time, CARB instead could have ensured that there would be no NOx increases from biodiesel use by simply requiring those interested in selling biodiesel in California to demonstrate that they could formulate biodiesel blends in a way that did not increase NOx emissions, which is one of the approaches CARB is now considering.[8]

The first time CARB was scheduled to adopt regulations addressing this issue was in November 2009; this is indicated on page 12 of CARB's 2009 Rulemaking Calendar,[9] which includes the following summary:

> *Staff will propose motor vehicle fuel specifications for biodiesel and renewable diesel. These specifications are necessary for the implementation of the Low Carbon Fuel Standard regulation (to be considered at the March 2009 Hearing).*

ADF 17-39

No action was taken by CARB in 2009 and the planned adoption date was moved to June 2010; this is evidenced by CARB's 2010 Rulemaking Calendar,[10] which lists the regulatory item on page 11. This time the summary reads:

> *The staff will propose adoption of new motor vehicle fuel specifications for biodiesel and renewable diesel. These specifications are necessary to ensure that the use of these fuels will not increase emissions of criteria and toxic air pollutants when used as a motor vehicle fuel.*

Again, no action was taken by CARB in 2010 and the planned adoption date was moved to November 2011; this is evidenced by CARB's 2011 Rulemaking Calendar,[11] which lists the regulatory item on page 14. This time the summary reads:

---

[5] See *CVS News*, at 27-31 (May 2004) (available at http://www.sierraresearch.com/documents/cvs_news_may_2004.pdf).
[6] See CARB, Draft Advisory on Biodiesel Use (Nov. 14, 2006) (available at http://www.arb.ca.gov/fuels/diesel/altdiesel/111606biodsl_advisory.pdf).
[7] See CARB, Suggested ARB Biodiesel Policy (May 24, 2006) (available at http://www.arb.ca.gov/fuels/diesel/altdiesel/052406arb_prsntn.pdf).
[8] See California Environmental Protection Agency, Discussion of Conceptual Approach to Regulation of Alternative Diesel Fuels (Feb. 15, 2013).
[9] See CARB, 2009 Rulemaking Calendar Schedule (available at http://www.arb.ca.gov/regact/2009rulemakingcalendar.pdf).
[10] See CARB, 2010 Rulemaking Calendar Schedule (available at http://www.arb.ca.gov/regact/2010rulemakingcalendar.pdf).
[11] See CARB, 2011 Rulemaking Calendar Schedule (available at http://www.arb.ca.gov/regact/2011rulemakingcalendar.pdf).

The Low Carbon Fuel Standard incents the use of biodiesel and renewable diesel, for which there are no current emissions–based fuel specifications. Staff will propose fuel specifications for both of these diesel blendstocks.

Yet again, no action was taken by CARB in 2011 and the planned adoption date was moved to November 2012; this is evidenced by CARB's 2012 Rulemaking Calendar,[12] which lists the regulatory item on page 14. This time the summary reads:

Rulemaking to establish commercial fuel specifications for blends of commercial diesel fuel and neat biodiesel in amounts greater than five volume percent.

Yet again, no action was taken by CARB in 2012 and, for the fourth consecutive year, the item was scheduled to be presented to the Board—the CARB Rulemaking Calendar for 2013[13] indicates on page 8 that the Board is currently scheduled to consider adoption of amendments to the agency's Alternative Diesel Fuel Regulations in September 2013. This time the summary reads:

ADF 17-39 cont.

Proposed new motor vehicle alternative diesel fuel specifications and commensurate amendments to the diesel fuel regulations.

Unlike the previous years, during 2013 CARB staff did begin to take action to actually develop a regulation that it purported would address increases in NOx emissions resulting from biodiesel use. The hearing notice[14] and Initial Statement of Reasons[15] for the proposed ADF regulation were published in October 2013, in advance of a Board hearing to be held on December 12-13, 2013. However, that hearing was postponed to until March 20, 2014,[16] and then the entire rulemaking was abandoned prior to the March 2014 hearing.[17]

History of Biodiesel Use

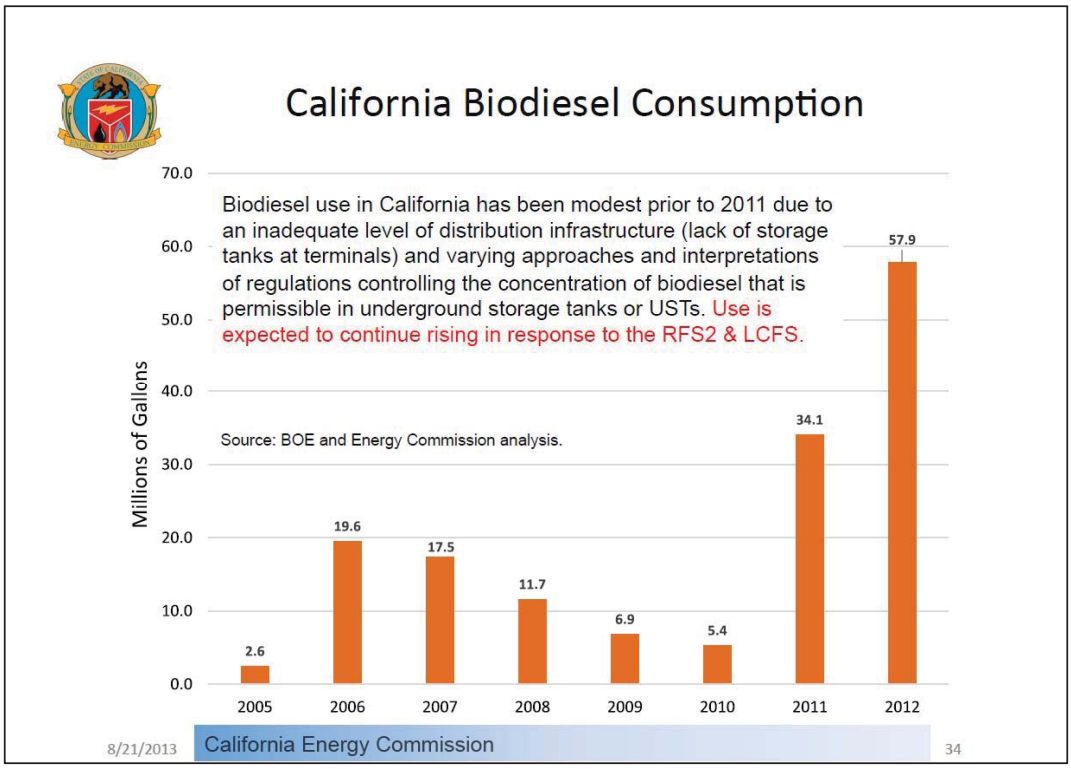
Although CARB does not disclose the amounts of biodiesel used in California prior to 72 million gallons estimated in 2014 in the ADF rulemaking documents (see ISOR Appendix B), data for 2005 to 2012 are available from the California Energy Commission.[18] These data are shown in Figure 1 below. As shown, biodiesel use in California increased dramatically in 2006 when CARB staff indicated that it would not regulate biodiesel, and then decreased until the LCFS

[12] See CARB, 20012 Rulemaking Calendar Schedule (available at http://www.arb.ca.gov/regact/2012rulemakingcalendar.pdf).
[13] See CARB, 2013 Rulemaking Calendar Schedule (available at http://www.arb.ca.gov/regact/2013rmcal.pdf).
[14] See http://www.arb.ca.gov/regact/2013/adf2013/adf2013notice.pdf
[15] See http://www.arb.ca.gov/regact/2013/adf2013/adf2013isor.pdf
[16] See http://www.arb.ca.gov/regact/2013/adf2013/adf2013postpone.pdf
[17] See http://www.arb.ca.gov/regact/2013/adf2013/NDNPadf2013.pdf
[18] See http://www.energy.ca.gov/2013_energypolicy/documents/2013-08-21_workshop/presentations/06_Schremp_Biofuels.pdf

took effect in 2011 at which point it again increased dramatically. Clearly, the appropriate baseline year for analysis of the ADF regulation is 2009 or 2010 when CARB first committed to adopting a regulation to address biodiesel NOx impacts, not any later year after which substantial increases in biodiesel use occurred in response to the LCFS.

ADF 17-40

Figure 1
Biodiesel Consumption in California as Reported by the California Energy Commission



The NOx increases resulting from CARB's failure to regulate biodiesel during the period from 2005 to 2014 are summarized in Table 1. The values presented are approximate and are based on the Sierra Research methodology for 2015 adjusted to account for differences in biodiesel use as well as the absence of NTDE engines in years prior to 2010. Biodiesel use for 2014 is taken from Appendix B of the ADF ISOR, and the estimated use for 2013 assumed linear growth in biodiesel use from 2012 to 2014. Significant increases in NOx emissions from 2011 to 2014 can be seen from a comparison of the values presented in Table 1 with the values presented in Table B-1 of Appendix B to the ADF ISOR. These increased NOx emissions from 2011 to 2014 total 782, 1032, and 3,463 tons for the San Joaquin Valley, South Coast, and entire state, respectively.

ADF 17-41

Attachment E-4

Table 1 Estimated Increases in NOx Emissions Due to Biodiesel Use in California from 2005 to 2014 (tons per year)			
Calendar Year	Statewide	South Coast	San Joaquin Valley
2005	31	9	7
2006	234	70	50
2007	209	63	45
2008	140	42	30
2009	82	25	18
2010	65	19	14
2011	447	134	98
2012	825	246	184
2013	1000	298	227
2014	1191	354	273
Total	4225	1260	945

ADF 17-41 cont.

Proposed ADF Mitigation Requirements

Under the proposed ADF regulation,[19] mitigation is generally required for "low-saturation" biodiesel blends with diesel fuel above B5 (e.g., B6 and higher) during the summer, and above B10 (e.g., B11 and higher) during the winter, unless the fuels are used in vehicles with new technology diesel engines in which case mitigation is not required for levels up to B20. For "high-saturation" biodiesel blends with diesel fuel, mitigation is required year-round above B10 (e.g., B11 and higher) again, unless the fuels are used in vehicles with new technology diesel engines in which case mitigation is not required for levels up to B20. However, no mitigation is required for any biodiesel blend sold in California prior to January 1, 2018.

ADF 17-42

According to the ADF ISOR,[20] CARB staff selected these levels based on an "analysis" for which no detail or documentation has been provided, and that reportedly included consideration of the impacts of new technology diesel engines (NTDEs) and the use of renewable diesel as "offsetting factors." Although it is impossible to thoroughly review an analysis which is not described in detail, in this case it can still be demonstrated to be fundamentally flawed. As discussed elsewhere, CARB incorrectly assumes that NOx emissions from NTDEs are unaffected by biodiesel despite the fact that available data show statistically significant increases in NOx emissions. Further, CARB cannot rely on the use of renewable diesel as mitigation for NOx increases from biodiesel as there is nothing in the ADF or the LCFS regulation that mandates the use of any volume of renewable diesel in California, nor which links the amount of renewable diesel used to the amount of biodiesel used. Further, neither the ADF nor LCFS regulations ensure that fuel producers will use biodiesel in a manner that provides surplus

ADF 17-43

[19] Proposed section 2293.6 Title 13, CCR in ISOR Appendix A.
[20] Chapter 6, Part H.

reductions[21] in NOx emissions. Given that CARB's reliance on "offsetting factors" is fundamentally flawed, the agency's "Determination of NOx Control Level for Biodiesel" is also fundamentally flawed. Another problem with the "determination" is that CARB staff claims to have performed an "analysis" for which no detail or documentation is provided, indicating that the higher blend level threshold for mitigation that applies to "low-saturation" blends during the winter months will not result in adverse air quality impacts. Again, it is not possible to critically review an analysis which is not described in detail; further, the information provided in this analysis is so insufficient that it is not even possible to develop an appropriate set of comments.

ADF 17-43 cont.

In addition to the flaws in CARB staff's analysis of what mitigation should be applied to address the increased NOx emissions associated with biodiesel use, CARB staff is arbitrarily delaying the date on which mitigation is required by two years from the expected effective date of the ADF regulation. According to ADF ISOR, CARB staff claim the reason for this delay is:

> *ARB is also proposing the in-use requirements come into effect on January 1, 2018, as time is needed to overcome logistical and other issues in implementation of in-use requirements. For example, use of the additive Di-tert-butyl peroxide (DTBP) will require replacement of steel tanks with stainless steel tanks, permitting of hazardous substance storage, approval by local fire agencies, additional additization infrastructure, and logistical business changes to acquire the additive. All of this is expected to take around 2 years to complete. Another method of compliance is re-routing higher blends to NTDEs. Research shows that the use of biodiesel in blends up to B20 in NTDEs results in no detrimental NOx impacts. This and other methods of complying with the in-use requirements, such as certification of additional options are also expected to take 2 years or more. Because compliance with the in-use options would be infeasible during initial implementation on January 1, 2016, only recordkeeping and reporting provisions will be implemented initially. The in-use requirements are proposed to come into effect on January 1, 2018.*

ADF 17-44

It is not clear why CARB staff believes that a two year delay in the implementation of mitigation requirements is required under the ADF regulation when the maximum delay in the implementation of new requirements under the LCFS regulation, which will much more dramatically impact fuel producers than the ADF requirements, is only one year, until January 1, 2017. Further, as the biodiesel industry has been on notice that CARB intended to impose NOx mitigation requirements for over ten years, it is not clear why such measures cannot be required from the expected January 1, 2016 effective date of the proposed regulation.

The impact of the failure to immediately require Biodiesel mitigation under the ADF regulation is shown in Table 2. These values are based on the Sierra Research emissions methodology which assumes statewide use of B5. As discussed elsewhere, these impacts

[21] In order to generate surplus reductions in NOx, renewable diesel would have to be blended into diesel fuel downstream of refineries, and although CARB staff has assumed that this will occur they have provided no basis for that assumption.

are significant in that the increases are as large or larger than those sought from emission control measures implemented of under consideration by CARB and local air pollution control agencies in the South Coast and San Joaquin Valley air basins.

Table 2
Potential NOx Increases Due to CARB's Failure to Require Immediate Biodiesel Mitigation Under the ADF
(tons per year)

	Statewide	South Coast	San Joaquin Valley
2016	3405	1013	796
2017	3460	1034	815
Total	6866	2047	1612

ADF 17-44 cont.

Attachment F

Potential for Actual Biodiesel Blend Levels to Exceed Levels Purported Under the Proposed ADF Regulation

In order to properly understand and mitigate the adverse environmental impacts of biodiesel blends sold in California, it is critical that the actual amount of biodiesel present in a blend be accurately known. Despite this, the proposed ADF regulation fails to adequately ensure that the actual biodiesel content of biodiesel blends—and therefore their adverse environmental impacts—will be accurately known or appropriately mitigated. As discussed below, significant changes are required to definitions used in the proposed LCFS and ADF regulations, and new testing, recordkeeping, and reporting requirements need to be added to the ADF regulation to prevent the blending of biodiesel with fuels that already contain undisclosed amounts of biodiesel.

ADF 17-45

Background

CARB regulations at §2281 and §2282, Title 13, California Code of Regulations apply to vehicular diesel fuel sold in California and define "diesel fuel" as follows:

> *"Diesel fuel" means any fuel that is commonly or commercially known, sold or represented as diesel fuel, including any mixture of primarily liquid hydrocarbons – organic compounds consisting exclusively of the elements carbon and hydrogen – that is sold or represented as suitable for use in an internal combustion, compression-ignition engine."*[1]

The proposed LCFS regulation contains the following definitions that are relevant to biodiesel blends (See ISOR Appendix A):[2]

> *"B100" means biodiesel meeting ASTM D6751-14 (2014) (Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels), which is incorporated herein by reference.*
>
> *"Biodiesel" means a diesel fuel substitute produced from nonpetroleum renewable resources that meet the registration requirements for fuels and fuel additives established by the Environmental Protection Agency under section 211 of the Clean Air Act. It includes biodiesel meeting all the following:*

[1] 13 CCR §2281(b)(1) and §2282(b)(3)
[2] See proposed §95481, Title 17, California Code of Regulations

(A) Registered as a motor vehicle fuel or fuel additive under 40 Code of Federal Regulations (CFR) part 79;
(B) A mono-alkyl ester;
(C) Meets ASTM D6751-08 (2014), Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels, which is incorporated herein by reference;
(D) Intended for use in engines that are designed to run on conventional diesel fuel; and
(E) Derived from nonpetroleum renewable resources.

"Biodiesel Blend" means a blend of biodiesel and diesel fuel containing 6 percent (B6) to 20 percent (B20) biodiesel and meeting ASTM D7467-13 (2013), Specification for Diesel Fuel Oil, Biodiesel Blend (B6 to B20), which is incorporated herein by reference.

"Diesel Fuel" (also called conventional diesel fuel) has the same meaning as specified in California Code of Regulations, title 13, section 2281(b).

"Diesel Fuel Blend" means a blend of diesel fuel and biodiesel containing no more than 5 percent (B5) biodiesel by weight and meeting ASTM D975-14a, (2014), Standard Specification for Diesel Fuel Oils, which is incorporated herein by reference.

Finally, the proposed ADF regulation contains the following definitions that are relevant to biodiesel blends:[3]

"Alternative diesel fuel" or "ADF" means any fuel used in a compression ignition engine that is not petroleum-based, does not consist solely of hydrocarbons, and is not subject to a specification under subarticle 1 of this article.

"Biodiesel" means a fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats that is 99-100 percent biodiesel by volume (B100 or B99) and meets the specifications set forth by ASTM International in the latest version of Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels D6751 contained in the ASTM publication entitled: Annual Book of ASTM Standards, Section 5, as defined in California Code of Regulations, title 4, section 4140(a), which is hereby incorporated by reference.

"Biodiesel Blend" means biodiesel blended with petroleum-based CARB diesel fuel or non-ester renewable diesel.

[3] See proposed §2293.2(a), Title 13, California Code of Regulations

"Blend Level" means the ratio of an ADF to the CARB diesel it is blended with, expressed as a percent by volume. The blend level may also be expressed as "AXX," where "A" represents the particular ADF and "XX" represents the percent by volume that ADF is present in the blend with CARB diesel (e.g., a 20 percent by volume biodiesel/CARB diesel blend is denoted as "B20").

"B5" means a biodiesel blend containing no more than five percent biodiesel by volume.

"B20" means a biodiesel blend containing more than five and no more than 20 percent biodiesel by volume.

"CARB diesel" means a light or middle distillate fuel that may be comingled with up to five (5) volume percent biodiesel and meets the definition and requirements for "diesel fuel" or "California nonvehicular diesel fuel" as specified in California Code of Regulations, title 13, section 2281 et seq. "CARB diesel" may include: non-ester renewable diesel; gas-to-liquid fuels; Fischer-Tropsch diesel; diesel fuel produced from renewable crude; CARB diesel blended with additives specifically formulated to reduce emissions of one or more criteria or toxic air contaminants relative to reference CARB diesel; and CARB diesel specifically formulated to reduce emissions of one or more criteria or toxic air contaminants relative to reference CARB diesel.

Discussion

The first issue related to the potential for uncertainty and inaccuracy in actual biodiesel content of fuels sold in California involves the different definitions that have been proposed for the term "biodiesel" under the proposed LCFS and ADF regulations. Although the two definitions may be functionally equivalent, they should be made the same under both the LCFS and ADF regulations unless CARB staff can articulate a compelling need for the use of different definitions to describe the same thing.

More importantly, the term "Biodiesel Blend" in the proposed LCFS regulation directly conflicts with the use of the same exact term in the proposed ADF regulation: a "Biodiesel Blend" under the LCFS regulations contains at least 6% biodiesel, while a "Biodiesel Blend" under the ADF is a diesel fuel containing any biodiesel. Furthermore, the LCFS regulation defines "Diesel Fuel Blend" as a blend of diesel fuel and up to 5% biodiesel, while such a fuel would be considered "CARB diesel" under the ADF regulation. Again, this haphazard use of the same term to describe fundamentally different fuels and different terms to describe the same fuel will assuredly lead to confusion in practice regarding the actual content of biodiesel available in California.

Further confusion is created by the definitions of "Biodiesel Blend" and "Blend Level" under the proposed ADF regulation. "Biodiesel Blend" is defined as a mixture of biodiesel and an undefined fuel referred to as "petroleum-based CARB diesel." "Blend

Level" applies to blends of all fuels subject to the ADF regulation, including biodiesel, and is defined as the ratio of an "Alternative diesel fuel" mixed with "CARB diesel." However, as noted above, "CARB diesel" may already contain as much as 5% biodiesel under the proposed ADF regulation. Furthermore, the definition of "Blend Level" includes no reference to the fuel termed "petroleum-based CARB diesel" that appears in the definition of "Biodiesel Blend" under the ADF—instead, it refers to "CARB diesel," which, as noted above, may contain as much as 5% biodiesel. Obviously, the addition of biodiesel to a fuel already containing some amount of biodiesel up to 5% will cause the actual biodiesel content to be higher than the blender expects; this, in turn, will lead to more significant adverse environmental impacts than expected. It is also clear that CARB staff mean for the definition of "Blend Level" to apply to "Biodiesel Blends," as that definition uses an example based on biodiesel (B20) to demonstrate the practical meaning of "Blend Level."

Finally, under the proposed ADF regulation, "B20" is nonsensically defined as a fuel that contains between 6% and 20% biodiesel, which directly contradicts the definition of "Blend Level" in same regulation. There appears to be no need for this definition or the definition of B5 in the proposed ADF regulation.

As outlined above, the proposed CARB LCFS and ADF regulations fail completely in clearly defining the four fuels that are of fundamental importance to ensuring that the biodiesel content of a fuels sold in California—and hence the adverse environmental impacts associated with their use—is accurately known. Instead, the proposed regulations make it likely that biodiesel blenders will unknowingly use fuels that already contain an unknown amount of biodiesel (up to 5%) in blending and that the actual biodiesel content of biodiesel blends may be as much as 5% greater than that represented by the blender and reported to CARB under the ADF regulation. This is significant because, as discussed in other attachments to this declaration, the increases in NOx emissions and associated adverse environmental impacts caused by biodiesel blends become larger in direct proportion to the amount of biodiesel present.

Both the LCFS and the ADF regulation must clearly define the four fuels described below.

1. ***"Diesel fuel"*** – This should defined as under 13 CCR §2281(b)(1) and §2282(b)(3).

2. ***"Biodiesel"*** or "***B100"*** – It appears that this could be properly defined through changes to the definitions currently proposed in the LCFS and ADF regulations; this is what should be blended only with "diesel fuel" to create a "Biodiesel Blend."

3. ***"CARB diesel"*** – This is accurately defined under the proposed ADF regulation, but under no circumstances should it be allowed to be blended with biodiesel or any other ADF. It should be renamed to clearly differentiate it from "diesel fuel" such that no reasonable person would understand that it could be legally mixed with any ADF.

ADF 17-45 cont.

4. ***"Biodiesel Blend"*** – This should refer to the "Blend Level" and must correspond to the actual amount of "Biodiesel" or "B100" in terms of percentage by volume in the final blend with "diesel fuel."

ADF 17-45 cont.

In addition to modifying the definitions as described above, the ADF regulation must also be modified to ensure that biodiesel blenders do not intentionally or unintentionally blend biodiesel into fuels that already contain biodiesel. This can easily be achieved by adding requirements to proposed §2293.8 Title 13, CCR, to require that any "diesel fuel" to be used in blending with biodiesel be tested for the presence of biodiesel prior to blending. Similarly, that section should be modified to include reporting and record keeping requirements for biodiesel blenders that document that they have used only biodiesel-free "diesel fuel" in all of their blending operations.

ADF 17-46

Attachment G

The Growth Energy Alternative to Proposed ADF Regulation is the Least-Burdensome Approach that Best Achieves the Project Objectives at the Least Cost That Must be Adopted

As part of the rulemaking process leading to CARB staff's proposed ADF regulation, staff was required to solicit and consider alternatives to the proposed regulation. Growth Energy submitted such an alternative which CARB staff acknowledged provided equivalent or superior reductions in NOx emissions from biodiesel use but rejected as being more costly. However, as is documented in detail below, CARB staff made fundamental errors in its' assessment of the Growth Energy Alternative, which will in fact provide greater reductions in NOx emissions from biodiesel use than the staff's proposed ADF regulation but do so with equal cost-effectiveness. (Equal cost-effectiveness means that the dollars spent per unit mass of NOx emissions eliminated will be the same.) Given that the Growth Energy alternative provides greater environmental benefits, which in turn substantially lessen the ADF's significant impacts, and is equally cost-effective as the staff's proposed ADF regulation, the Growth Energy Alternative rather than the staff proposal should be adopted by CARB.

ADF 17-47

Background

On July 29, 2014, CARB published a "Solicitation of Alternatives for Analysis in the Alternative Diesel Fuel Standardized Regulatory Impact Assessment" which is attached. On August 15, 2014, Growth Energy submitted an alternative regulatory proposal for the ADF regulation (which is attached) to CARB in response to the agency's solicitation. On December 30, 2014, CARB staff published both the ISOR for the ADF regulation as well as a document entitled "Summary of DOF Comments to the Combined LCFS/ADF SRIA and ARB Responses" which is Appendix E to the ADF ISOR, both of which include information related to staff's decision to reject the alternative to the ADF regulation proposed by Growth Energy.

The staff's assessment of the Growth Energy (GE) Alternative published in Appendix E of the ADF ISOR is as follows (emphasis added):

ADF 17-48

> ***Benefits:***
>
> ***ARB finds that the GE alternative would meet the emissions goals of the ADF proposal and achieve roughly the same emissions benefits as the ADF proposal. The GE alternative may achieve marginally more emissions benefits if biodiesel were to be widely used as an additive under the ADF proposal. Although the GE alternative is simpler than the ADF proposal, the GE alternative is unnecessarily strict; ARB's analysis of the science does not find that there are NO_X increases with B5 animal biodiesel or biodiesel used in NTDEs, so***

requiring mitigation for these does not achieve any additional emissions benefit versus the ADF proposal.

Costs:

The GE alternative would require mitigation of more fuel than the ADF proposal; regulated parties would incur more costs to mitigate non-animal- and animal-based biodiesel similarly and setting the significance level for both at one percent. Additionally, the NTDE exemption would increase the volumes of fuels to be mitigated, further increasing the direct costs on regulated parties.

Economic Impacts:

The REMI results also indicate that the combined LCFS/ADF proposal has no discernible difference from the GE alternative. Employment, GSP, and output differ only slightly and represent a difference of less than one tenth of one percent. Given that the GE alternative has higher direct costs, the combined LCFS/ADF alternative is preferred.

Cost-Effectiveness:

ADF 17-49

The GE alternative costs more than the ADF proposal, because it requires mitigation of more biodiesel than the ADF proposal. The GE alternative does not result in any more emissions reductions than the ADF proposal and as such is less cost effective than the ADF proposal.

Reason for Rejection:

ARB rejects the GE alternative because it costs more than the ADF proposal and does not achieve additional emissions benefits*.*

The reason for rejection of the Growth Energy (GE) alternative presented in the ADF ISOR itself is as follows:

This alternative proposal retains the same biodiesel NOx mitigation options as the ADF proposal*. However, under the GE alternative, animal and non-animal biodiesel would be treated equally and require NOx mitigation for all biodiesel blends, including blends below B5.* ***ARB rejects this alternative because the costs are significantly higher than the ADF proposal and do not achieve additional emissions benefits.*** *During the development of this regulation, staff considered alternatives to the proposal and determined that the proposal represents the least-burdensome approach that best achieves the objectives at the least cost.*

Finally, it should be noted that the stated intention of the ADF regulation according to CARB staff in the ADF ISOR is as follows (emphasis added):

*The ADF regulation is intended to create a framework for these low carbon diesel fuel substitutes to enter the commercial market in California, **while mitigating any potential environmental or public health impacts**.*

Discussion

As indicated above, the stated reason why CARB staff rejected the Growth Energy alternative to the proposed ADF regulation is because CARB staff believed it would require that actions be taken to mitigate increased NOx emissions from biodiesel under circumstances where CARB staff incorrectly assumed there would no increased emissions due to biodiesel use on under the ADF. However, as is clearly demonstrated in another attachment to the declaration of James M. Lyons,[1] CARB staff's analysis and assumptions of the increases in NOx emissions that will result for the ADF regulation is fatally flawed as is CARB's basis for rejection of the Growth Energy Alternative.

As shown by the Sierra emissions analysis, once the flaws in the CARB emissions analysis are corrected, it becomes clear that the ADF regulation will allow significant and unmitigated increases in NOx emissions to occur throughout California including areas such as the South Coast and San Joaquin air basins which experience the worst air quality in the state. As CARB staff itself admits, the Growth Energy alternative would require mitigation in exactly those areas where CARB staff was lead to believe it was not required based on its flawed emissions analysis. CARB staff also admits the Growth Energy alternative is based on the same mitigation options contained in the ADF regulation, which CARB staff has already determined to be technically feasible and cost-effective. However, the Growth Energy Alternative is superior to the ADF regulation because it expands the conditions under which this mitigation has to be applied in order to eliminate the potential for any increase in NOx emissions due to biodiesel use to a less-than-significant level. The Growth Energy Alternative therefore precludes any adverse environmental impacts due to increased NOx emissions, which is exactly what CARB staff has asserted the ADF regulation is intended to do.

ADF 17-49 cont.

Given that the Growth Energy alternative:

1. Provides complete mitigation of potential NOx emission increases due to biodiesel use under the ADF and any associated adverse environmental impacts; and

2. Relies on the same mitigation strategies proposed by CARB staff which staff has found to be technically feasible and cost-effective,

ADF 17-50

CARB must adopt the Growth Energy alternative as it better achieves the stated project objectives in an equally cost-effective manner.

[1] Review of CARB Staff Estimates of NOx Emission Increases Associated with the Use of Biodiesel in California under the Proposed ADF Regulation.

Appendix J

Appendix J

Additional Analysis Required Under the California Environmental Quality Act

A. CARB May Not Ignore the LCFS Regulation's Pre-2015 Impacts

CARB Staff initiated the environmental review process for the LCFS regulation in 2007, and circulated an Initial Statement of Reasons for the proposed regulation in 2009. As explained by the Court in *POET, LLC v. California Air Resources Board* (2013) 218 Cal.App.4th 681 ("*POET*"), CARB subsequently approved that regulation on April 24, 2009, without completing the environmental review process, and impermissibly delegated authority to complete the environmental review process to the Executive Officer. The Court found that CARB's actions violated CEQA, and directed the superior court to issue a writ enjoining enforcement of the LCFS regulation beyond 2013 levels. The writ issued by the superior court requires CARB, prior to its consideration of the LCFS regulation, to evaluate "the potential adverse environmental effect of increased NOx emissions" associated with the "project" (*i.e.*, the LCFS regulations presently being enforced). (Exhibit "1.") To this day, CARB has never performed a legally compliant review of the environmental effects of CARB's existing LCFS regulation.

LCFS 46-261

Although the court in *POET* directed CARB to evaluate the effects of the LCFS regulation, the Environmental Assessment ("EA") for the LCFS regulation and the ADF regulation (the "Proposed Regulations") ignores the impacts of the LCFS regulation presently in effect, as well as any other impacts of the project prior to 2014. As a result, prior to its consideration of the LCFS regulation and the ADF regulation, CARB must substantially revise and recirculate the EA for public review to evaluate the entire project.

LCFS 46-262

1. CARB's Project Description Is Inadequate Because it is Unclear Whether the Existing LCFS Regulation Is Part of the Project

"An accurate, stable and finite project description is the sine qua non of an informative and legally sufficient" environmental document. (*County of Inyo v. City of Los Angeles* (1977) 71 Cal.App.3d 185, 193.) Additionally, the ***entire project*** being proposed must be described in the EIR, and the project description must not minimize project impacts. (*City of Santee v. County of San Diego* (1989) 214 Cal.App.3d 1438, 1450.) As explained in *County of Inyo*:

> A curtailed or distorted project description may stultify the objectives of the reporting process. Only through an accurate view of the project may affected outsiders and public decision-makers balance the proposal's benefit against the environmental cost, consider mitigation measures, assess the advantage of terminating the proposal (*i.e.*, the "no project" alternative) and weigh other alternatives in the balance.

(*County of Inyo v. City of Los Angeles* (1977) 71 Cal.App.3d 185, 192-93.)

LCFS 46-263

The EA violates this mandate. First, the EA is unclear as to whether CARB is treating the "Project" as including the LCFS regulation presently in effect. On the one hand, the EA's project description discusses the existing LCFS regulation; the EA recognizes that the present action is being taken in response to the decision in *POET*; and the "re-adopted" LCFS regulation is structurally nearly identical to the LCFS regulation presently being enforced. On the other hand, however, the EA does not address the environmental effects of the LCFS regulation presently being enforced, and the "carbon intensity" base year has changed from 2010 to 2014. Because it is unclear whether the "project" analyzed in the EA includes the LCFS regulation presently in effect, the project description in the EA is not stable or finite, and is thus inadequate under CEQA.

LCFS 46-263 cont.

To the extent CARB intended to omit the current LCFS regulation from the project description, that action would also result in an inadequate project description because it is "inaccurate." CEQA requires the project description to include ***entire project***, not a smaller piece of the project that would have the impact of minimizing project impacts. (*City of Santee*, *supra*, 214 Cal.App.3d at 1450.) Describing only the "re-adopted" portions of the LCFS regulation also runs directly contrary to the writ issued by the superior court, which specifically requires CARB to analyze the effects of the project presently being implemented. (See Exhibit "1.")

LCFS 46-264

As a result, CARB must revise the project description in the EA to specifically include the existing LCFS regulation, and analyze the impacts associated with the existing regulation.

LCFS 46-265

2. <u>The Baseline Used By CARB Is Unclear</u>

Because the impacts of a project are evaluated against the environmental baseline, determining the proper baseline is critical to a meaningful discussion of the project's environmental impacts. (See *Communities for a Better Environment v. South Coast Air Quality Mgmt. Dist.* (2010) 48 Cal.4th 310, 320.) The EA here obscures the baseline used by CARB for its analysis of the impacts of the regulations because there is no definitive statement explaining what specific baseline is being used in the EA. Rather, the portion of the EA that purportedly sets forth the baseline cites to an appendix to the EA, which discusses the "Environmental and Regulatory Setting" of the Regulations. But even this appendix does not specifically state what date the EA is using as the baseline for environmental review. As a result, the EA should be revised to specifically state what baseline it is using, and recirculated for public review.

LCFS 46-266

3. Ignoring Pre-2014 Impacts Results in an Improper Baseline for <u>Environmental Review</u>

Generally, the "environmental baseline" includes the environmental conditions as they exist at the time the lead agency publishes the Notice of Preparation ("NOP") for the project, or, if there is no NOP, as is the case here, "at the time the environmental analysis is commenced." (CEQA Guidelines, § 15125(a).) Although the EA does not specifically state what baseline is being used, the analysis in the EA ignores the LCFS regulation's impacts prior to 2014, and asserts that the analysis in the EA "addresses the potentially significant adverse environmental impacts resulting from implementing the proposed LCFS and ADF regulations

LCFS 46-267

compared to existing conditions, **which include existing compliance with the LCFS left in place by the Court at the 2013 regulatory standards**." (EA at 3 [emphasis added].)

LCFS 46-267 cont.

Omitting analysis of the project's pre-2014 impacts is improper. Here, the environmental review commenced in 2007, and the initial Staff Report/ISOR for the LCFS regulation was released in 2009. As a result, the proper baseline for environmental review under CEQA is 2007, and certainly no later than 2009. (CEQA Guidelines, § 15125(a).)

LCFS 46-268

To the extent CARB intends to use a baseline of 2014, that baseline is also impermissible because it is "misleading" and obscures the impacts of the Regulations. (See, e.g., *Neighbors for Smart Rail v. Exposition Metro Line Construction* (2013) 57 Cal.4th 439.) Specifically, NOx emissions caused by the existing LCFS regulation from 2011 through 2014 from the San Joaquin Valley, the South Coast air basin, and the entire state, respectively, total 782, 1,032, and 3,463 tons per year. (Decl. Lyons at E-4.) Because a 2014 baseline has the effect of essentially sweeping prior NOx emissions under the rug, it is misleading, and a more accurate baseline should be used.

LCFS 46-269

The fact that the emissions occurred in the past does not excuse CARB from analyzing the effects of those emissions, as CARB still has the ability to mitigate these emissions, or modify the LCFS regulation in response to its analysis. In *Bakersfield Citizens for Local Control*, for example, the court set aside an EIR for a large commercial development, including a Wal-Mart. The trial court enjoined the construction of the Wal-Mart, but let the remainder of the construction proceed, and those businesses were operating at the time the court of appeal heard the case. The agency asserted the environmental review for the other businesses was moot because those businesses were operational. The Fifth District Court of Appeal disagreed, finding:

> [E]ven at this late juncture full CEQA compliance would not be a meaningless exercise of form over substance. The City possesses discretion to reject either or both of the shopping centers after further environmental study and weighing of the projects' benefits versus their environmental, economic and social costs. As conditions of reapproval, the City may compel additional mitigation measures or require the projects to be modified, reconfigured or reduced. The City can require completed portions of the projects to be modified or removed and it can compel restoration of the project sites to their original condition.

LCFS 46-270

(*Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1204.) In other words, "[a]s a matter of public policy and basic equity, developers should not be permitted to effectively defeat a CEQA suit merely by building out a portion of a disputed project during litigation . . . ." (*Id.* at 1203.) By ignoring pre-2014 NOx emissions, CARB is seeking to do just that.[1]

[1] CARB also cannot rely upon the rule that the baseline for a previously-reviewed project assumes the previously-approved project exists. (See Remy, Thomas, Moose & Manley, *Guide to CEQA* (11th ed. 2007) at 207.) This is because the Court in *POET, LLC v. California Air Resources Board* invalidated CARB's environmental document for the original LCFS regulation.

Because the EA employs the wrong baseline, the EA should be revised, and recirculated for public review.

LCFS 46-271

4. By Failing to Address Pre-2014 NOx Emissions, the EA Is Deficient Because it Does Not Analyze Cumulative Impacts

Even if CARB could argue the existing LCFS regulation was a different "project" under CEQA, CARB in its EA would still need to address the impacts of that regulation as "cumulative impacts." This is because CEQA requires that the environmental document discuss the cumulative effect on the environment of the subject project in conjunction with other closely-related ***past***, present, and reasonably foreseeable probable future projects. (See, e.g., Pub. Resources Code, § 21083, subd. (b).) "The purpose of this requirement is obvious: consideration of the effects of a project or projects as if no others existed would encourage the piecemeal approval of several projects that, taken together, could overwhelm the natural environment and disastrously overburden the man-made infrastructure and vital community services. This would effectively defeat CEQA's mandate to review the actual effect of the projects upon the environment." (*Citizens to Preserve the Ojai v. County of Ventura* (1985) 176 Cal.App.3d 421, 432.) Thus, regardless of whether the original LCFS regulation and the proposed LCFS regulation constituted different projects, CARB cannot avoid analyzing pre-2014 impacts as cumulative impacts.

LCFS 46-272

5. CARB's Failure to Analyze Pre-2014 Impacts Constitutes Improper Segmentation/Piecemealing

Ignoring the impacts of the existing regulation also impermissibly piecemeals the analysis of the impacts of the LCFS regulation. CEQA prohibits a lead agency from piecemealing – or segmenting – the environmental review of a project; in other words, a lead agency may not break up an action into several small "projects" that would have the effect of minimizing environmental review. "The requirements of CEQA cannot be avoided by piecemeal review which results from "chopping a large project into many little ones-each with a minimal potential impact on the environment-which cumulatively may have disastrous consequences." (*Lighthouse Field Beach Rescue v. City of Santa Cruz* (2005) 131 Cal.App.4th 1170, 1208-09 [quoting *Bozung v. LAFCo* (1975) 13 Cal.3d 263, 283-84]; see also *Environmental Protection Info. Ctr. v. Calif. Dept. of Forestry & Fire Prot.* (2008) 44 Cal.4th 549, 503.) In other words, where "an individual project is a necessary precedent for action on a larger project," the environmental review performed by the public agency "***must*** address itself to the scope of the larger project." (Cal. Code Regs., § 15165 [emphasis added].)

LCFS 46-273

As explained previously, NOx emissions caused by the LCFS regulation from 2011 through 2014 from the San Joaquin Valley, the South Coast air basin, and the entire state, respectively, total 782, 1,032, and 3,463 tons per year. (Decl. Lyons at E-4.) These past emissions – caused directly by the LCFS regulation that remains in effect – are troubling, due to among other things the U.S. EPA's recent redesignation of the San Joaquin Valley as an "extreme" non-attainment area for NOx. (75 Fed. Reg. 24409.) Estimated NOx emissions in the San Joaquin Valley caused by the existing version of the LCFS regulation total approximately 2.39 tons per day (or 872.35 tons per year) in 2020. (Decl. Lyons at D-10 [Figure 1c], F-18 [Table 8].) This is far higher than the San Joaquin Valley Air Pollution Control District's (the "District") adopted threshold of significance for NOx, which explain that a "project" under

CEQA is considered to have a significant impact on air quality if it would cause NOx emissions to exceed 10 tons per year.[2]

The EA makes no mention of these past increases, despite the fact that under the proposed LCFS regulation considered for "re-adoption" and the ADF regulation, statewide NOx emissions from biodiesel are projected to increase. (ADF ISOR at 42.) To fully consider and evaluate the potential significant impacts of the LCFS regulation and the ADF regulation, CARB may not look at the post-2014 emissions in isolation. Rather, by "chopping" the LCFS regulation into two smaller pieces, and obscuring the environmental impacts of the Regulations in the process, CARB is seeking to impermissibly piecemeal environmental review of the project. (*Lighthouse Field, supra*, 131 Cal.App.4th at 1208-09.)

LCFS 46-273 cont.

B. The EA's Analysis of Criteria Pollutant Emissions, Including NOx, Is Incomplete

NOx is one of the most important smog-forming emissions from man-made sources in some areas of California, including the San Joaquin Valley. Progress in reducing smog depends largely upon reductions of NOx, or "oxides of nitrogen," which are considered "major contributors to smog formation and acid deposition." (17 C.C.R., § 93118(d)(19).) NOx contributes to the formation of ground-level ozone (smog) in the San Joaquin Valley, particularly during the summer months. (*Calif. Building Indus. Ass'n v. San Joaquin Valley Air Pollution Control Dist.* (2009) 178 Cal.App.4th 120, 126 ["*CBIA*"].) The San Joaquin Valley air basin does not meet the federal ozone standard required under the Clean Air Act; the area has thus been designated by EPA as "extreme non-attainment" for ozone under the federal National Ambient Air Quality standards ("NAAQs"). (75 Fed. Reg. 24409.)

LCFS 46-274

1. The EA Fails to Analyze or Discuss Criteria Pollutants Other than NOx

The EA contains only a minimal discussion of impacts associated with criteria pollutants. (See EA at 51-52.) The EA only quantifies the emissions associated with one criteria pollutant: NOx. There is no discussion of other criteria pollutants, including particulate matter (PM), volatile organic compounds (VOCs), and reactive organic gases (ROG).

Whether CARB believes these impacts are insignificant is irrelevant. CEQA places the burden of environmental investigation on government rather than the public," and a lead agency "should not be allowed to hide behind its own failure to gather data." (See, e.g., *Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296, 311.) By failing to analyze the impacts of the proposed "re-adopted" LCFS regulation and the ADF regulation on criteria pollutants, other than NOx, the EA does not comply with CEQA.

LCFS 46-275

[2] San Joaquin Valley Air Pollution Control Dist., Guide for Assessing and Mitigating Air Quality Impacts (1998; Jan. 2002 rev.) § 4, Table 4-1, p. 26 (the "SJVAPD Guide"), *available at* http://www.valleyair.org/transportation/CEQA%20Rules/GAMAQI%20Jan%202002%20Rev.pdf

2. The Project Will have Significant Impacts Associated With NOx Emissions, Even Using CARB's Own Analyses

Although the EA estimates that NOx emissions will decrease over time, CARB itself estimates that increased use of biodiesel associated with the ADF regulation and the "re-adopted" LCFS regulation will result in additional NOx emissions of 1.29 tons per day [or 470.85 tons per year] in 2015. (ADF ISOR, Table B-1.) Although CARB's estimated increases in NOx are inaccurate, and drastically understate NOx emissions, as explained *infra*, an increase in NOx emissions of 470.85 tons per year is in itself significant, and CARB cannot plausibly claim the Projects' impacts will have "beneficial" impacts on operational criteria pollutant emissions. LCFS 46-276

Any attempt by the EA to offset, or mitigate, biodiesel NOx emissions with the use of renewable diesel fuel is erroneous. There is "nothing in either the proposed ADF regulation or the proposed LCFS regulation that mandates the use of any volume of biodiesel in California, much less the use of the exact ratio of renewable diesel to biodiesel assumed by CARB staff in its emissions analysis." (Decl. Lyons, at D-4.) Despite this, the EA does not include any analysis of the possibility that renewable diesels will not displace biodiesels at the rate contemplated in the ISOR. Thus, any alleged off-set is speculative, and does not excuse CARB's failure to analyze NOx increases associated with biodiesel, or to mitigate the 470.85 tons per year in emissions increased use of biodiesel will generate. LCFS 46-277

Moreover, none of the documents made available for public review by CARB (including the EA, the two ISORs, or the supporting materials) support staff's assertion "that 40% of renewable diesel used in California will be used by refiners to aid in compliance with CARB's existing diesel fuel regulations and that 60% will be blended downstream of refineries." (*Id.*) Indeed, this result defies common sense; to the extent fuel producers choose to blend renewable diesel in California, it would be far more logical for "them to do so by purchasing renewable diesel for use at their refineries where they can benefit from the other desirable properties of this fuel beyond its low carbon intensity (CI) value (e.g., high cetane number and fungibility with diesel fuel at all blend levels)," as opposed to "purchasing LCFS credits generated by downstream blenders of renewable diesel fuel." (*Id.*) LCFS 46-278

The Regulations will have significant impacts resulting from the emission of NOx caused by increase biodiesel usage. As a result, the EA's finding that the Regulations would have a "beneficial" effect to criteria pollutant emissions is erroneous, and not supported by substantial evidence. LCFS 46-279

3. The Analysis of NOx Impacts Is Flawed and Incomplete, and Omits Known Sources of Emissions

The EA's analysis significantly understates the true impacts associated with operational NOx emissions. CARB staff's calculation of NOx emissions associated with increased biodiesel usage was based on the erroneous assumption that biodiesel use in "New Technology Diesel Engines" (NTDEs) at levels up to B20 will not increase NOx emissions. As explained in the Declaration of James M. Lyons, the available data demonstrate "not only that NOx emissions from NTDEs will increase with the use of biodiesel in proportion to the amount LCFS 46-280

of biodiesel present in the blend, but also that the magnitude of the increase on a percentage basis will be much greater than that observed for 'legacy vehicles.'" (Decl. Lyons, at D-4.)

Specifically, "if one simply and extremely conservatively assumes that NTDE NOx increases will be the same on a percentage basis as legacy vehicles and eliminates the NOx offsets assumed from renewable diesel, the NOx increases expected from biodiesel increase from 1.36 tons per day statewide in 2014 to approximately 3.44 tons per day—a factor of about 2.65." (Decl. Lyons, at D-4; see also ADF ISOR, Table B-1.) "For 2023, estimated NOx emission increases due to biodiesel rise to about 0.87 tons per day . . . ." (*Id.* at D-4, D-5.) Thus, accounting for NOx emissions associated with NTDEs alone, projected NOx emissions are far greater than those calculated by CARB staff.

By performing a detailed and comprehensive – yet conservative – analysis of NOx increases using generally accepted techniques, Sierra Research has concluded that NOx emissions are far more severe, and could total as much as 9.73 tons per day statewide in 2020, and 2.39 tons per day (or 872.35 tons per year) in 2020 in the San Joaquin Valley air basin alone. (Decl. Lyons at D-10 [Figure 1c], D-18 [Table 8].) This figure is vastly higher than the 10 tons per year threshold of significant adopted by the San Joaquin Valley Air Pollution Control District for projects under CEQA. (See SJVAPD Guide, § 4, Table 4-1, p. 26.)

LCFS 46-280 cont.

4. The EA Fails to Quantify Impacts Associated With the Construction Of New Facilities

The EA posits that the Regulations would result in the construction of new or modified fuel production facilities to meet demand for fuels created by the Regulations, including processing plants for agriculture-based ethanol, cellulosic ethanol, and biomethane. Without quantifying the potential impacts of these facilities, the EA makes the bare conclusion that several of the impacts associated with these facilities would be "significant and unavoidable."

An environmental document, including a functional equivalent document, however, cannot simply label an impact "significant and unavoidable" without first providing a discussion and analysis. Such a backwards approach "allows the agency to travel the legally impermissible easy road to CEQA compliance." (*Berkeley Keep Jets Over the Bay Comm. v. Bd. of Port Comm'rs* (2001) 91 Cal.App.4th 1344, 1370.) Rather, the lead agency must quantify the impact, and consider feasible mitigation based on that analysis. (See, e.g., *Sundstrom*, *supra*, 202 Cal.App.3d at 311 ["CEQA places the burden of environmental investigation on government rather than the public," and a lead agency "should not be allowed to hide behind its own failure to gather data."].)

The potential impacts associated with the development of new or modified facilities *can* be quantified. As explained in the Declaration of James M. Lyons, CARB attempted to quantify emissions from such facilities in its 2009 rulemaking. (Decl. Lyons at B-3.)

LCFS 46-281

Moreover, by declining to quantify impacts associated with new facilities, the EA essentially forecloses any and all mitigation measures. For example, if potential criteria pollutant emissions were quantified, CARB could modify the proposed regulation, enact another

LCFS 46-282

regulation, or otherwise develop mitigation to reduce such impacts. CARB could also reconfigure the Regulations, create performance standards for new California biodiesel facilities, or otherwise create disincentives to develop new facilities within California. Instead, however, the EA merely provides a laundry list of *potential* mitigation measures, without actually requiring that those mitigation measures be implemented, or analyzing whether those mitigation measures would reduce the impacts to a less-than-significant level.

LCFS 46-282 cont.

5. The Increased NOx Emissions Under the Regulations Violate AB32

NOx emissions caused by the Regulations also violate AB 32. Health and Safety Code Section 38570, subdivision (b), requires CARB, "***[p]rior to*** the inclusion of any market-based compliance mechanism in the regulations," to "(1) [c]onsider the potential for direct, indirect, and cumulative emission impacts from these mechanisms, including localized impacts in communities that are already adversely impacted by air pollution," and "(2) [d]esign any market-based compliance mechanism *to* ***prevent any increase*** in the emissions of toxic air contaminants or criteria air pollutants." (Health & Saf. Code § 38570, subd. (b) [emphasis added]. In addition, for any regulation adopted under AB32 like the LCFS regulation, the Board must "***ensure*** . . . activities undertaken pursuant to the regulations do not interfere with . . . efforts to achieve and maintain federal and state ambient air quality standards" (*Id.* § 38562(b)(4); emphasis added)].) Because the Regulations would ***increase*** NOx emissions from biodiesel, the Regulations are unlawful.

LCFS 46-283

C. The Mitigation Measures Proposed in the EA Inadequate Under CEQA

The Mitigation Measures specified in the EA are also inadequate under CEQA. The EA finds that several potential impacts of the Regulations would be "significant and unavoidable," resulting from the construction of new or modified facilities to meet demand for fuels created by the Regulations, including processing plants for agriculture-based ethanol, cellulosic ethanol, and biomethane. Rather than including enforceable mitigation, however, the EA merely sets forth "recognized practices" that are "routinely required" to avoid or minimize impacts, without requiring the implementation of any specific measure, or even evaluating whether any such measures – if incorporated – would actually reduce or minimize the impact. This is improper under CEQA for several reasons.

LCFS 46-284

First, mitigation must be enforceable. (Pub. Resources Code, § 21081.6, subd. (b); CEQA Guidelines, § 15126.4(a)(2).) The EA, however, does not require any particular measure. Rather, the EA just sets forth a potential mitigation measures that local land use authorities *could* implement if they choose to do so. Because none of the mitigation measures identified in the EA are enforceable, they are inadequate under CEQA.

LCFS 46-285

Mitigation must also be effective, and an agency must identify mitigation measures that will minimize the project's significant impacts by reducing or avoiding them. (See, e.g., Pub. Resources Code, §§ 21001, 21100.) The EA, however, does not discuss *how* any of the proposed mitigation measures – if implemented – would reduce or avoid the potential impacts of the Regulation, and if so, to what degree.

LCFS 46-286

Nor may CARB permissibly defer the formulation of specific mitigation. To defer mitigation, a lead agency must still (1) "evaluate[] the potentially significant impacts of the

LCFS 46-287

project," (2) "identif[y] measures that will mitigate those impacts," (3) "commit[] to the mitigating the significant impacts of the project," and (4) "specify performance standards which would mitigate the significant effect of the project" to govern the subsequent mitigation. (*California Native Plant Soc'y v. City of Rancho Cordova* (2009) 172 Cal.App.4th 603, 621.) Here, in contrast, the EA does not specifically identify the potential impacts, require the mitigation of significant impacts, or "specify performance standards which would mitigate the significant effect of the" Regulations. (See *id.*)

LCFS 46-287 cont.

As a result, CARB must revise the EA to further analyze potential mitigation measures, and include enforceable mitigation to minimize the recognized potentially significant impacts of the Regulations, and recirculate the revised EA for public review.

LCFS 46-288

D. <u>The EA Fails to Analyze Impacts Associated With Fuel Shuffling</u>

Since its enactment in 2009, the LCFS regulation has led to a phenomenon called "fuel shuffling," in which lower-CI fuels are shipped from around the world to California and higher-CI fuels must be sent for sale elsewhere. (Decl. Lyons at B-4.) CARB has admitted that fuel shuffling will occur. (See, e.g., December 2009, Final Statement of Reasons at 241.) There is no environmental advantage to fuel shuffling, for the same fuels are still produced and consumed, and the same GHGs are still emitted from those processes. Rather, because the LCFS regulation encourages the shipment of fuels to alternative locations that are further from origin facilities, fuel shuffling actually causes emissions of GHGs to increase.[3]

These increases in emissions are potentially significant, but discussed nowhere in the EA. For example, even using CARB's direct emissions model (GREET), GHG emissions associated with shuffling would be significant. For example, the LCFS regulation will likely result in higher amounts of Brazilian cane ethanol being shipped to California, with more traditional fuels being shipped from California to Brazil and other destinations by ship. Additional shipping corn- and sugarcane-based ethanol by ship to and from destinations such as Brazil alone would result in an additional 150,000 tons per year of CO2 equivalent emissions. (Appendix G) Using more accurate direct emission models, increase CO2 equivalent emissions would be between 385,000-735,000 tons per year – or nearly 4.5% of the total emissions benefits CARB assets the Regulations would allegedly cause. (Appendix G) Notably, these figures do not include increases in emissions associated with fuel shuffling of crude oils, or the increases in the transport of ethanol by rail as part of fuel shuffling. (Appendix G)

LCFS 46-289

The EA likewise does not evaluate whether fuel shuffling caused by the Regulations would result in additional increases in criteria pollutant emissions. Because transportation of fuels by rail, truck, and sea indisputably create emissions of criteria pollutants, both inside and outside[4] California, the EA must analyze those potential impacts to determine

LCFS 46-290

[3] Because the LCFS regulation will not achieve any benefits as to climate change, CARB cannot base any statement of overriding considerations on this assertion.

[4] CARB must analyze both in-state and out-of-state impacts caused by the Regulation. CEQA defines "environment" to include "the physical conditions that exist within the area which will be affected by a proposed project, including land, air, water, minerals, flora, fauna, noise, or objects of historic or aesthetic significance." (Public Resources Code, § 21060.5.) That definition includes no geographic limitation. We also understand CARB has considered out-of-state impacts in previous rulemakings.

whether they are significant. (See, e.g., *Sundstrom*, *supra*, 202 Cal.App.3d at 311 ["CEQA places the burden of environmental investigation on government rather than the public," and a lead agency "should not be allowed to hide behind its own failure to gather data."].)

LCFS 46-290 cont.

Thus, to accurately identify and analyze the impacts of the Regulations, the EA must be revised to address impacts associated with fuel shuffling, and recirculate the EA for public review.

LCFS 46-291

E. <u>The EA's Discussion of the Growth Energy Alternative Is Insufficient</u>

The requirement that environmental documents identify and discuss alternatives to the project stems from the fundamental statutory policy that public agencies should require the implementation of feasible alternatives or mitigation measures to reduce the project's significant impacts. (See, e.g., Pub. Resources Code, § 21002.) The lead agency must focus on alternatives that can avoid or substantially lessen a project's significant environmental effects. (See *id.*) The EA here impermissibly rejects discussion of the Growth Energy Alternative, and does not include any discussion of a Cap and Trade Alternative. These alternatives are discussed in greater detail below. The CEQA Guidelines specifically recognize that comments raised by members of the public on an environmental document are particularly helpful if they suggest "additional specific alternatives . . . that would provide better ways to avoid or mitigate the significant environmental effects." (CEQA Guidelines, § 15204.)

LCFS 46-292

The Growth Energy Alterative contemplates an adjustment to the cap and trade regulation in Title 17 of the California Code of Regulations to account for whatever increment of GHG emissions reductions would be foregone by eliminating the LCFS regulation. CARB concedes the Growth Energy Alternative would achieve the same emissions reductions contemplated under the Regulations. (See Standardized Regulatory Impact Assessment at 26-27.)

LCFS 46-293

The Growth Energy Alternative also would not result in fuel shuffling, or the construction of numerous fuel production plants in California. (See Decl. Lyons at B-4.) Because the only impacts found to be "significant and unavoidable" under the EA result from the construction of new and modified fuel production facilities, the Growth Energy Alternative would likely eliminate ***all*** of the Regulations' significant and unavoidable impacts. Because the Growth Energy Alternative would lessen the "significant and unavoidable" effects of the Regulations, it should be included as an alternative in a recirculated EA. (Pub. Resources Code, § 21002.)

LCFS 46-294

Despite these benefits, the EA rejects the Growth Energy Alternative to the Regulations because it would allegedly require that actions be taken to mitigate increased NOx emissions from biodiesel under circumstances where CARB staff incorrectly assumed there would be no increased emissions due to biodiesel use under the ADF. These assumptions are flawed.

LCFS 46-295

As demonstrated by Sierra Research, the ADF regulation will result in significant and unmitigated increases in NOx emissions throughout California, including significant impacts within the San Joaquin Valley and South Coast air basins. (Decl. Lyons ¶ 15.) The EA concedes the mitigation proposed under the Growth Energy Alternative would require "mitigation in

exactly those areas where CARB staff was lead to believe it was not required based on its flawed emissions analysis." (Decl. Lyons at G-3.) Because of this, and the fact that the Growth Energy Alternative expands the conditions under which this mitigation has to be applied in order to eliminate the potential for any increase in NOx emissions due to biodiesel use, the Growth Energy Alternative is environmentally superior to the ADF regulation. (*Id.*)

LCFS 46-295 cont.

To the extent CARB argues the Growth Energy Alternative does not meet the objective of "greater innovation and development of cleaner fuels," this is not a valid reason to reject discussion of the alternative. First, as explained in the Declaration of James M. Lyons, the Growth Energy Alternative would also foster greater innovation and development of cleaner fuels in California because most of the same fuels will be blended into California fuels as a result of the federal RFS program. (Decl. Lyons at C-4.)

But even if the Growth Energy Alternative would not meet this project objective, (see ISOR at E-40, E-41), CARB may not simply reject discussion of an alternative simply because it does not meet one of several project objectives. Rather, a feasible alternative that would substantially reduce the project's significant impacts should not be excluded from the analysis simply because it would not fully achieve the project's objectives. (See *Habitat & Watershed Caretakers v. City of Santa Cruz* (2013) 213 Cal.App.4th 1277, 1304.) Here, as discussed above, the Growth Energy Alternative would essentially eliminate all of the "significant and unavoidable" impacts of the Regulations.

LCFS 46-296

Further, to the extent CARB relies upon this objective to reject mere analysis of the Growth Energy Alternative, this is improper because it would essentially limit the range of alternatives described to regulations that are nearly identical to the Regulations. Because agencies may not "give a project's purpose an artificially narrow definition," (*In re Bay-Delta Programmatic Envt'l Report Coordinated Proceedings* (2008) 43 Cal.4th 1143, 1166), and CARB has previously demonstrated a pattern of prejudging the LCFS regulation prior to completing the environmental review process, (see *POET, LLC v. California Air Resources Board* (2013) 218 Cal.App.4th 681), CARB should not artificially tailor its objectives to limit the range of alternatives to the LCFS regulation itself.

LCFS 46-297

In short, the Growth Energy Alternative better achieves the project objectives than the Regulations, and is environmentally superior to the Regulations. As a result, the EA must analyze the Growth Energy Alternative, and CARB must recirculate the EA for public comment.

LCFS 46-298

F. CARB Must Substantially Revise the LCFS Regulation, the ADF Regulation, And the EA, Due to Material Inconsistencies Between the Two Regulations

As explained in detail in the Declaration of James M. Lyons, the LCFS regulation and the ADF regulation "contain inconsistent and conflicting definitions," and lack "provisions requiring the determination, through testing, of the biodiesel content of commercial blendstocks." (Decl. Lyons ¶ 17.) These inconsistencies include that: (1) the Regulations contain different definitions for the term "biodiesel"; (2) the term "Biodiesel Blend" under the LCFS regulations contains at least 6% biodiesel, while a "Biodiesel Blend" under the ADF is a diesel fuel containing any biodiesel; (3) the LCFS regulation defines "Diesel Fuel Blend" as a blend of diesel fuel and up to 5% biodiesel, while such a fuel would be considered "CARB diesel" under the ADF regulation; and (4) under the proposed ADF regulation, "B20" is

LCFS 46-299

nonsensically defined as a fuel that contains between 6% and 20% biodiesel, which directly contradicts the definition of "Blend Level" in same regulation. (See Decl. Lyon at H-3, H-4.)

In addition, the term "Biodiesel Blend" is defined in the ADF regulation as a mixture of biodiesel and an undefined fuel referred to as "petroleum-based CARB diesel." "Blend Level" applies to blends of all fuels subject to the ADF regulation, including biodiesel, and is defined as the ratio of an "Alternative diesel fuel" mixed with "CARB diesel." As noted above, however, "CARB diesel" may already contain as much as 5% biodiesel under the proposed ADF regulation. The addition of biodiesel to a fuel already containing some amount of biodiesel up to 5% will cause the actual biodiesel content to be higher than the blender expects, which in turn will result in increased NOx emissions. (See Decl. Lyons at F-3, F-4.) These potential NOx emissions are not discussed in the EA.

The internal inconsistencies between the LCFS regulation and the ADF regulation also render the project description defective. "An accurate, stable and finite project description is the sine qua non of an informative and legally sufficient EIR." (*County of Inyo v. City of Los Angeles* (1977) 71 Cal.App.3d 185, 193.) Because the LCFS regulation and the ADF regulation contain material, conflicting terms, the project description is not accurate or stable, and must be revised.

Due to these material inconsistencies, the EA is legally flawed. Both the proposed regulations and the EA must be revised significantly, and recirculated for public review.

LCFS 46-299 cont.

Comment Letter 46_OP_LCFS_GE/17_OP_ADF_GE Responses

LCFS 46-1

The commenter asserts that ARB should not have an LCFS regulation, but instead should only rely on the Cap-and-Trade program to achieve greenhouse gas (GHG) reductions and the goals of Assembly Bill 32 (AB 32, the Global Warming Solutions Act of 2006). This comment is noted, but ARB has instead chosen to rely on a suite of policies, planning measures, direct regulations, market approaches, incentives and voluntary efforts to achieve required GHG reductions. The proposed LCFS Regulation is a key measure in this suite. In addition, the LCFS program provides other benefits, including greater diversification of the state's transportation fuels and a reduction in the impacts of price volatility of petroleum-based fuels.

Cap-and-Trade and the LCFS are complementary programs. While both programs affect transportation fuels, they have different objectives and approaches to emission reductions. These programs work synergistically to achieve the objectives of AB 32 and Executive Order S-01-07. Most importantly, while the focus of the Cap-and-Trade program is on the economy-wide reduction of GHG emissions, the objective of the proposed LCFS Regulation is to lower the CI of transportation fuels – thereby achieving GHG reductions as well as helping transform and diversify the transportation fuel pool in California.

Regarding the cost of the LCFS, the market based core of LCFS along with features such as cost containment would allow the objectives of LCFS to be achieved at the lowest possible cost.

The comment states that the new justification for the LCFS Regulation ignores the federal Renewable Fuels Standard (RFS) program and states that ARB staff did not properly account for the beneficial effects of the federal RFS program in stimulating fuels diversification and in the commercialization of cellulosic renewable fuels.

ARB staff has thoroughly considered the role of the federal RFS program as it relates to the LCFS Regulation. In general the federal RFS program is complementary, but not equivalent to the LCFS Regulation. The RFS program only targets biofuels, and therefore it disregards the role of electricity, hydrogen, and natural gas in a future clean transportation fuel pool. In addition, the RFS structure of binning fuels into four broad categories does not reward

incremental improvements or innovations within the bins that could lower GHG emissions further.

As stated in the ISOR, if California were to rely solely on the RFS program, the state would not be able to achieve the CI and GHG emissions reduction targets in the proposed LCFS Regulation.

LCFS 46-2 The comment states that the LCFS Regulation would disrupt the national market for renewable fuels and cause increases to GHG emissions. See response to **LCFS 46-61** and **LCFS 46-254**.

LCFS 46-3 & 46-4 The comments describe the Draft EA and indicate that CEQA-related comments are provided in Part III and Appendix J of the comment letter. Please see responses to comments **LCFS 46-29** through **LCFS 46-63** and **LCFS 46-261** through **LCSF 46-299**.

LCFS 46-5 The comment states that any regulation must be consistent with the purposes of AB 32, and reasonably necessary to accomplish AB 32's goals only.

AB 32 authorizes ARB to adopt a LCFS. The regulation, by stimulating innovative fuels and incentivizing the use of existing low-carbon fuels such as electricity, would help accomplish the purposes of AB 32, including a reduction in GHG emissions. Notably, ARB has authority to promulgate regulations under many statutes, including broad police power authority to regulate motor vehicles, motor vehicle fuels, and to address motor vehicle emissions systematically. (See, e.g., Health & Safety Code §§39003, 39600, 39601.) Moreover, it has been the State's express policy for a number of years to reduce the State's dependence on petroleum. (Pub. Res. Code §25000.5)

The comment also asserts that AB 32 implementation measures must not interfere with efforts to reduce ambient air pollution.

Chapter 4 of the Final Environmental Analysis for the Low Carbon Fuel Standard and Alternative Diesel Fuel Regulations explains the air quality analysis. See below for an excerpt:

> The proposed regulations provide a clear legal pathway to the commercialization of innovative, lower-carbon diesel fuel substitutes that would result in **beneficial** air quality impacts in regards to PM, CO, TAC, and other air pollutants. Specifically, the estimated total reduction of $PM_{2.5}$ emissions would be more than 1,200 tons from transportation fuels in

California from 2016 through 2020. These emissions reductions include the reduced tailpipe emissions of $PM_{2.5}$ associated with the replacement of conventional diesel with substitute fuels net of any increased emissions of $PM_{2.5}$ associated with feedstock and fuel truck trips from additional California biofuel production facilities and transport from out-of-state biofuel production facilities. In addition, stationary source emissions associated with transportation fuel production would be subject to local rules and regulations (e.g., authority to construct and permit to operate requirements) and, consequently, would not be approved by local air districts if emissions were to exceed designated levels for attaining and maintaining ambient air quality standards, and/or exceed acceptable risk levels for TAC exposure.

The comment asserts that GHG reductions must be "real, permanent, quantifiable, verifiable, and enforceable."

Chapter 4 of the Draft EA addresses GHG emissions associated with the Proposed Regulation. The objective of the proposed LCFS Regulation is to reduce the CI of transportation fuels in the California market by at least 10 percent of its 2010 levels by 2020. The lower CI is expected to reduce GHG emissions from the state's transportation sector by about 35 million metric tons (MMT) during 2016 -2020. The comment provides no evidence to indicate why the anticipated GHG reductions would not be realized.

The comment asserts that the Board is required to rely on the best available economic and scientific information available when adopting AB 32 regulations.

As set forth in the ISOR, and its appendices and references, ARB staff has relied upon the best available economic and scientific analyses. In addition to ARB's research and analyses, the development process has included input from the public at more than a dozen workshops and public hearings, as well as input and guidance from regulated parties, academic experts, an expert Working Group, and an Advisory Panel. In 2009 and again in 2015, independent peer reviewers from a variety of universities agreed that the bases for the proposed LCFS Regulation were scientifically sound.

LCFS 46-10 The comment states that the LCFS would interfere with the federal RFS program. ARB disagrees with the factual and legal assertions

in the comment. The assertions are similar to those being litigated in federal court. ARB strongly disagrees that the proposed LCFS Regulation is preempted by federal law. In fact, the LCFS has objectives in common with a number of federal statutes, including the statute establishing the RFS program. As noted elsewhere, is common for ARB to adopt synergistic programs that work in partnership with U.S. EPA's regulations – regulation of fuel and fuel additives and rules increasing the fuel economy and decreasing GHG emissions from cars and light-duty trucks are examples. The RFS program and the LCFS program provide such synergistic and positive benefits with respect to alternative fuels, but LCFS does not interfere with or conflict with RFS.

The comment speculates, without offering evidence, that companies outside of California could sell fuel in other states and nations without taking steps to reduce that fuel's CI, thus the LCFS would not achieve "real" GHG reductions. Please see response to comment **46-61**. For related responses, also see comments **LCFS 46-31** and **46-41**.

LCFS 46-29 The commenter repeats **LCFS 46-5** regarding AB 32. See response to **LCFS 46-5**, above. The commenter also mentions CEQA, as an introduction to comment **LCFS 46-30**. Please see response to **LCFS 46-30**, below.

LCFS 46-30 The commenter correctly explains that, under a certified state regulatory program, an agency must include alternatives to a proposed project and mitigation measures to avoid or reduce any significant or potentially significant effects that the project might have on the environment. ARB's certified regulatory program includes this requirement, as directed in 17 CCR 60005(b): "The analysis shall address feasible mitigation measures and feasible alternatives to the proposed action which would substantially reduce any significant adverse impact identified." Alternatives to the project are discussed in Chapter 7 of the Draft EA; mitigation measures are described following impact discussions in Chapter 4 of the Draft EA.

LCFS 46-31 The comment states that previous versions of LCFS have not resulted in GHG emissions reductions. To the extent the comment is intended to question the EA's conclusions about emissions reductions and air quality benefits of the LCFS and ADF proposals, ARB disagrees with the statement. The existing LCFS is frozen at the 2013 compliance level of 1 percent average CI reduction by court order, and the emissions reductions may therefore have been

lower than what they otherwise might have been. Even so, the LCFS program has seen real, substantiated changes to the transportation fuel in California as a result of its program – increased volumes of renewable diesel and lower-CI ethanol are two examples. To date, nearly 160 active entities have registered for reporting in the LCFS Reporting Tool, and since the regulation went into effect, regulated parties have successfully operated under the LCFS program. Furthermore, fuel producers are innovating and achieving material reductions in their fuel pathways' carbon intensity, an effect the LCFS regulation is expressly designed to encourage. This is reflected in the large number of applications submitted under the "Method 2A/2B" process. The Method 2A/2B process allows fuel producers to apply for carbon intensity values for their fuels that are lower than the default values found in the LCFS Lookup Tables. To date, more than 230 individual new or modified fuel pathways with substantially lower carbon intensities have been certified. Almost 170 biofuel facilities are registered under the LCFS as supplying low-carbon fuels to California. The fact that some Midwest biorefinieries have a low CI and others are adjusting their processes to lower their CI, is a positive sign demonstrating the innovative nature of the market based program.

The proposed LCFS Regulation requires progressively more stringent CI for the transportation fuel used in California, up to a 10 percent value in 2020 and beyond. It is possible to measure emission reductions by reference to the compliance standards in the proposed regulation, and, with respect to the existing program, by reference to the balance of unused credits, each of which represents one metric ton of carbon dioxide equivalent (CO2e). These tell the story of real, significant GHG emission reductions, in addition to the core objective of the regulations, which is to lower the CI of transportation fuels in California.

As described in the ISOR and Draft EA, ARB staff determined the cumulative emission reductions of the program, in concert with other state and federal programs, as 63 million metric tons CO_2e ($MMTCO_2e$) in 2020. Other federal and state programs, such as RFS2 and Advanced Clean Cars (ACC), work synergistically with the LCFS Regulation to reduce GHG emissions. To provide a conservative value, however, the ISOR estimates a GHG emissions-reduction benefit of 35 $MMTCO_2e$ through 2020 from the proposed LCFS Regulation that is over and above any benefit from RFS2 and ACC. Additional details about how ARB estimated GHG

emissions reductions in the EA are provided below under responses to comments **LCFS 46-45**.

LCFS 46-32 The comment states that quantitative estimates of GHG reductions were not provided. See response to **LCFS 46-45**.

LCFS 46-33 The comment states that assumptions used to determine how the market would comply with the proposed LCFS Regulation are unrealistic. The LCFS Regulation is a market-based program that allows individual businesses flexibility in selecting compliance pathways but ensures CI reductions, and corresponding GHG emissions reductions, by requiring a progressively declining performance-based standard. Many of the low CI options also provide reductions of criteria pollutants (e.g., renewable diesel, electric vehicles, and natural gas).

LCFS 46-34 The comment states that the proposed LCFS Regulation could not properly be treated as a regulation that meets the purposes of AB 32 because there is no reliable demonstration that the regulation would reduce GHG emissions. See responses to **LCFS 46-5**, **LCFS 46-31**, **LCFS 46-41**, and **LCFS 46-45**.

The comment also states that ARB ignored feasible alternatives for reducing GHG emissions. An alternative that would do nothing other than reduce GHG emissions without driving changes in fuels and transportation technologies would not meet the goals and objectives of the project (see Section 1.B of the EA, Objectives of the Proposed LCFS and ADF Regulations).

LCFS 46-35 The comment states that the proposed LCFS and ADF Regulations do not meet the CEQA requirements and do not meet requirements set forth under the POET decision. See responses to **LCFS 46-261** through **LCFS 46-301**.

LCFS 46-41 The comment states that there has been no real reduction in the "average CI in the mix of biofuels used in California." ARB staff disagrees with the assertions of the commenter and has provided estimated emission reductions in the ISOR and the Environmental Analysis. Over the first three years of the existing LCFS, there has been a steady decline in the average CI of the mix of biofuels used in California. Concurrent with that decline, there has been a great expansion of the applications for fuel-pathway CIs. These lower CI pathways will provide additional opportunities to produce more credits per unit of fuel used. ARB staff expects these trends to

continue and actually accelerate as the stringency of the LCFS increases and credits become more valuable.

The proposed LCFS program requires progressively more stringent CI for the transportation fuel used in California, up to a 10 percent reduction in 2020 and beyond. This provides real, significant GHG emission reductions, in addition to the core objective of the regulation, which is to lower the carbon intensity of transportation fuels, including biofuels, in California. See response to **LCFS 46-31**.

LCFS 46-44

The comment states that the proposed LCFS Regulation would result in fuel shuffling, which would result in greater GHG emissions. Please see response to comment **LCFS 46-61**.

The proposed CI values are based on the best available science and have undergone significant public review. They accurately reflect the real-world life-cycle emissions of each fuel including components such as the emissions from oceangoing tankers from sugarcane ethanol that would come from overseas. See response to **LCFS 46-254**.

As discussed in Chapter VII of the ISOR, the LCFS sends an appropriate market signal that low-CI fuels are inherently more valuable. Similarly, products with higher CI values have less value in the context of an LCFS Regulation. The market responds to this price signal with a variety of actions, including increased supply of the more valuable products and decreased supply of the least valuable products. This may include increasing or reducing planting to match the new demand; developing or improving new, lower CI fuels; and, improving lifecycle processes for greater efficiency (lower CI) of existing fuels.

LCFS 46-45

The comment asserts that GHG emissions reductions have not been estimated.

The estimate of 63 MMTCO_2e between 2016 and 2020 is based upon the total number of deficits that the proposed LCFS Regulation is expected to create during the period from 2016 through 2020. Since each deficit must be offset by a LCFS credit, the total benefit of the program is estimated to be the sum of the deficits obligations. However, a sizable portion of the credits needed to offset deficit obligations would be concurrently created when obligated parties supply fuels needed to comply with either the federal RFS 2 program, the ARB's zero emission vehicle (ZEV)

program or through an increase in natural gas (NG) use. The estimate of 35 $MMTCO_2e$ removes all of these credits, thus providing a conservative estimate of the net benefit of the proposed LCFS Regulation. Below is a summary of how the 35 $MMTCO_2e$ reductions (from 2016 to 2020) were estimated:

- Total cumulative deficits from 2016 to 2020 were 63 $MMTCO_2e$
- A total of 23 $MMTCO_2e$ of deficit obligations were estimated to be met with credits created by GHG reductions from programs that would be implemented independent of the LCFS Regulation:
  - The ZEV program was estimated to provide 4 $MMTCO_2e$
  - Electricity used in lieu of diesel fuel was estimated to provide 1 $MMTCO_2e$
  - Natural gas use by heavy duty vehicles (HDVs) was estimated to provide 4 $MMTCO_2e$
  - Lower CI fuels that would be used under RFS II was estimated to provide 14 $MMTCO_2e$
- Banked credits, created prior to 2016, were estimated to provide 5 $MMTCO_2e$
- The remaining deficits, approximately 35 $MMTCO_2e$, would be met through GHG reductions expected between 2016 and 2020 due to the LCFS Regulation
- Impacts of California's Pavley Vehicle Standards and the federal CAFE program are incorporated into the baseline energy demand for transportation fuels, and did not require additional adjustment.

LCFS 46-46 The comment asserts that GHG emissions reductions have not been estimated. See response to **LCFS 46-45**.

LCFS 46-47 The comment asserts that GHG emissions reductions have not been estimated and that the proposed LCFS Regulation does not conform with rulemaking requirements of AB 32. See responses to **LCFS 46-45** and **LCFS 46-68**.

LCFS 46-48 The commenter correctly states that the Board must consider comments submitted by stakeholders, as well as responses prepared by ARB staff.

ADF 17-2 The comment states that biodiesel use allowed by the ADF Regulation, and occurring as part of efforts to comply with the LCFS Regulation, would result in additional NO_X emissions. Please see response to comment **LCFS 46-276**.

ADF 17-3

The comment states that the total diesel NO_X emissions inventory on which the assessment is based is not described. As stated in Appendix B of the ADF staff report, the baseline for ARB staff's calculation is the ARB diesel emissions inventory. The emissions inventory tool is available at: http://www.arb.ca.gov/app/emsinv/2013/emssumcat.php. Staff's query selected statewide mobile sources using diesel fuel, excluding ocean-going vessels as it is unlikely that those vessels would use biodiesel.

Staff downloaded the emissions data for the 2010, 2015, and 2020 inventory years. For 2011, 2012, 2013, and 2014 the slope from 2010 to 2015 was applied and a linear decrease in emissions was assumed. For 2016, 2017, 2018, and 2019 the slope from 2015 to 2020 was applied and a linear decrease in emissions was applied. The years past 2020 were calculated using the same slope as the years from 2015 to 2020.

As stated in Appendix B of the ADF staff report, the portion of vehicle miles travelled (VMT) by new technology diesel engines (NTDEs) was determined using the EMFAC 2011 online tool, which can be found at: http://www.arb.ca.gov/emfac/. Staff downloaded the results for each year in the analysis and filtered the results by model year and VMT. Model years 2010 and newer were labeled NTDE, and 2009 and older were labeled non-NTDE.

Staff's analysis used the penetration of NTDEs as estimated by EMFAC 2011 and did not make a separate estimate for NTDE penetration in off-road engines because it is currently unclear what the penetration of both biodiesel use, and Selective Catalytic Reduction (SCR) use in off-road engines is, or would be in the coming years. During the program review to be completed by 2020, staff would consider the penetration of NTDEs in the off-road market, and the effects this has on staff's analysis.

Staff used EMFAC 2011 because at the time the ADF proposal was developed, along with the subsequent data analysis, EMFAC 2011 was ARB's official emissions inventory. EMFAC 2014 was publicly released on December 30, 2014, the same date that the ADF ISOR was released for public comment on ARB's rulemaking website. As of May 2015, EMFAC 2011 is still ARB's official inventory.

ADF 17-4

The comment states that ARB staff has erroneously concluded that the use of biodiesel in NTDEs equipped with exhaust after-

treatment devices to lower NO_X emissions would not lead to increases in NO_X emissions.

The proposed ADF Regulation is designed to reduce, over time, the NO_X emissions from biodiesel. The analysis that staff performed to arrive at the conclusion that NO_X emissions would decrease over time is described in EA Section 4.B.8., and in the ADF staff report, especially in Chapter 7 and Appendix B. That analysis was conducted using the best available data to evaluate the impacts of the ADF Regulation. Additionally, staff's analysis was completed in consultation with stakeholders and industry experts. An independent reviewer examined the data and methods that staff utilized; his conclusions are set out in Appendix G of the ADF staff report.

Specifically with regard to new technology diesel engines (or NTDEs), the comment states that NTDEs do not eliminate the NO_X emissions increases from the use of biodiesel. As discussed in Chapter 6.D.6 of the ADF staff report, staff reviewed the available literature on emissions from engines meeting the latest emission standards (NTDEs) through the use of Selective Catalytic Reduction (SCR) using biodiesel. Two studies were reviewed and used in staff's analysis: 1) a study conducted by the National Renewable Energy Laboratory that found NO_X emissions control eliminates fuel effects on NO_X, up to and including B100 and 2) a recent study at UC Riverside which tested B50 blends and found a NO_X increase (blends below B50 were not tested).

Three other studies on NTDEs were reviewed by staff and rejected as not relevant because these three studies were performed using retrofit devices rather than entire systems designed for commercial use. In such cases, the engine controls and retrofit controls are not designed to work together, and therefore such retrofit engines are not representative of the way that commercially-designed systems work. It is expected that the vast majority of SCR systems in NTDEs would be from purchase of new vehicles with commercially-designed systems.

Based on these results, staff reasonably concluded that the use of lower levels of biodiesel with NTDEs results in no increase in NO_X. However, there is some uncertainty in the NO_X impacts at higher biodiesel blends. Therefore, staff took a conservative approach in designing the proposed ADF Regulation by limiting the conclusion of no increase in NO_X from NTDEs to the use of blends B20 and below.

Section 2293.6(a)(6) of the proposed ADF Regulation includes a provision for ARB to conduct, on or before December 31, 2019, a program review of the in-use requirements for biodiesel. Specifically, the review would examine the effects of the offsetting factors used in the regulatory analysis. The proposed ADF Regulation considers NTDEs to be an offsetting factor, and as such staff would consider the effects of NTDEs during that review.

Additionally, the comment states that ARB incorrectly applied ratios of on-road vehicle travel to non-road equipment. Please see response to comment **ADF 17-3**.

ADF 17-5 The comment states that the staff has incorrectly subtracted NOx reductions due to the use of renewable diesel fuel from increases in NOx from biodiesel. See response to **LCFS 46-277**.

ADF 17-6 The comment states that there are flaws in the analysis that ARB performed. The commenter's analysis found NOx emissions to be increasing over time as they assumed that NTDEs do not eliminate the NOx increase from biodiesel use, and they assumed that animal biodiesel increased NOx at blends B10 and below.

ARB staff disagrees with both the commenter's conclusions and the assumptions upon which those conclusions are based. The analysis that staff performed is found in the EA Section 4.B.8 and described in detail in the ADF staff report, in Chapter 7 and Appendix B. Using the best available data to evaluate the impacts of the proposed ADF Regulation, staff concluded that NO_X from the use of biodiesel would decrease over time. Additionally, staff's analysis was completed in consultation with stakeholders, as well as an independent statistical review, found in Appendix G of the ADF staff report.

For more discussion on the use of the latest ARB emissions model, please see the response to comment **ADF 17-3**. For more discussion of the inputs, assumptions and results of staff's analysis please see responses to comments **ADF 17-4**, **LCFS 46-277**, and **ADF 17-9**.

ADF 17-7 The comment suggests that staff's analysis should have considered the emissions effects for multiple regions in the State, including the South Coast and San Joaquin Valley Air Basins, rather than analyzing only the statewide effects. Staff used the online EMFAC tool to look at the distribution of NTDEs statewide and on a regional basis and found that there was little to no variation in vehicle miles

traveled (VMT) by NTDEs regionally compared with statewide. Additionally, when performing the emissions analysis, ARB staff assumes that commercial fuels are used fairly uniformly throughout the State. Given the uniformity of the effects of biodiesel throughout the State, no region should experience a disproportionate amount of detriment or benefit from the ADF proposal. Because of this, it was determined that a statewide analysis of emissions would be appropriate. Accordingly any individual region's emissions effects should be proportional to their portion of VMT travelled in that region versus statewide VMT.

Further, the ADF Regulation is designed to reduce the NO_X emissions from biodiesel use over time.

With regard to staff's analysis on the NO_X effects of the ADF Regulation, see response to comment **ADF 17-6**.

ADF 17-8

The comment states that inconsistencies and conflicts in the treatment of diesel and biodiesel fuels could create the potential for biodiesel blends to contain as much as 5 percent more biodiesel by volume than would be reported to ARB. The differential treatment of biodiesel under the proposed LCFS and ADF Regulations is dictated by the objectives of each program. However, the different treatment of blend levels in each regulation is due to their different goals and would not result in an emissions increase. In the proposed LCFS Regulation, biodiesel is reported by the amount of B100 sold within California. As the proposed LCFS Regulation is concerned with CI and GHG emissions, individual blend levels of end use are not as important in that program. However, in the proposed ADF Regulation, biodiesel has differential treatment based on end use blend levels. Therefore, it is appropriate that the two regulations treat biodiesel in different ways.

The proposed ADF Regulation includes provisions to ensure that, whenever a biodiesel fuel is blended, the blender reports what blending occurred, to what blend level the biodiesel was blended, and what NO_X controls were used, if required. Staff made 15-day changes to the reporting and recordkeeping provisions of the proposed ADF Regulation to clarify these reporting requirements. Staff made additional 15-day changes to clarify that the Stage 3A in-use requirements for biodiesel only apply to blends of B20 and below; blends above B20 are not allowed to be sold in California under the Stage 3A provisions. Instead, such blends would need to undergo the full 3-stage commercialization process established in the proposal.

Ultimately, under the proposed ADF Regulation, it is the responsibility of blenders to ensure that biodiesel is accurately blended and reported. For example, if a blender were to purchase a diesel fuel for biodiesel blending, the blender would need to ascertain what the biodiesel content of the diesel is, or take into account that the diesel may contain up to 5 percent biodiesel and blend conservatively to ensure they do not create a blend that has a higher biodiesel content than intended. Accurate blending practices are required by both ARB, for the purposes of this proposal, and the California Department of Food and Agriculture (CDFA) for compliance with American Society for Testing and Materials (ASTM) quality standards. Additionally ARB has the authority (e.g. HSC 41510) to sample and test biodiesel blends and other ADFs to ensure that they are properly mitigated based on their blend level.

ADF 17-9

The comment states that the 2014 baseline is inappropriate. ARB disagrees because CEQA requires use of the 2014 baseline to inform ARB and the public of the environmental consequences of its proposes actions, which are adoption of the ADF regulation and re-adoption of the LCFS. Therefore, significance determinations reflected in this EA are based on a comparison of the potential environmental consequences of the proposed regulations with the regulatory setting and physical conditions in 2014.

Because the entire proposed LCFS Regulation has been analyzed, and would be considered along with the proposed ADF Regulation, the date of the beginning of this environmental review, 2014, is the appropriate baseline that provides environmental informational value for the Board's decision. Please also see response to **LCFS 46-54**.

The comment states that the EA lacks documentation in setting NOx control levels for biodiesel. All of the documents upon which staff relied in their analysis for the ADF rulemaking have been placed in the rulemaking file, as part of the staff report released December 30, 2014. Additionally, staff made available all relevant material discussed during public workshops on its website at http://www.arb.ca.gov/fuels/diesel/altdiesel/meetings/meetings.htm

The comment states that ARB uses unsupported assumptions in determining the NO_X control level for biodiesel. Please see response to comment **ADF 8-1** for information on the statistical analysis and methods staff used.

The comment states that the Draft EA contains an unnecessary delay in the effective date for implementation of mitigation requirements under the proposed ADF Regulation. Please see response to comment **ADF 17-21**.

ADF 17-10/LCFS 46-49

The commenter addresses an alternative to the proposed ADF and LCFS Regulations that was submitted by Growth Energy. This alternative, and justification for removal from detailed consideration, is discussed under Section 7.C.4.b in the Draft EA. This discussion is reproduced as follows in response to the comment:

The Growth Energy alternative was submitted in response to ARB's solicitation for alternatives. Growth Energy's alternative proposal retains the mitigation options as the proposed ADF Regulation, but requires their use in different situations than the ADF Regulation. The main differences between staff's ADF Regulation and the Growth Energy alternative are listed below:

- Growth Energy proposes treating animal and non-animal based biodiesel the same, by setting the significance level for both at zero percent, compared to the ADF proposal, which sets the significance level at B1 for non-animal biodiesel and B5 for animal biodiesel.
- Growth Energy proposes eliminating the exemptions based on the use of NTDEs, compared to staff's ADF proposal, which provides exemptions for biodiesel used in NTDEs.
- Growth Energy proposes eliminating the sunset provision of staff's ADF proposal, compared to the staff proposal, which would likely end mitigation for biodiesel in 2024.

Under the Growth Energy alternative, animal and non-animal biodiesel would be treated equally. Thus, renewable diesel would need to be blended at a ratio of 2.75:1 with both animal and non-animal biodiesel, to mitigate NO_X emissions. For mitigation using additives, both animal and non-animal biodiesel would need to have one percent additive for a B20 blend to be mitigated.

The Growth Energy alternative would require mitigation of more fuel than the proposed ADF Regulation; regulated parties would incur more costs to mitigate non-animal and animal based biodiesel similarly and setting the significance level for both at one percent. The Growth Energy alternative likely would not achieve any more

emissions benefits than the preliminary proposal unless biodiesel were to be used much more widely than anticipated in staff's projections. Although the Growth Energy alternative is simpler than staff's preliminary ADF Regulation, the Growth Energy alternative is unnecessarily strict; staff's analysis of the best available data does not find that there are any NO_X increases with B5 animal biodiesel or biodiesel used in NTDEs, so requiring mitigation for these does not achieve more emissions benefit than staff's preliminary ADF Regulation. As a result, to meet an increased demand for ADF specification requirements, such as additives for example, additional infrastructure may be needed, thereby increasing costs while not reducing any environmental effects. As a result, this alternative is considered to not be feasible and is not considered further.

LCFS 46-50 The comment states that under a CEQA certified regulatory program such as ARB's, the environmental analysis is subject to many of the substantive requirements of CEQA. These requirements are also discussed under Section 1.E.1 in the Draft EA. ARB does not agree with the assertion that the ADF Regulation and draft EA have "serious deficiencies."

LCFS 46-51 The comment characterizes requirements under a CEQA certified regulatory program. These are also discussed under Section 1.E.1 in the Draft EA. Alternatives to the project are described in Chapter 7 of the Draft EA. Mitigation measures to reduce the significant effects of the Proposed LCFS and ADF Regulations are described following impact discussions through Chapter 4 of the Draft EA.

LCFS 46-52 The commenter states that, under a certified state regulatory program, an agency must include alternatives to an activity and mitigation measures to avoid or reduce any significant or potentially significant effects that the project might have on the environment. Alternatives to the project are in Chapter 7 of the Draft EA; mitigation measures are described following impact discussions through Chapter 4 of the Draft EA.

The commenter states that the Board must consider comments submitted by stakeholders, as well as responses prepared by ARB staff. The Board will consider comments and responses to those comments.

LCFS 46-53 The comment states the EA does not comply with CEQA. ARB staff disagrees. Please see responses to comments **LCFS 46-54** through **LCFS 46-63**.

LCFS 46-54

The comment states that the Draft EA does not assess environmental impacts associated with the 2009 regulation, stating this is not consistent with the POET decision. The commenter's position is that the Draft EA should have used an earlier baseline for purposes of the analysis to capture changes to the environment that occurred between adoption of the original LCFS Regulation and current conditions. ARB staff disagrees with the comment that the recommended approach is required by the decision, and does not agree that a pre-dated baseline would yield meaningful information for environmental analysis.

In the present 2015 proceeding, the Board is deciding whether to adopt the LCFS and ADF, to be effective starting in 2016. The Board is not deciding what it would do in the past nor, obviously, is the Board considering the effect its 2015 decision might have on the environment as it stood in 2007, when a different rulemaking was initiated. Choosing an environmental baseline predating the beginning of a project would be misleading, and is not required by law.

The POET decision requires ARB to set aside the existing regulation and to comply with CEQA in readopting an LCFS Regulation, including a determination as to whether the Board action re-adopting a regulation would result in a significant impact from increased NO_X emissions and, if a significant impact is identified, Board consideration of mitigation measures to reduce the impact. As a result, a new environmental analysis was initiated for the proposed LCFS Regulation, including use of current conditions as the baseline as required by CEQA (CEQA Guidelines 15125 (a)). Regarding the baseline, see response to **ADF 17-9**. A public workshop was held on Friday, May 30, 2014 to discuss updates to LCFS and the scope of the EA. Public input was solicited related to the scope and content of the EA, including foreseeable methods of compliance, associated adverse environment impacts, feasible mitigation measures, and feasible alternatives to the proposed amendments. This stage of the process is when the environmental review began, thus it is the correct time period to use for baseline and the point of comparison that provides meaningful environmental impact information to the Board.

To base the analysis in the current EA on the older baseline associated with the prior CEQA document for the original LCFS would not provide the public or the Board with accurate information about the potential environmental effects of the proposed regulations (i.e., re-adoption of an LCFS Regulation and adoption

of the proposed ADF Regulation) and, as noted above, would therefore, be misleading and contrary to the requirements of CEQA. The regulation has gone through several updates and amendments and the currently proposed LCFS Regulation is not the same as the one which began development in 2007 and was proposed and adopted in 2009. If ARB staff were to evaluate the environmental impacts of the proposed regulation under 2007 or 2009 conditions, several issues would arise that would result in incomplete analysis and misleading conclusions. For instance, the regulatory setting would not reflect the correct time period, and consideration of the physical environment (e.g., listed species, GHG considerations, energy demand, RFS 2 was not in place) would not be accurate information that could be used to inform the environmental analysis. Because the EA provides a full-scope analysis that considers the effects of the proposed action on the existing environment, use of the 2014 baseline is not only required by CEQA, but necessary to inform ARB about the impacts of the actions the Board is considering taking in 2015.

Finally, the POET Court's decision cannot reasonably be read as imposing a special baseline on the Board that is inconsistent with CEQA requirements; instead, the Court directed ARB to comply with CEQA requirements, including CEQA's requirements that significant impacts associated with re-adoption of an LCFS Regulation be identified and, when identified, be mitigated where feasible to do so.

Impact 3.b in the Draft EA (Section 4.B.8) analyzes air quality impacts, including NO_X emissions, using 2014 as a baseline. In addition, this section provides a discussion related to the current and expected future emissions of NO_X from biodiesel relative to the NO_X emissions from biodiesel that were occurring prior to the adoption of the original LCFS in 2009 (see page 52 of the Draft EA). While not required by CEQA, this discussion was included in the interest of public disclosure. Also, please see response to comment **ADF 17-9**.

LCFS 46-55

The comment states that the Draft EA does not say what environmental baseline is used in its analysis. In fact, the Draft EA and Final EA both state that a 2014 baseline was used, as required by CEQA (see Section 4.A, Basis for Environmental Impact Analysis and Significance Determinations). CEQA provides that the baseline for determining the significance of environmental impacts would normally be the existing conditions at the time the environmental review is initiated (CEQA Guidelines 15125 (a)).

Therefore, significance determinations reflected in the Draft EA are based on a comparison of the potential environmental consequences of the proposed regulations with the regulatory setting and physical conditions in 2014.

The commenter states that the 2014 baseline is inappropriate. Please see the responses to comments **ADF 17-9** and **LCFS 46-54**.

LCFS 46-56 The comment states that the analysis of criteria pollutant emissions fails to analyze criteria pollutant emissions other than NOx, fails to consider NOx emissions from increased biodiesel use, and improperly offsets biodiesel NOx emissions with lower renewable diesel emissions. ARB staff disagrees with these statements. The EA analyzes criteria pollutant emissions in Chapter 4. In addition, Chapter IV of the ISOR includes an analysis of VOCs, carbon monoxide (CO), NO_X, sulfur oxides (SO_X) and PM from sources associated with the proposed LCFS and ADF Regulations. Included in this analysis are estimates of the emissions resulting from the movement of fuel and feedstock in heavy-duty diesel trucks and railcars. A health impact analysis was included in the proposed re-adoption of the LCFS Regulation as well.

The LCFS incentivizes the use of both biodiesel and renewable diesel, among other fuels, thus it is appropriate to consider the potential effects of the LCFS as a whole, not just the effect on one fuel. As detailed in Chapter 6 of the ADF staff report, renewable diesel has been found to decrease NO_X emissions relative to CARB diesel. Please see response to comment **46-277**.

LCFS 46-57 The comment states that the draft EA fails to analyze emissions associated with NTDEs. See response to **ADF 17-4**.

LCFS 46-58 The comment states that NO_X emissions would be more severe than disclosed in the Draft EA and would violate AB 32. See response to **LCFS 46-5** for a discussion of the relationship between LCFS and AB32; and response to **ADF 17-4** and **LCFS 46-276** for a summary of NO_X impacts.

LCFS 46-59 The comment states that the Draft EA inadequately describes environmental impacts by discussing them generally, instead of calculating project emissions associated with development. ARB disagrees. The EA analysis is appropriately programmatic, because it must evaluate future reasonably foreseeable compliance responses that have not been specifically proposed and cannot be

precisely defined as to location, detailed character, and design. Where uncertainties exist, the EA makes significance conclusions in a conservative manner (i.e., tending to overstate the impact), to disclose the possibility of adverse impacts to the public. Stated differently, this approach avoids the risk of understating the significance of environmental effects. This approach is discussed in Section 4.A.1 in the Draft EA, as follows:

> The analysis of adverse effects on the environment, and significance determinations for those effects, reflect the programmatic nature of the analysis of the reasonably foreseeable compliance responses of the regulated entities and the marketplace. These reasonably foreseeable compliance responses were described in more detail in Chapter 2. The EA analysis addresses broadly defined types of impacts or actions that may be taken by others in the future as a result of the proposed LCFS and ADF Regulations, without the ability to determine specific projects or locations, facility size and character, or site-specific environmental characteristics affected by any potential future facilities. For purposes of this impact analysis section, the term "project" refers to any activities undertaken by entities and the marketplace in response to the proposed regulations; and the term "project-level" refers to the site-specific facility level activities that are reasonably foreseeable. These references to "project" should not be confused with the reference to the two proposed regulations as a "project" for purposes of CEQA, as discussed in section 1.A and section 2 above.
>
> This EA takes a conservative approach and determines some environmental impacts as potentially significant because of the inherent uncertainties in the relationship between physical actions that are reasonably foreseeable under the proposed LCFS and ADF Regulations and environmentally sensitive resources or conditions that may be affected. This approach tends to overstate environmental impacts in light of these uncertainties and is intended to satisfy the good-faith, full-disclosure intention of CEQA. If and when specific projects are proposed and subjected to project-level environmental review, it is expected that many of the impacts recognized as potentially significant in this EA, that are not already mitigated or avoided with this proposed approval, can later be avoided or reduced to a less-than-significant level. If a potentially significant

environmental effect cannot be feasibly mitigated with certainty, this EA identifies it as significant and unavoidable. If the Board re-adopts the proposed LCFS and ADF with one or more significant, unavoidable environmental effects identified in this EA, as part of that approval action, the Board would adopt findings for each significant impact as well as a statement of overriding considerations (i.e., other benefits of the action including economic, legal, social, technological are determined to outweigh and override its unavoidable significant effects).

LCFS 46-60

The comment states that the Draft EA violates CEQA because it forecloses mitigation. ARB disagrees with the comment. Mitigation measures are identified for significant effects, whenever feasible. In many cases, the authority to require the measures rests with other agencies and details as to the mitigation that will be required will depend on what infrastructure and other compliance responses are proposed in the future, so ARB recognizes this uncertainty in its determinations of significance after mitigation. Please see response to comment **LCFS 46-59**. Similar issues are also addressed in Section 4.A.2 of the Draft EA, provided as follows:

> The EA contains a degree of uncertainty regarding implementation of mitigation for potentially significant impacts. While ARB is responsible for adopting the proposed LCFS and ADF Regulations, it does not have authority over all of the potential infrastructure and development projects that could be carried out in response to the proposed LCFS and ADF Regulations. Also, because the fuel standards are performance-based and not prescriptive, the proposed LCFS Regulation is not mandating any specific fuel or technology. Other agencies are responsible for the review and approval, including any required environmental analysis, of any facilities and infrastructure that are reasonably foreseeable, including any definition and adoption of feasible project-specific mitigation measures, and any monitoring of mitigation implementation. For example, local cities or counties must approve proposals to construct new facilities, such as for fuel blending or distribution facilities. Additionally, State and/or federal permits may be needed for specific environmental resource impacts, such as take of endangered species, filling of wetlands, and streambed alteration.

Because ARB cannot precisely predict specific projects, nor does it have authority over implementation of specific infrastructure projects that may occur, the programmatic analysis in this EA does not allow for a precise description of the details of project-specific mitigation. As a result, there is inherent uncertainty in the degree of mitigation that would ultimately need to be implemented to reduce any potentially significant impacts identified in this EA. Consequently, this EA takes the conservative approach in its post-mitigation significance conclusions (i.e., tending to overstate the risk that feasible mitigation may not be sufficient) and discloses, for CEQA compliance purposes, that potentially significant environmental impacts may be unavoidable, where appropriate. It is also possible that the amount of mitigation necessary to reduce environmental impacts to below a significant level may be far less than disclosed in this EA on a case-by-case basis. It is expected that facility and infrastructure projects would be able to feasibly avoid or mitigate to a less-than-significant level many of these potentially significant impacts as an outcome of their project-specific environmental review processes.

LCFS 46-61

The comment states that the Draft EA fails to identify and analyze the environmental impacts associated with fuel shuffling. The proposed LCFS Regulation will further incentivize the development of new fuels and reductions in the CIs of existing fuels compared to the market without an LCFS. LCFS will therefore contribute to development of cleaner, cheaper innovative fuels that are ultimately expected to benefit consumers worldwide. Given the size of the California fuels market and the growth in alternative fuel production both in and outside California, the average CI of fuels in California will not be offset by increases in the CI of fuels in surrounding states. Any “fuel shuffling” that could occur as a strategy for complying with the proposed LCFS regulation would be limited in amount and duration, if it occurs at all. In response to an increased and growing demand for low-carbon fuels, suppliers will look for more efficient processes to provide lower CI.

During development of the proposed LCFS Regulation, staff worked with the United States Environmental Protection Agency (U.S. EPA) in an effort to harmonize to the extent feasible the respective fuel programs in a number of critical areas. Harmonizing fuel programs between state, federal, and foreign jurisdictions is useful to ensure the optimum reduction of CI and associated GHG emissions. Similar program frameworks also reduce the possibility

of fuel shuffling across different jurisdictions, and they reduce the administrative burden for both regulated parties and regulatory agencies. The concept of harmonizing specific aspects of the LCFS program with other low carbon fuel standard programs has, therefore, been of interest for ARB since the inception of the program.

LCFS 46-62

The comment states that the Draft EA does not adequately analyze project alternatives, and specifically objects to rejection of the Growth Energy Alternative for biodiesel and the Cap and Trade Alternative to LCFS. Please see response to **LCFS 40-35** with regard to the Growth Energy alternative, which would have required mitigation of all biodiesel use without a sunset date and without considering use of new technology diesel engines, which have different NOx emissions from biodiesel blends than older engines. This alternative was considered by ARB but rejected for the reasons explained in section 7.C.4 of the EA

The Cap-and-Trade Alternative referred to in the comment would achieve GHG emissions reductions through the existing Cap-and-Trade program in lieu of re-adopting the LCFS as proposed. This alternative would be similar to the no project alternative analyzed in the EA, except that the higher GHG emissions from not having an LCFS program might be achieved through adjustments to the Cap-and-Trade program. This alternative was not analyzed in the EA because it would not achieve some of the basic objectives of the proposed LCFS regulation, as described in section 7.B of the EA. ARB explained why it did not consider proposals to eliminate LCFS and achieve GHG reductions through other programs to be a feasible alternative to the LCFS proposal in the LCFS and ADF Standardized Regulatory Impact Assessment (SRIA), as follows:

a. Comment Proposal

A group of ethanol producers submitted an alternative for consideration that proposes the LCFS be eliminated. The justifications indicated in their letter were that the GHG emissions reductions can be achieved by relying on the following programs:

- Federal Renewable Fuels Standard (RFS), which the commenters indicate will achieve the GHG reductions at the tailpipe through increased biofuels and ethanol for blending with gasoline and blending of biodiesel and renewable diesel with conventional diesel.

- California-specific vehicle and engine-based regulations will be the main driver of electricity and hydrogen as transportation fuels. As for heavy-duty vehicles, the letter cites the California's Tractor-Trailer regulation (2008) and the heavy-duty regulations that will begin for the 2014 year, as the drivers of the changes in the diesel market.
- California's Cap-and-Trade program is indicated as another regulation that will drive GHG reductions. The commenters indicate that any shortfall in emissions reduction can be achieved through a modification of the Cap-and-Trade program.

b. Response

The proposed alternative assumes that the exclusive goal of the proposed LCFS Regulation is to achieve GHG emissions reductions without regard to source. If that were the case, this would be a viable alternative to the LCFS and would be assessed in this analysis. It is likely true that the estimated GHG emissions reductions appearing in the 2009 LCFS ISOR (California Air Resources Board, 2009) could be achieved by the AB 32 Cap-and-Trade Program, along with the other programs cited by Sierra Research and Growth Energy. The LCFS proposal, however, was designed to address the CI of transportation fuels. Transportation in California was powered almost completely by petroleum fuels in 2010.

Those fuels were extracted, refined, and distributed through an extensive and mature infrastructure. Transitioning California to alternative, lower-carbon fuels requires a very focused and sustained regulatory program tailored to that goal. The other regulatory schemes the alternative would rely on are comparatively "blunt instruments" less likely to yield the innovations fostered by the LCFS proposal. In the absence of such a program, post-2020 emissions reductions would have to come from a transportation sector that would, in all likelihood, have emerged from the 2010-2020 decade relatively unchanged.

In the absence of an LCFS designed to begin the process of transitioning the California transportation sector to lower-carbon fuels starting in 2010, post-2020 reductions would be more difficult and costly to achieve. This is why the primary goals of the LCFS are to reduce the CI of California fuels and to diversify the fuel pool. A transportation sector that achieves

these goals by 2020 will be much better positioned to achieve GHG emissions reductions post-2020.

ARB is required to analyze only those alternatives that are reasonable and that meet the goals of the program as required by statute. An initial assessment of the program indicates the goals of the LCFS proposal can be achieved by keeping the program. "…separate of the AB 32 Cap-and-Trade system initially (at least first 10 years) in order to stimulate innovation and investment in low-GWI [global warming intensity] fuel (or transportation) technologies." Due to the fact that the Cap-and-Trade program alone would generate neither the CI reductions nor innovation in the transportation fuel sector, this alternative will not be assessed in this document.

The comment also states that ARB may not limit its project objectives in a way to foreclose consideration of any and all projects, with the exception of the project under consideration. The project objectives involve the underlying goals of reducing the CI of transportation fuels, and are not overly restrictive. The fact that multiple feasible alternatives are considered in this EA supports this conclusion. This comment also further references the POET decision discussion of *post hoc* environmental review, and impermissible delegation of environmental review authority. The issue of impermissible delegation of environmental review authority addressed in the POET decision is related to the timing of environmental review. The public review process has, and will continue to be, consistent with CEQA statues and guidelines. A description of the public review process for the document is described in Section 1.E.2 of the Draft EA.

LCFS 46-63 The comment summarizes preceding comments (**LCFS 46-53** through **LCFS 46-62**, above) by concluding that the draft EA does not provide a complete and accurate investigation of the environmental effects of the proposed regulations. See responses to **LCFS 46-53** through **LCFS 46-62**.

LCFS 46-64 The comment states that the Board should consider a less burdensome alternative to the current staff proposal, and suggests an alternative submitted by Growth Energy. Please see response to comment **ADF 17-10**.

LCFS 46-65 The comment states that the proposed LCFS Regulation would cost as much as 13 cents per gallon by 2020. This comment does

not appear to implicate any environmental impacts, and the commenter provides no information to suggest otherwise.

The comment also requests justification for dismissal of the Growth Energy alternative submitted during the SRIA process. The objectives of the LCFS program are described in section 7.B of the EA and include:

- Reduction in CI of transportation fuels in California by 10 percent by 2020
- Reduction in GHG emissions from the transportation sector
- Diversification of California's fuel portfolio
- Reduced dependence on petroleum
- Greater innovation and development of cleaner fuels

- Support for ongoing efforts to improve ambient air quality

ARB staff did not analyze the alternative proposed by Growth Energy during the SRIA process or in the EA because the alternative did not achieve a number of these objectives. As such, staff did not estimate the GHG emissions reductions of the alternative. Additionally, a transportation sector that achieves the goals of the LCFS will be much better positioned to achieve GHG emissions reductions post-2020. AB 32 directs ARB to develop measures that will reduce greenhouse gas emissions, spur investment "in the development of innovative and pioneering technologies," and "maintain and continue reductions in emissions of greenhouse gases beyond 2020." (Cal. Health & Saf. Code sections 38501(e), 38510, and 38551. The 2008 UC Davis paper cited by the commenter echoes the benefits of an LCFS program, and is not the source of ARB's authority. See response to **LCFS 46-62**.

LCFS 46-66 The comment argues against dismissal of the Growth Energy alternative, stating that AB 32 does not require the use of a fuels diversification strategy or CI indexes to achieve GHG reductions. See responses to comments to **LCFS 46-5, LCFS 46-62,** and **LCFS 46-65**.

LCFS 46-67 The comment asserts that the proposed LCFS Regulation does not provide any emission reductions. ARB staff disagrees and has provided estimated emission reduction in the ISOR and the EA.

The proposed LCFS Regulation requires progressively more stringent CI for the transportation fuel used in California, up to a 10

percent value in 2020 and beyond. This provides real GHG emission reductions, in addition to the core objectives of the regulations, which are to lower the CI of transportation fuels in California and diversify the State's fuel pool.

The ISOR conservatively estimates a GHG emissions reduction benefit from the LCFS of 35 $MMTCO_2e$ in 2020 that is over and above any benefit from other programs.

It should be noted that even at the current modest 1 percent level, staff can see measurable evidence of a shift to lower CI fuels – incremental improvements in ethanol CI, new supplies of renewable diesel, certification of lower CI pathways, etc. This early shift to lower CI fuels is already providing commensurate GHG reduction benefits.

For a discussion of the relationship between AB 32 and the Proposed LCFS Regulation, see response to comments **LCFS 46-5, and LCFS 46-65**.

LCFS 46-68

The comment states that ARB lacks legal authority to adopt the LCFS regulation and has not sufficiently explained its reasons for not adopting Growth Energy's proposed alternative. The comment assumes that (1) the LCFS is exclusively founded upon the authority provided by AB 32, Parts 4 and 5. The commenter asserts that the LCFS (2) does not yield quantifiable GHG emission reductions and is therefore (3) not consistent with and reasonably necessary to effectuate AB 32's purpose (citing Gov. Code § 11342.2)].

ARB staff disagrees with those three points. First, ARB's authority to readopt the LCFS is not based solely on AB 32. The text of the proposed regulation cites sections of the Health and Safety Code that provide authority for the proposed regulation outside of AB 32, Parts 4 and 5. See also *Western Oil and Gas Ass'n v. Orange County Air Pollution Control District*, 14 Cal.3d 411 (1975).

Second, while the precise fuel mixture market participants will use to comply in the future cannot be predicted with certainty now, the LCFS provides for real reductions in GHG emissions from the transportation sector by setting quantifiable carbon intensity standards for each year. These standards regulate the average CI of California's transportation fuel pool through a system of quantifiable credits and debits.

Third, the LCFS is authorized and necessary to effectuate a variety of policies, including the Legislature's command to adopt regulations that "modernize[] California's energy infrastructure…and complement[] the state's efforts to improve air quality." (Health & Saf. Code 38501(h).) Incentivizing innovative fuels and transportation technologies holds promise for escaping the air quality and climate burdens that attend our current fossil fuel use.

The comment also asserts that ARB staff has not demonstrated that Growth Energy's alternative proposal does not meet the criteria in California Government Code section 11346.9(a)(4). The reasons for rejection of the alternative have been explained in the record, and ARB will submit a Final Statement of Reasons to OAL that contains the determination required by the statute that the comment cites. please see responses to comments **ADF 17-10** and **LCFS 46-276**.

See also response to comment to **LCFS 46-45**.

LCFS 46-69

The comment requests identification, if available, of the increase in fuels diversification that the proposed LCFS Regulation would achieve compared to the federal RFS program and ARB's ACC. First, the RFS2 does not incentivize the use of electricity or hydrogen fuel, whereas the LCFS does. Secondly, the federal RFS2 and the ARB's Advanced Clean Cars programs work synergistically with the proposed LCFS Regulation to achieve benefits above and beyond those of the RFS2 and Advanced Clean Car Programs. Without the proposed LCFS Regulation, these programs would not achieve the objectives of the LCFS to lower the CI of transportation fuels in California by 10 percent by 2020. These programs would also not achieve the same level of emission reductions.

Also see the response to comments **LCFS 46-1** and **LCFS 46-67**.

LCFS 46-235

The comment states that the LCFS ISOR and EA do not quantify GHG emission reductions. ARB staff has provided GHG emissions reduction benefits associated with the proposed LCFS Regulation. Staff has determined the emission reductions of the program will contribute to GHG reductions of other state and federal programs such as RFS2 and Advanced Clean Cars To provide a conservative value, the ISOR identifies a GHG benefit of 35 $MMTCO_2e$ in 2020 for the program that is over and above any benefit that would be

achieved by RFS2 and Advanced Clean Cars without the proposed LCFS regulation.

See response to comment **LCFS 46-67**.

LCFS 46-236 The comment states that a complete analysis of the potential air quality impacts associated with the proposed LCFS Regulation has not been completed. See responses to **LCFS 46-239** through **LCFS 46-255**.

LCFS 46-237 The comment states that an alternative suggested by Growth Energy was rejected because it would not ensure a transition to lower CI fuels. Please see response to comment **ADF17-10**.

LCFS 46-238 The comment states that NO_X emissions affect atmospheric levels of nitrogen dioxide and are precursors to the formation of ozone and PM, which are in non-attainment in the South Coast and San Joaquin Valley air basins. ARB staff agrees and has not indicated otherwise.

ADF 17-18 The comment states that due to biodiesel use allowed under the proposed ADF Regulation, NO_X emissions will increase by 1.35 tons per day in 2014. The proposed ADF Regulation was initially proposed in December 2014 and would not take effect until January 1, 2016; therefore, no NO_X emissions in 2014 can be attributed to the proposed regulation. Please see response to comment **LCFS 46-58**.

ADF 17-19 The comment states that the assessment of the NO_X emission impacts of biodiesel use allowed under the proposed ADF Regulation, presented in the ISOR and its appendices, are fundamentally flawed because: the basis for total diesel NO_X emission inventory is not described in the ISOR; the assumptions related to NTDEs not resulting in increased NO_X emissions is incorrect; the assumptions and model used to estimate NTDEs were incorrect; and, that renewable diesel was inappropriately used as an offsetting factor. See responses to comments **ADF 17-3** for information on the emissions inventory and the assumptions and model used to estimate NTDEs, **ADF 17-4** for NTDE emissions analysis, and **ADF 17-5** for appropriateness of Renewable Diesel as an offsetting factor.

ADF 17-20 The commenter has provided a summary of NO_x emissions impacts of biodiesel. Please see response to comment **LCFS 46-276**. For

more information on the statistical analysis please see response to comments **ADF 17-9** and **ADF B3-74**.

ADF 17-21

The comment states that there are fundamental flaws associated with the air quality and environmental analyses, specifying the use of 2014 as a baseline, the lack of documentation, and an unnecessary delay in mitigation requirements under the ADF Regulation. Please see responses to **ADF 17-9** and **LCFS 46-54** for ARB staff's response regarding use of a 2014 baseline.

With regard to a lack of documentation, ARB has maintained, throughout the rulemaking process, a webpage dedicated to the ADF rulemaking and has provided documentation on that website at: http://www.arb.ca.gov/fuels/diesel/altdiesel/biodiesel.htm. In addition, the entire rulemaking file, including references cited in the EA, has been available for public inspection.

With regard to staff assumptions for NO_X control levels, see response to comment **ADF 17-9**.

Further, the comment states that the implementation date of the proposed ADF Regulation is unreasonably delayed. The reporting requirements of the proposed ADF Regulation are effective January 1, 2016. Regarding the date of implementation of in-use requirements for biodiesel, staff and stakeholders have had several public workshops to discuss the effects of biodiesel and how best to deal with the adverse effects, including an appropriate and feasible timeline for implementation. Compliance with the regulation assumed a two-year lead time to allow for preparation and operation of storage and blending facilities. This is consistent with prior rulemakings. ARB staff finished testing of higher blends of biodiesel in late 2011, but did not complete testing on lower blends of biodiesel until 2014. Therefore the timeline of 2016 for first implementation and 2018 for full implementation of the ADF Regulation is reasonable in light of when ARB staff received new data that provided a better understanding of biodiesel emissions and potential methods of controlling any biodiesel NOx increases, and in light of changes the industry will need to make for compliance with the proposed new biodiesel requirements.

ADF 17-22

The comment suggests that ARB's analysis uses incorrect emissions data and has a flawed analysis. Please see response to comments **ADF 17-3** and **LCFS 46-280**.

The comment suggests that NO_X emissions from biodiesel use would be much larger than ARB's estimates. The proposed ADF Regulation is designed to reduce the NO_X emissions from biodiesel over time. Modest increases in NO_X emissions as a result of the use of biodiesel rather than solely CARB diesel are already occurring as part of the current conditions of the environmental analysis.

The analysis in the ADF staff report, in both Chapter 7 and Appendix B concluded that NO_X would decrease over time. That analysis was conducted using the best available data to evaluate the impacts of the ADF Regulation. Additionally, staff's analysis was completed in consultation with stakeholders and industry experts as well as an independent statistical analysis, found in Appendix G of the ADF staff report.

In addition, the comment suggests that the proposed ADF Regulation would lead to significant increases in NO_X emissions in the South Coast and San Joaquin Valley. Please see response to comment **ADF 17-7**.

ADF 17-23 The comment states that the Growth Energy Alternative provides greater environmental benefits as cost-effectively as the proposed ADF Regulation, and should be adopted. Please see responses to comments **ADF 17-10** and **ADF 17-46** through **ADF 17-49**.

LCFS 46-239 The comment states that ARB staff released the ISOR and Draft EA for the proposed LCFS Regulation.

LCFS 46-240 The comment states that GHG estimates were not provided. See response to **LCFS 46-45**.

LCFS 46-241 The commenter questions the sufficiency of the air quality analysis in the LCFS ISOR.

The EA analyzes criteria pollutant emissions in Chapter 4. In addition, Chapter IV of the ISOR includes an analysis of VOCs, carbon monoxide (CO), NO_X, sulfur oxides (SO_X) and PM from sources associated with the proposed LCFS and ADF Regulations. Please see response to comment **LCFS 46-56**.

LCFS 46-242 The comment states that the Draft EA inadequately describes environmental impacts by discussing them generally, instead of calculating project emissions associated with development. Please see response to comment **LCFS 46-59**.

LCFS 46-243 The comment states that the EA concludes that feasible mitigation measures associated with short-term construction-related air quality impacts are outside of the agency's authority to adopt. This is correct, since agencies other than ARB will be responsible for reviewing and permitting any construction activities that are related to the proposed regulations.

LCFS 46-244 The comment states that the long-term air quality discussion only addresses NO_X emissions. Impact 3.b in the Draft EA, discusses PM, CO, and toxic air contaminants. In addition, the impact discussion refers the reader to the LCFS ISOR, Chapter IV. Chapter IV of the ISOR provides a thorough analysis of emissions associated with various aspects of the proposed LCFS and ADF Regulations.

LCFS 46-245 The comment states that the air quality analysis is limited and cursory. See response to **LCFS 46-241**.

LCFS 46-246 The comment states that the GHG emissions reduction benefits of the proposed LCFS Regulation should be explicitly quantified without any double-counting. As stated in response to comment **LCFS 46-235,** ARB staff has estimated the GHG emissions reduction benefits of the program. Staff has determined the emission reductions of the program, in concert with other state and federal programs such as RFS2 and Advanced Clean Cars as 63 $MMTCO_2e$ in 2020. Staff is not double counting emissions benefits, but quantifying the total benefit of a 10 percent reduction in CI by 2020. The ISOR provides a conservative value of the GHG emissions reduction benefit attributable to the LCFS proposal alone, which is 35 $MMTCO_2e$ in 2020.

ARB staff provided an aggregated emissions benefit analysis rather than estimating separate gasoline and diesel benefits. ARB is not legally obligated to break down the emissions benefit further and has found little benefit in such an analysis given that the market based nature of the program will yield a variety of different compliance strategies.

LCFS 46-247 The comment states that ARB failed to provide documents to support its air quality analysis equivalent to what it provided pursuant to AB 1085 in other rulemakings. The commenter refers to the fact that in a handful of other rulemakings, ARB has posted certain additional information from its rulemaking file on the internet and labeled it as AB 1085 information. But ARB does not rely on such postings as the primary means for complying with AB 1085,

and nothing in AB 1085 requires that information be posted on the internet. ARB complies with AB 1085 by issuing its notice of proposed rulemaking prior to the start of the public comment period – earlier than other agencies typically do – and announcing in the notice that the rulemaking file is available for public inspection. ARB staff followed that procedure for the LCFS and ADF rulemakings. See response to comment **ADF F5-2**.

LCFS 46-248 The commenter states that air quality analysis associated with the development of biofuel production facilities in California is superficial. The EA provides the appropriate level of detail at a programmatic level of analysis. Construction emissions impacts are under the jurisdiction of local air pollution and air quality management districts and are expected to be mitigated at the local level for each facility that is developed. As discussed in the ISOR for the LCFS regulation, any impacts associated with individual projects would be assessed on a project-specific basis by the local siting authority. Such impacts, by their nature, are more appropriately assessed on a project specific/site-specific basis. Local agencies, rather than ARB, have the responsibility and legal authority to be the lead agencies for facility and project siting decisions. Hence, the local agencies are required by CEQA and/or NEPA to perform environmental analyses and implement all feasible mitigation measures for adverse impacts that are identified in project-level environmental review.

LCFS 46-249 The commenter states that the air quality analysis only describes NO_X, PM_{10}, and volatile organic compound emissions associated with a hypothetical cellulosic ethanol plant. See response to **LCFS 46-241**.

LCFS 46-250 The comment states that documentation is not available for air emissions associated with fuel and feedstock transportation and distribution. See response to **LCFS 46-241**.

LCFS 46-251 The comment states that only NO_X emissions are addressed, with respect to long-term air quality impacts in the draft EA. See response to **LCFS 46-241**.

LCFS 46-252 The comment states that the air quality analysis fails to address long-term changes in motor vehicle emissions beyond those associated with biodiesel and renewable diesel. See response to **LCFS 46-241**.

LCFS 46-253 The comment states that construction emissions associated with biofuel production facilities in California are not quantified. See response to **LCFS 46-241** and **LCFS 46-248**.

LCFS 46-254 The comment states that the air quality analysis should have identified and quantified emissions associated with increased tanker visits to California ports, as a result of the ADF and LCFS Regulations.

In the analysis of air quality impacts that would be expected to result from the proposed LCFS re-adoption, staff made the assumption that Brazilian ethanol would be transported to California via two routes. The first route is by tanker ship through the Panama Canal to California ports and by heavy duty trucks to blending facilities. The second route is by tanker ship through the Port of Houston and by rail to California blending facilities. The Panama Canal is limited in the volume of fuel that can be transported through the facility annually, estimated by staff to be 260 million gallons per year (MGPY). Fuel by tanker is currently being delivered at the capacity cap. Therefore, additional ethanol volumes to be delivered to the California market are assumed to be delivered through the Port of Houston. The change in emissions from truck and rail traffic and the health impacts of these changes were estimated and results tabulated in the ISOR. See response to **LCFS 46-61**.

The comment also states that construction-related air quality emissions should have been quantified. As described under Impact 3.a, the specific location, type, and number of construction activities is not known and would be dependent upon a variety of factors that are not within the control or authority of ARB and not within its purview. That is, ARB may not provide local permitting or land use authority, discretionary actions, or otherwise direct construction projects that could result from implementation of the proposed LCFS and ADF Regulations. Furthermore, the EA is intended to provide a programmatic-level of analysis, which describes the types of environmental impacts that could occur; subsequent environmental review would be conducted at such time that an individual project is proposed and land use or construction approvals are sought. See response to **LCFS 46-253**.

LCFS 46-255 The comment addresses the potential for increased emissions associated with new tanker deliveries at California ports. The proposed LCFS and ADF Regulations would not incentivize increased crude deliveries at California ports, or otherwise alter the

quantities of fuels transported to California. See response to **LCFS 46-254** and **LCFS 46-256**. The comment states that the Growth Energy alternative should have been analyzed and not rejected. See response to **LCFS 46-65**.

LCFS 46-257 The comment restates and quotes ARB's rationale for rejecting an alternative proposed by the commenter in connection with the SB 617/SRIA process; that rationale was that the LCFS' objective was to both (1) reduce GHG emissions in the near term from the transportation sector and (2) incentivizing innovation in transportation fuels and technologies, which will make even greater GHG reductions possible after 2020. No response to the quotation is necessary, but see response to comment **LCFS 46-258**.

LCFS 46-258 The comment states its proposed alternative would be better/less costly than ARB's proposal if the program's goals were different – namely limited to short-term GHG reductions. The commenter asserts that there is "no analysis or other support" for the ARB assertions that the LCFS has broader goals, other than a cited discussion about the potential roles and interactions between LCFS and Cap-and-Trade regulatory approaches.

The strategy to incentivize innovation in transportation fuels and technologies so that more GHG reductions would be possible after 2020 is ARB's goal because transformation of the fuel pool and substantial reduction in CI will require decades of changes, which the Legislature has put California on the path toward achieving. Here, ARB is implementing the more general goals set forth by the Legislature. Those goals go beyond the narrow, short-term goal the commenter has focused on exclusively.

LCFS 46-259 The comment suggests that the federal RFS program would also yield fuel diversity, suggesting that the LCFS is simply not needed. ARB disagrees. The federal RFS program does not encompass all fuels (excluding electricity and hydrogen, for example), and those that are included are lumped into bins associated with different carbon intensities, thus not rewarding incremental improvements in CI in the production of various fuels within each bin.

LCFS 46-260 The comment points to other ARB regulatory programs that may foster innovation and diversity for transportation fuels and technologies, implying that goals such as zero- and near zero-emission freight transport are covered or might be covered by future rulemakings and; therefore, promoting ARB's long-range goals through LCFS is not necessary or appropriate. In response,

ARB notes that it is authorized to pursue multiple strategies to work in concert toward cleaner, lower-carbon transportation in the next century. Please see response to comment **LCFS 46-1**.

ADF 17-24 The comment states that ARB staff's analysis on NO_X emissions increases due to biodiesel use is fatally flawed and that there would be substantial increases in NO_X emissions associated with biodiesel use if the proposed ADF Regulation is implemented as proposed. See responses to comments **LCFS 46-280**, **ADF 17-3**, and **ADF 17-20**.

ADF 17-25 The comment states that ARB staff provided no source for the emissions inventory. Please see response to **ADF 17-3**.

ADF 17-26 This comment suggests that ARB did not meet the requirements of AB 1085 with regards to providing sufficient documentation. Throughout the period ARB was developing the ADF proposal and after, ARB has maintained a webpage dedicated to that development and to the ADF rulemaking, and has provided documentation on that website at: http://www.arb.ca.gov/fuels/diesel/altdiesel/biodiesel.htm. In addition, since publication of the proposed regulation, ARB has maintained rulemaking files that are available for inspection by members of the public, and ARB provided public notice that the file was available for inspection prior to the start of the 45-day comment period. Please see response to comment **ADF F5-2**.

ADF 17-27 The comment states that staff's assumptions with regards to biodiesel use in NTDEs presents an "issue" involving development of the emissions inventory. Please see response to comment **LCFS 46-277**, **LCFS 46-280,** and **ADF 17-3**.

ADF 17-28 The comment states that staff's assumptions regarding the offset of biodiesel NO_X emissions by the use of renewable diesel fuel presents an "issue" with regards to development of the emissions inventory. Please see response to comment **LCFS 46-277**, **LCFS 46-280**, and **ADF 17-3**.

ADF 17-29 The comment states that ARB made flawed assumptions regarding biodiesel NO_X emissions in NTDE's and NO_X emissions offsets from renewable diesel. Please see response to comments **LCFS 46-277**, **LCFS 46-280**, and **ADF 17-3**.

Additionally, the comment states that the proposed ADF Regulation would lead to increases in NO_X. Please see response to comment **ADF 46-276**.

ADF 17-30 This comment does not constitute an objection or recommendation regarding the proposal released in December 2014. However, the comment states that ARB made flawed assumptions and included undocumented sources of data. Please see response to comments **LCFS 46-277**, **LCFS 46-280, ADF 17-3** and **ADF 17-26**.

ADF 17-31 This comment does not constitute an objection or recommendation regarding the proposal released in December 2014. However, the comment states that ARB has made faulty assumptions on NO_X impacts from NTDEs and assumed levels of biodiesel. Additionally, that the analysis completed by the commenter shows that NO_X impacts would be much greater than anticipated. Please see response to comments **LCFS 46-277**, **LCFS 46-280**, **ADF 17-3,** and **ADF 17-20**.

ADF 17-32 The comment displays results from an analysis that claims to show the relative contributions of NO_X from legacy vehicles and NTDE's. Because of the differing assumptions on NO_X emissions from NTDE's, the comment asserts that there are substantial contributions to NO_X emissions in 2015, 2020, and 2023 from these vehicles. Please see response to comment **LCFS 46-280**.

The comment suggests that staff's analysis should have considered the emissions effects for multiple regions in the State, including the South Coast and San Joaquin Valley Air Basin's, rather than analyzing only the statewide effects. Staff used the online EMFAC tool to look at the distribution of NTDEs Statewide and on a regional basis and found that there was little to no regional versus statewide variation in VMT by NTDEs. Additionally, ARB staff assumes that commercial fuels are used uniformly throughout the State when performing emissions analysis, as that is what has been observed in the past. As time goes on and ADFs have larger market share their use in the State should become more uniform. Given the uniformity of the effects of biodiesel throughout the State, no region should experience a disproportionate amount of detriment or benefit from the proposed ADF Regulation, and it was determined that a Statewide analysis of emissions would be appropriate. Any individual region's emissions effects should be proportional to their portion of VMT in that region vs. Statewide VMT.

Further, the comment critiques staff's approach of limiting to B20 the condition that NTDEs eliminate the biodiesel NO_X increase. The comment claims this approach is not truly precautionary because only two of the five studies referenced by the commenter were considered in this determination. Staff's analysis found that only two of the five studies referenced by the commenter are relevant because the other three studies were performed using retrofit devices rather than entire systems designed for commercial use. The retrofit controls are not designed along with the engines and other engine controls, and do not work together in the same way that the holistically-designed systems do. It is expected that the vast majority of SCR systems in NTDEs will be from purchase of new vehicles with complete, commercially-designed systems.

Based on test results, staff concluded that the use of lower levels of biodiesel with NTDEs results in no increase in NO_X; however, there is some uncertainty in the NO_X impacts at higher biodiesel blends. Therefore, staff took a conservative approach in designing the proposed ADF Regulation by limiting the conclusion of no increase in NO_X from NTDEs to the use of blends B20 and below.

Section 2293.6(a)(6) of the proposed ADF Regulation includes a provision for ARB to conduct, on or before December 31, 2019, a program review of the in-use requirements for biodiesel. Specifically, the review would examine the effects of the offsetting factors used in the regulatory analysis. The proposed ADF Regulation considers NTDEs to be an offsetting factor; as such, staff would consider the effects of NTDEs during that review.

ADF 17-33 The comment displays results from an analysis that show the relative contributions of NO_X from legacy vehicles and NTDE's. Please see response to comment **ADF 17-32**.

ADF 17-34 The comment states that the submitted analysis shows that NO_X emissions for the State would increase as a result of the proposed ADF Regulation. Please see responses to comments **ADF 17-9** and **ADF 17-25** through **ADF 17-33**.

ADF 17-35 The comment states that the proposed ADF Regulation would result in NO_X increases that are far greater than reductions expected from local Air Quality Plans. Please see response to comment **ADF 17-7**.

ADF 17-36 The comment states that 2014 is not the correct baseline year to analyze NO_X emissions. Please see response to comment **ADF 17-9** and **LCFS 46-54**.

ADF 17-37 The comment states that the mitigation measures to reduce NO_X emissions are unreasonably delayed. Please see response to comment **ADF 17-21.**

ADF 17-38 The comment states that the mitigation requirements for the proposed ADF Regulation are based on flawed emission analysis and that mitigation should not be delayed. Please see response to comment **LCFS 46-277** and **LCFS 46-280**.

Further, the comment states that the implementation date of the ADF Regulation is unreasonably delayed. Please see response to comment **ADF 17-21**.

ADF 17-39 The comment provides a summary of statements made by ARB staff that address actions associated with NO_X emissions resulting from biodiesel and biodiesel use in California. This comment does not appear to address issues associated with the Proposed Regulations or the content of the EA, thus no further response can be provided.

ADF 17-40 The comment states that 2014 is not the correct baseline year to analyze NO_X emissions. Please see response to comment **ADF 17-9** and **LCFS 46-54**.

ADF 17-41 The comment claims to provide calculated NO_X emissions data from 2011 to 2014. Please see response to comment **ADF 17-9** for a discussion related to methodology.

ADF 17-42 The comment summarizes the mitigation requirements for biodiesel in the proposed ADF Regulation, but does not include additional information or suggest additional mitigation for which a response can be provided.

ADF 17-43 The comment states that NTDEs do not reduce NO_X, that the renewable diesel use assumed in the proposed ADF Regulation is speculative, and that staff's analysis is flawed. Please see response to comments **LCFS 46-278** and **LCFS 46-280**.

ADF 17-44 The comment addresses delay of mitigation measures for NO_X associated with the proposed ADF Regulation. Please see response to comments **ADF 17-21** and **LCFS 46-276**.

ADF 17-45 The comment compared definitions between the proposed LCFS and ADF Regulations. Staff evaluated the differences in definitions between the CARB Diesel Regulations and the proposed LCFS and ADF Regulations. Staff has harmonized these definitions where it was deemed appropriate and made changes to section 2293.2 in the 15-day change for the ADF regulation and to section 95481 (a) in the 15-day changes to the LCFS regulation. However, these regulations serve differing but complementary purposes so staff elected to move forward with the original proposed definitions where a change was not appropriate. See response to **ADF 17-46**.

ADF 17-46 The comment suggests the proposed ADF Regulation be modified to ensure biodiesel blenders do not intentionally or unintentionally blend biodiesel in fuels that already contain biodiesel. The proposed ADF Regulation includes provisions to ensure that whenever a biodiesel fuel is blended, the blender report the blending event, to what blend level the biodiesel was blended, and what NO_X controls were used, if required. Staff made 15-day changes to the reporting and recordkeeping provisions of the proposed ADF Regulation to clarify these reporting requirements. Staff made additional 15-day changes to clarify that the Stage 3A in-use requirements for biodiesel only apply to blends of B20 and below; blends above B20 are not allowed to be sold in California under the Stage 3A provisions.

Ultimately, under the proposed ADF Regulation, it is the responsibility of blenders to ensure that biodiesel is accurately blended and reported. For example if a blender were to purchase a diesel fuel for biodiesel blending they would need to test or be told from the seller what the biodiesel content of the diesel is, or take into account that the diesel may contain up to 5 percent biodiesel and blend conservatively to ensure they do not create a blend that has higher biodiesel content than intended. Accurate blending practices are required by both ARB, for the purposes of this proposal and the California Department of Food and Agriculture for compliance with ASTM quality standards. Additionally ARB has the authority (e.g. HSC 41510) to sample and test biodiesel blends and other ADFs to ensure that they are properly mitigated based on their blend level.

ADF 17-47 The comment states that the Growth Energy alternative provides greater environmental benefits and is equally cost-effective as the proposed ADF Regulation. See response to comment **ADF 17-10**.

ADF 17-48 The comment purports to state the facts about when the commenter submitted its alternative and the reasons provided in the SRIA that address the feasibility of the commenter's alternative. No response is required.

ADF 17-49 The comment purports to quote from rulemaking documents, asserts that ARB staff "admits" to certain of the commenter's positions, and concludes that ARB has no choice but to adopt Growth Energy's suggested alternative for the ADF regulation. ARB staff does not agree that the Growth Energy alternative better achieves stated project objectives or that it is as cost-effective as ARB's proposal. Please see responses to comments **ADF 17-18** through **ADF 17-23**. For a discussion related to rejection of the Growth Energy Alternative, in general, please see response to comment ADF **17-10**.

ADF 17-50 The comment states that the Growth Energy Alternative would provide complete mitigation for NO_X emissions and relies on the same mitigation strategies proposed by ARB staff. Please see responses to comments **ADF 17-18** through **ADF 17-23**. For a discussion related to rejection of the Growth Energy Alternative, in general, please see response to comment **ADF 17-10**.

LCFS 46-261 The comment states ARB has never performed a legally compliant review of the environmental effects of ARB's existing LCFS Regulation. As required by law, the Draft EA provides a detailed analysis of the environmental impacts that could occur as a result of implementation of the proposed regulations. The proposed ADF Regulation addresses one of the remedial actions identified by the POET Court.

LCFS 46-262 The comment states that the EA does not evaluate the environmental impacts associated with the existing LCFS Regulation. There is no requirement to evaluate the environmental effects of the existing LCFS Regulation. The environmental impacts associated with the proposed LCFS and ADF Regulations are provided in Chapter 4 of the Draft EA. See responses to comments **ADF 17-9** and **LCFS 46-54** and **LCFS 46-55** with respect to use of 2014 baseline.

LCFS 46-263 The commenter expresses confusion related to the project description provided in the EA, stating that it is unclear whether the "project" analyzed in the EA includes the LCFS Regulation presently in effect. Chapter 2 in the Draft EA provides a discussion

of the project description. As described in the second paragraph of this chapter:

> This first part of this chapter provides a background summary of the proposed LCFS Regulation, including essential concepts related to its implementation, applicable fuel types and sources, fuel pathway analysis, credit market provisions. It also provides an overview of the proposed ADF Regulation. Additional details about the two regulations are available in the Initial Statements of Reasons (ISORs) associated with each proposed regulation. Sections D, E, and F of this chapter, describe particular provisions (e.g. fuel pathways) and the potential compliance scenarios resulting from the proposed regulations. This information, along with the information in section G, are described to provide a basis for the subsequent discussion of the reasonably foreseeable environmental effects of the proposed regulations in Chapter 4, as required by CEQA (Public Resources Code [PRC] 21159).

Section 2.G of the Draft EA provides an illustrative, reasonably foreseeable compliance response scenario that could result under the proposed LCFS and ADF Regulations. As described,

> "The compliance scenario described in this section is based on assumptions that ARB staff has determined to be reasonably foreseeable in light of existing fuel types and sources, recent fuel supply trends, and anticipated production and transportation capacities in coming years. Actual compliance responses under the proposed LCFS and ADF Regulations may vary from those set forth here because the LCFS is a market-based program and as such, fuel producers and suppliers would ultimately determine how the required reduction in CI is achieved. While innumerable variations in these compliance responses could be posited as possible outcomes of the proposed LCFS Regulation, those variations are considered by ARB to be largely speculative. The compliance responses described here are based on a reasonable range of assumptions and therefore provide a sound basis for evaluating the proposed action's reasonably foreseeable environmental impacts."

Note that the term, "proposed LCFS and ADF Regulations" refers to the 2014 version of LCFS and the proposed ADF Regulation.

Previous versions of the LCFS Regulation are not under consideration for adoption.

LCFS 46-264 The comment states that omitting the previous versions of the LCFS Regulation does not constitute a sufficient project description. Previous versions of the LCFS Regulation are not under consideration for adoption. Chapter 2 of the Draft EA provides background information related to the proposed LCFS and ADF Regulations and a description of an illustrative, reasonably foreseeable compliance response scenario. CEQA Guidelines 15121(a) states that an "EIR is an informational document which will inform public agency decision makers and the public generally of the significant environmental effects of a project…" Thus, the project description should contain the information that would be presented to the ARB Board for consideration of approval and is the correct content for the purposes of the EIR as an informational document.

LCFS 46-265 The comment suggests that the project description should be revised. Please see response to comment **LCFS 46-264**.

LCFS 46-266 The comment states that the baseline used for the environmental analysis is not clear. Please see response to comments **LCFS 46-54** and **LCFS 46-55**.

LCFS 46-267 The comment states that the EA does not describe the baseline used for the analysis. Please see response to **LCFS 46-55** and **LCFS 46-268**.

LCFS 46-268 The comment states that the proper baseline for CEQA is 2007 because that is when environmental review of the LCFS Regulation began. The comment is referring to the original LCFS Regulation, which has since been amended and would soon need to be set aside by the Board to comply with a court order. The subject of the EA is the proposed LCFS Regulation and the proposed ADF Regulation. Please also refer to responses to comments **ADF 17-9** and **LCFS 46-54**.

LCFS 46-269 The comment refers to a court case, *Neighbors for Smart Rail v. Exposition Metro Line Construction* (2013) to support a baseline that differs from 2014. In that case, a majority of the California Supreme Court held that a lead agency has the discretion to use "[p]rojected future conditions … as the sole baseline," instead of existing conditions, if the agency can justify its decision to depart from the standard existing-conditions analysis. 57 Cal.4th 439, 451.

This case does not address, let alone require, the use of a *past* baseline. The EA uses existing conditions as the baseline, both because that is what CEQA requires and because ARB staff determined that a comparison to existing physical conditions would provide the most meaningful information and understanding of how the environment would change with the approval and implementation of LCFS and ADF. In the case of the proposed regulations, the existing conditions provide the necessary information to decision-makers to determine the effects of the proposed project(s). While some commenters state that ARB should have used a past baseline of 2007 or 2009, ARB staff does not believe such a baseline would be consistent with CEQA or provide the public or the Board with the information they need in 2015. Also see responses to **ADF 17-9** and **LCFS 46-54**.

LCFS 46-270

The comment states that the fact that the emissions occurred in the past does not excuse ARB from analyzing the effects of those emissions. While the impact analysis conclusion was properly based upon 2014 conditions, the air quality discussion in the EA also addressed emissions that occurred in the past. As stated on page 52 of the Draft EA:

> In the interest of public disclosure, ARB staff examined the current and expected future emissions of NO_X from biodiesel relative to the NO_X emissions from biodiesel that were occurring prior to the adoption of the original LCFS (2009). In 2009, there were few NTDEs, no renewable diesel, and little biodiesel in California, so the NO_X emissions from biodiesel were minimal. However, since 2009, NO_X emissions from biodiesel have increased due to increased use of biodiesel because there have been multiple incentives in place affecting use of biodiesel since 2009. Thus, it is unclear and impossible to determine what portion of the increase in use can be attributed to the original LCFS. In addition to implementation of the LCFS approved in 2009, biodiesel was incented by the federal 2007 Renewable Fuels Standard (RFS2) and tax credits, which staff believes were more instrumental in bringing biodiesel to California in these early years because of their higher economic incentives. California generally gets its “fair share” of the national supply of fuels, approximately 11 percent of U.S. supply. To date, California has not yet reached its fair share for biodiesel. Accordingly, the amount of biodiesel used in California was likely lower than it could have been due to the policy signals ARB was sending of its intent to regulate biodiesel. On the

other hand, California has received more than its fair share of renewable diesel, which suggests the existing LCFS more clearly incented more renewable diesel use in California. The use of this increased renewable diesel since 2009 has led to decreases in NO_X compared to the amount of renewable diesel in 2009. It is expected that supply and use of renewable diesel will continue to grow, which decreases NO_X and offsets some the NO_X increases from biodiesel in those same years. This, combined with increased NTDE adoption, will cause biodiesel-related NO_X emissions in California to continue to decrease and ultimately return to 2009 levels by 2023. Given the RFS, federal tax incentives, and the growth of alternative fuel technologies and markets, it is certainly possible that biodiesel use in California would continue at or near existing levels – or even increase – in the absence of an LCFS Regulation.

The comment refers to a discussion of the mootness in the case *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004); however, the mootness (and other) issues presented in that case are not presented here. Perhaps most notably, that court held the case was not moot because the developers proceeded with a project at their own risk during the pendency of the appeal when the validity of project approval was uncertain. 124 Cal.App.4th 1184, 1203 ("As a matter of public policy and basic equity, developers should not be permitted to effectively defeat a CEQA suit merely by building out a portion of a disputed project *during litigation.*") (emphasis added). In contrast, the status of the LCFS was not uncertain after the *POET* decision. The *POET* court expressly authorized ARB to continue implementing the LCFS, at 2013 levels, because "the environment will be given greater protection if the LCFS regulations are allowed to remain operative pending ARB's compliance with CEQA." 218 Cal.App.4th at 762.

LCFS 46-271 The comment states that the EA should be revised and recirculated, using a different baseline than 2014. ARB staff disagrees. Please see response to comment **LCFS 46-54**.

LCFS 46-272 The comment states that the cumulative air quality analysis should include previous versions of LCFS. As stated in CEQA Guidelines Section 15130(a)(1), "a cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts. An EIR should not discuss impacts which do not result in part from the project evaluated in the EIR." As stated in Section

5.C.3 of the EA, because the proposed LCFS and ADF Regulations would result in long-term beneficial effects on air quality emissions, there would be no considerable contribution to a significant adverse impact; thus, the discussion provided is adequate because a beneficial impact could not contribute to, or result in, a cumulatively significant impact. However, to provide clarification to this discussion, the text of the fourth paragraph on page 108 of the Draft EA is modified as follows:

> Biodiesel and renewable diesel fuels have been found to reduce PM emissions relative to conventional diesel. Renewable diesel has been found to decrease NO_X relative to conventional diesel; however, biodiesel has been found to increase NO_X emissions in some cases, depending on feedstock and type of engine of used. The following discussion considers NO_X emissions associated with biodiesel, which has been incentivized, in part, under LCFS Regulations beginning in 2009.
>
> In 2009, there were few NTDEs, no renewable diesel, and little biodiesel in California. Since 2009, multiple incentives have contributed to greater biodiesel use and associated NO_X emissions. In addition to implementation of the LCFS approved in 2009, biodiesel was incented by the federal 2007 Renewable Fuels Standard (RFS2) and tax credits, which ARB staff considers to have been more instrumental in bringing biodiesel to California because of their higher economic incentives. California generally gets its "fair share" of the national supply of fuels, (i.e., approximately 11 percent of U.S. supply). To date, California has not yet reached its fair share for biodiesel, but has received more than its fair share of renewable diesel.
>
> Increased use of renewable diesel, compared to biodiesel has led to decreases in NO_X. It is expected that supply and use of renewable diesel will continue to grow, which offsets some the NO_X increases from biodiesel. This, combined with increased NTDE use, will cause biodiesel-related NO_X emissions in California to continue to decrease and ultimately return to 2009 levels by 2023. Given the RFS, federal tax incentives, and the growth of alternative fuel technologies and markets, it is reasonable to assume that biodiesel use in California would continue at or near existing levels – or even increase – in the absence of an LCFS Regulation.

However, as discussed under Impact 4.3, implementation of the proposed ADF Regulation would mitigate any potentially significant NO_X emissions impacts resulting from increased use of biodiesel associated with the proposed LCFS Regulation. Thus, adoption of the proposed LCFS and ADF Regulations would not result in a cumulatively considerable contribution to a significant adverse to long-term air quality.

~~Implementation of the proposed LCFS and ADF Regulations would result in long-term operational impacts that would be beneficial; thus, no cumulatively-considerable contribution to a significant adverse impact to long-term air quality would occur.~~

LCFS 46-273 The comment asserts that the Draft EA is segmented because it does not include NO_X emissions caused by previous versions of the LCFS Regulation. Segmenting or piecemealing, under CEQA, refers to splitting a project and environmental analysis in such a way that impacts are minimized, where they should or could be considered significant impacts as part of one project. The Draft EA evaluates the whole of the project, setting aside the existing regulation and evaluating the proposed LCFS and ADF Regulations. Thus, the EA is not segmented or piecemealed. Please also see responses to comments **LCFS 46-270 and LCFS 46-272**.

LCFS 46-274 The comment states that the EA air quality analysis is not complete. Please see part 4(B)(3) of the EA for an analysis of the project's potential impacts on air quality. Please also see responses to comments **LCFS 46-241, LCFS 46-270,** and **LCFS 46-272**.

LCFS 46-275 The comment states that the EA does not discuss criteria pollutants other than NO_X. See responses to comments **LCFS 46-241** and **LCFS 46-274**.

LCFS 46-276 The comment states that biodiesel use associated with the proposed ADF Regulation and the "readopted" LCFS Regulation would result in additional NO_X emissions. The 1.29 tons per day increase the commenter refers to is the NO_X increase associated with biodiesel in 2015 (ADF ISOR, Table B-1). This number represents the NOx emissions that are the result of the use of biodiesel blends and are higher than the NOx emissions that would occur if only CARB diesel were used to fulfill diesel fuel demand in California. However, biodiesel blends are currently being used in

addition to CARB diesel to fulfill California diesel fuel demand and, therefore, the emissions the commenter refers to are already occurring as part of the current conditions.

Thus, the 2014 and 2015 NO_X emissions (1.35 TPD in 2014 and 1.29 TPD in 2015) associated with biodiesel use are not NO_X increases resulting from the implementation of the proposed regulation starting in 2016, but are estimated emissions associated with current conditions. For purposes of the EA, ARB analyzed impacts against 2014 conditions, the time when the environmental analysis began. ARB staff's analysis of NO_X emissions from 2014 through 2023 (displayed in Table B-1), shows that NO_X emissions would decrease over time with the implementation of the regulatory proposal. This NO_X emissions decrease over time is considered a "beneficial" impact resulting from the proposed regulation.

As previously stated staff found that NOx emissions decrease over time with the ADF Regulation, but as part of the program review to be conducted by 2019, staff would consider the data and assumptions used to calculate NO_X impacts using the most updated information to make adjustments if warranted. Please see response to comment **LCFS 46-54**.

LCFS 46-277

The comment states that any offset potential from renewable diesel is speculative because ARB has no mandate on fuel volumes, specifically volumes of renewable diesel and biodiesel. Reductions in biodiesel NOx emissions are driven by increased NTDEs and increased renewable diesel volumes. Staff used reasonable assumptions to evaluate future emissions, consistent with the CEQA Guidelines (14 CCR 15000 et eq.) and ARB's certified regulatory program under CEQA (14 CCR 15251(d); 17 CCR 60000-60008). The evaluation completed in the EA considered reasonably foreseeable actions for compliance with both the proposed ADF and LCFS Regulations. As such, ARB staff included the amounts of biodiesel and renewable diesel that may occur as part of a possible pathway to LCFS compliance. These amounts fed into the analysis showing a steady decline in emissions to a negligible level, around 2023 and after.

The volumes of biodiesel and renewable diesel used in the reasonably foreseeable compliance scenario were based on staff's analysis of potential supply that would be available to California, and analysis of which of those fuels were most likely to come to California based on a number of factors including the fuel's CI

value. More information about the possible pathway to LCFS compliance is available in Appendix B of the LCFS staff report.

Section 2293.6(a)(6) of the proposed ADF Regulation includes a provision for ARB to conduct, on or before December 31, 2019, a program review of the in-use requirements for biodiesel. Specifically, the review would examine the effects of the offsetting factors used in the regulatory analysis, which would include whether the projected volumes and displacement of biodiesel and renewable diesel were reflective of actual volumes. As described in the response to **LCFS 46-276**, the 470.85 tons per year of NO_X emissions in 2015 associated with biodiesel use are not NO_X increases resulting from the implementation of the proposed regulation, which begins implementation in 2016.

In addition, the comment suggests that renewable diesel should not be used to offset or mitigate NO_X impacts from biodiesel. As detailed in Chapter 6 of the ADF staff report, renewable diesel has been found to decrease NO_X emissions relative to CARB diesel. Biodiesel and renewable diesel are both liquid fuels, incentivized by the LCFS, which can be used in conventional diesel engines. Because of this, staff believes it is appropriate to offset the increase in NO_X emissions from biodiesel with the decrease in NO_X emissions from renewable diesel.

Biodiesel and renewable diesel may be present in fuel tanks at the same time and the use of the two fuels is assumed to be fairly uniform throughout the State, an assumption that is supported by previous trends. Thus, it is appropriate to look at the emissions of both fuels used together and to offset the increases in NO_X from biodiesel with the decreases from renewable diesel. It could mislead the public to analyze emissions any other way, given that the LCFS incentivizes both and no one in California exclusively breathes the emissions from one type of fuel.

LCFS 46-278

The comment states that ARB did not make available documentation for public review, specifically with regard to ARB's assumptions on how renewable diesel is used and blended in California, and that the assumptions made were erroneous. As part of the 15-day change notice, staff re-analyzed its earlier estimate that 40 percent of the state's renewable diesel enters refineries and is used as a blendstock to produce diesel fuel. If renewable diesel is used in refineries, it may only be offsetting the emissions of a dirtier diesel blendstock and may not be available to offset the NOx emissions of biodiesel downstream. Therefore, to be conservative

in estimating potential NOx emissions (i.e., to ensure potential NOx impacts from biodiesel were not underestimated), ARB has reduced the total renewable diesel volume expected to provide NOx emissions reductions by the amount that is estimated to be used at refineries as a blendstock.

Note that although data is available for how much renewable diesel is purchased by refinery operators, no data is available to show how much renewable diesel is used by the refineries as diesel blendstock. For the staff report, staff assumed that refineries purchasing renewable diesel with an LCFS compliance obligation are using a large portion of that renewable diesel as a blendstock for diesel production. Furthermore, the most conservative approach, when estimating emissions benefits from renewable diesel use, would be to assume that all refinery purchases of renewable diesel with compliance obligation would be used as diesel blendstock. For these reasons, staff used renewable diesel purchased by refineries with obligation as a surrogate for the amount of renewable diesel used in refineries as diesel blendstock and included that value in the ADF staff report analysis.

Staff's original analysis used confidential data from the Low Carbon Fuel Standard Reporting Tool (LRT) to determine that 40 percent of renewable diesel was being purchased with obligation by refiners in 2013, which was the latest year with available data at the time the staff report was released. Based on this data staff assumed that 40 percent of renewable diesel in California was used in refineries as diesel blendstock, assumed no emissions benefit from this fuel, and assumed that this trend would continue as refineries continued to purchase more renewable diesel with obligation.

ARB received comments in response to the original proposed regulation questioning the 40 percent estimate and the method by which staff determined this value. This prompted staff to perform the same analysis with 2014 LRT data, which had recently become available. Staff's analysis of 2014 LRT data shows that only 5 percent of renewable diesel was purchased by refiners with obligation. Note that neither the total renewable diesel purchased nor the total renewable diesel purchased by obligated parties with refineries similarly decreased – only the amount of renewable diesel purchased with obligation by refineries. Staff believes refineries are still using renewable diesel as a diesel blendstock, but no longer purchasing the fuel with obligation. This large difference in obligated purchase suggests that purchase with obligation likely reflects other market conditions and is not as

accurate an indicator of how much renewable diesel is used as a blendstock, as staff originally believed. Staff has also been monitoring recent trends in renewable diesel use and has observed an increase in the current and anticipated future use of renewable diesel as unblended R100 by end users, either through fleet purchase or through retail sales.

Given the large variability in obligated purchases of renewable diesel by refineries and a general trend toward more use of unblended renewable diesel in-use, staff concluded the 40 percent estimate for future years was too high. Implicit in the 40 percent estimate was an assumption that the amount of renewable diesel being used in refineries would be increasing over time as the overall renewable diesel use in California increased. However, that assumption no longer seems to be supported by the data. Staff determined it is more realistic to assume that a certain volume of renewable diesel is used in refineries as diesel blendstock and that volume remains constant over time. However, staff is not confident about using the reported 2014 renewable diesel volume purchased with obligation for this analysis. In order to retain the conservative approach of the original analysis, which is more protective of air quality, staff is retaining the estimated volume of renewable diesel entering refineries in 2014 that was used in the December 2014 staff report (48 million gallons). We believe the volumes are conservative but the percent going into the future is no longer accurate. The volumetric assumption is extended to all other years in replacement of the percentage assumption. The results of this change are shown in the table below, which was included in the May 22, 2015 notice of modifications to the proposed ADF Regulation (at http://www.arb.ca.gov/regact/2015/adf2015/signedadfnotice.pdf).

	Projections based on LCFS illustrative compliance scenario									
(Million gallons)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total Biodiesel	65	97	129	160	180	180	180	185	185	185
B20 (No NOx post 2018)					28	28	28	33	33	33
B20 Producer exemption					2	2	2	2	2	2
BD Potentially causing NOx	65	97	129	160	152	152	152	152	152	152
RD Volume	114	180	250	300	320	360	400	500	550	600
Liquid Diesel Demand	3787	3788	3845	3903	3961	4021	4081	4142	4204	4267
	NOx emissions Calculations									
%NTDE (EmFAC 2011) (VMT)	40.09%	50.86%	59.87%	66.35%	71.26%	75.00%	79.78%	85.03%	88.74%	98.44%
BD used in legacy vehicles	38.9	47.7	51.8	53.8	43.7	38.0	30.7	22.8	17.1	2.4
%NOx increase (B100)	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
RD used in legacy	68	88	100	101	92	90	81	75	62	9
RD used in refineries	48	48	48	48	48	48	48	48	48	48
Legacy RD used in refineries	29	24	19	16	14	12	10	7	5	1
Legacy RD not used in refineries	40	65	81	85	78	78	71	68	57	9
Legacy BD offset by Legacy RD	14	24	29	31	28	28	26	25	21	3
%NOx increase from BD	0.13%	0.13%	0.12%	0.12%	0.08%	0.05%	0.02%	-0.01%	-0.02%	0.00%
Emissions Inventory (Diesel TPD)	916	863	818	772	726	680	634	588	542	496
NOx increase from BD (TPD) (original proposal)	1.35	1.29	1.27	1.26	0.90	0.65	0.43	0.20	0.10	0.01
NOx increase from BD (TPD) (additional analysis)	1.19	1.10	0.95	0.91	0.56	0.33	0.15	-0.05	-0.09	-0.02
Net NOx increase (from 2014)	0.00	-0.09	-0.24	-0.28	-0.63	-0.86	-1.04	-1.24	-1.28	-1.21

LCFS 46-279

The comment states that a "finding" of beneficial effect to criteria pollutant emissions is erroneous. The analysis conducted for the EA on the combined effects of the proposed ADF and LCFS Regulations found that the two regulations, in concert, would lead to both increased volumes of biodiesel and renewable diesel. The proposed LCFS Regulation is expected to result in increases of both biodiesel and renewable diesel. Other ARB regulations are expected to result in increases in the percent of VMT by NTDEs. The proposed ADF Regulation introduces NO_X controls which would eliminate NO_X increases from biodiesel blends above B5. The offsetting effects of increasing renewable diesel and NTDEs combined with the NO_X controls on biodiesel are expected to result in overall decreases in NO_X relative to current conditions.

A detailed description of the offsetting effects associated with NTDEs, and the offsetting effects of renewable diesel can be found in responses to comment **LCFS 46-277** and **LCFS 46-278**. The expected results of the offsetting effects are found in Chapter 7 and Appendix B of the ADF ISOR, with full details in Table B-1. As described in the responses to comments **LCFS-46 274** and **LCFS 46-276,** staff's analysis shows that NO_X emissions are expected to decrease over time with the implementation of the proposed ADF Regulation. This NO_X emissions decrease over time is considered a beneficial impact resulting from the proposed ADF Regulation.

ARB's analysis presented in the EA and the LCFS ISOR concluded that the proposed regulations would also have a beneficial impact in reducing other criteria pollutants.

LCFS 46-280 The comment states the Draft EA analysis understates the impacts associated with operational NOx emissions. See response to comment **ADF 17-4**.

LCFS 46-281 The comment states that the impacts related to potential construction projects can and should be quantified. The EA provides the appropriate level of detail at a programmatic level of analysis. In addition, the Draft EA takes a conservative approach and determines some environmental impacts as potentially significant because of the inherent uncertainties in the relationship between physical actions that are reasonably foreseeable under the proposed LCFS and ADF Regulations, and environmentally sensitive resources or conditions that may be affected. This approach tends to overstate environmental impacts in light of these uncertainties and is intended to satisfy the good-faith, full-disclosure intention of CEQA.

If and when specific projects are proposed and subjected to project-level environmental review, it is expected that many of the impacts recognized as potentially significant in the Draft EA could be reduced to a less-than-significant level through implementation of recommended mitigation measures. If a potentially significant environmental effect cannot be feasibly mitigated with certainty, this EA identifies it as significant and unavoidable (see page 38 of the Draft EA). This level of detail of impact analysis is necessarily and appropriately general, because the nature of the proposed LCFS and ADF Regulations is programmatic.

Furthermore, industry decisions regarding the specific location and design of new facilities and other infrastructure undertaken in response to the proposed regulations are difficult, if not impossible, to predict with precision, given the influence of other business and market considerations in those decisions and the numerous locations where those facilities might be built. As stated above, specific development projects undertaken in response to the proposed LCFS and ADF Regulations would undergo required project level environmental review and compliance processes (see page 4 of the Draft EA).

LCFS 46-282 The comment states that the draft EA fails to quantify impacts from new facilities, and consequently forecloses analysis of mitigation

measures. As stated in the Draft EA, while ARB is responsible for adopting the proposed LCFS and ADF Regulations, it does not have authority over all of the potential infrastructure and development projects that could be carried out in response to the proposed LCFS and ADF Regulations. Also, because the fuel standards are performance-based and not prescriptive, the proposed LCFS Regulation is not mandating any specific fuel or technology. Other agencies are responsible for the review and approval, including any required environmental analysis, of any facilities and infrastructure that are reasonably foreseeable, including any definition and adoption of feasible project-specific mitigation measures, and any monitoring of mitigation implementation. For example, local cities or counties must approve proposals to construct new facilities, such as facilities for fuel blending or distribution. Additionally, State or federal permits may be needed for specific environmental resource impacts, such as take of endangered species, filling of wetlands, and streambed alteration.

Because ARB cannot predict specific projects precisely, and ARB does not have authority over implementation of specific infrastructure projects that may occur, the programmatic analysis in this EA does not allow for a precise description of the details of project-specific mitigation. As a result, there is inherent uncertainty in the degree of mitigation that would ultimately need to be implemented to reduce any potentially significant impacts identified in this EA. Consequently, this EA takes the conservative approach in its post-mitigation significance conclusions (i.e., tending to overstate the risk that feasible mitigation may not be sufficient) and discloses, for CEQA compliance purposes and where appropriate, that potentially significant environmental impacts may be unavoidable. It is also possible that the amount of mitigation necessary to reduce environmental impacts to below a significant level may be far less than disclosed in this EA on a case-by-case basis. It is expected that facility and infrastructure projects would be able to feasibly avoid or mitigate to a less-than-significant level many of these potentially significant impacts as an outcome of their project-specific environmental review processes (see page 38-39 of the Draft EA).

LCFS 46-283 The comment states the increased NO_X emissions violates AB 32. See response to comments **LCFS 46-45, LCFS 46-56**, and **LCFS 46-68**.

LCFS 46-284 The commenter states that the mitigation measures presented in the Draft EA are inadequate. Please see response to **LCFS 46-282**.

LCFS 46-285 The comment states that the mitigation measures are not enforceable, as required under CEQA. ARB disagrees; the ADF measures are enforceable, as would be mitigation measures developed relating to local construction projects. Nevertheless, the EA takes a conservation approach in its post-mitigation significance conclusions and discloses that potentially significant environmental impacts may be unavoidable. Please see response to comment **LCFS 46-282**.

LCFS 46-286 The comment states that the EA must identify how, and to what degree, the mitigation measures would reduce or avoid potentially significant impacts. Please see response to **LCFS 46-282.**

LCFS 46-287 The comment states that the mitigation measures presented in the Draft EA are deferred. This EA generally does not analyze site-specific impacts when the location of future facilities or other infrastructure that may be built in response to either the LCFS or the ADF Regulations is speculative. However, the EA does examine regional (e.g., air basin) and local issues to the degree feasible where appropriate. As a result, the impact conclusions in the resource-oriented sections of Chapter 4, Impact Analysis and Mitigation Measures, cover broad types of impacts, considering the potential effects of the full range of reasonably foreseeable actions undertaken in response to the proposed regulations. The mitigation measures presented in the Draft EA provide recognized practices that are routinely required to avoid and/or minimize environmental impacts. Because the mitigation measures that are beyond ARB's authority cannot be enforced by ARB, many potentially significant impacts are conservatively considered to be potentially significant and unavoidable. And because the programmatic level of analysis associated with the EA does not attempt to address project-specific details of mitigation, there is inherent uncertainty in the degree of mitigation that may ultimately by implemented to reduce potentially significant impacts (stated throughout Chapter 4 of the Draft EA). Thus, mitigation is not deferred.

LCFS 46-288 The comment states that the EA must be revised to further analyze potential mitigation measures. For the reasons discussed in responses to **LCFS 46-282** through **LCFS 46-287**, this EA does not need to be revised.

LCFS 46-289 The comment states that the Draft EA fails to analyze impacts associated with fuel shuffling. See response to **LCFS 46-61**.

LCFS 46-290 The comment states that fuel shuffling is not evaluated. See response to **LCFS 46-61**.

LCFS 46-291 The comment states that the EA should be revised to address impacts associated with fuel shuffling. For the reasons discussed under responses to **LCFS 46-61**, the Draft EA does not need to be revised and recirculated.

LCFS 46-292 The comment states that the Growth Energy Alternative should not be eliminated from detailed discussion. Please see responses to **ADF 17-10** and **LCFS 40-36**.

In terms of a Cap-and-Trade Alternative, please see response to comment **LCFS 46-62**.

LCFS 46-293 The comment states that Growth Energy's suggested alternative proposes elimination of LCFS. As stated in the LCFS and ADF SRIA:

> The proposed alternative assumes that the exclusive goal of the LCFS proposal is to achieve GHG emissions reductions without regard to source. If that were the case, this would be a viable alternative to the LCFS and would be assessed in this analysis. It is likely true that the estimated GHG emissions reductions appearing in the 2009 LCFS ISOR (California Air Resources Board, 2009) could be achieved by the AB 32 Cap-and-Trade Program, along with the other programs cited by Sierra Research and Growth Energy. The LCFS proposal, however, was designed to address the CI of transportation fuels. Transportation in California was powered almost completely by petroleum fuels in 2010. Those fuels were extracted, refined, and distributed through an extensive and mature infrastructure. Transitioning California to alternative, lower-carbon fuels requires a very focused and sustained regulatory program tailored to that goal. The other regulatory schemes the alternative would rely on are comparatively "blunt instruments" less likely to yield the innovations fostered by the LCFS proposal. In the absence of such a program, post-2020 emissions reductions would have to come from a transportation sector that would, in all likelihood, have emerged from the 2010-2020 decade relatively unchanged.

See responses to **LCFS 46-294** through **LCFS 46-298** for responses to specific comments related to the Growth Energy Alternative.

LCFS 46-294 The comment provides a brief discussion of the impacts associated with the Growth Energy Alternative to LCFS. For a discussion of why this alternative was dismissed from detailed consideration, please see response to comment **LCFS 46-293**.

LCFS 46-295 The comment states that the Growth Energy Alternative for ADF is environmentally superior to the proposed ADF Regulation. Please see response to comment **LCFS 46-293**.

LCFS 46-296 The comment states that the Growth Energy Alternative should not be rejected because it fails to meet a project objective. However, contrary to statements made by the commenter, the reason for rejection did not hinge on one project objective. ARB states on page 36 of the SRIA and pages 136-137 of the Draft EA that the Growth Energy Alternative requires mitigation of more biodiesel than the ADF Regulation and would not result in any additional emissions reductions. Furthermore, the alternative was found to be unnecessarily strict, as it would mitigate non-animal and animal-based biodiesel similarly and set the significance level for both at one period. ARB staff analysis of the best available data does not find that there are NO_X increases with B5 animal biodiesel or biodiesel used in new technology diesel engines (NTDE).

CEQA states that consideration and discussion of alternatives to the proposed project is governed by the rule of reason (CEQA Guidelines 15126.6[a]). The factors that may be used to eliminate an alternative from detailed consideration include, and are not limited to: failure to meet most of the basic project objectives, infeasibility, or inability to avoid significant environmental impacts. Alternative discussions are intended to foster meaningful public participation and informed decision making (CEQA Guidelines 15126.6[f]).

ARB staff found that Growth Energy's proposed alternative would not reduce any potentially significant environmental effects, and that although the alternative may accelerate the timeframe of emissions benefits compared to the proposed ADF Regulation, it would do so at an unreasonable cost, in a way that may not be technically feasible, and would be unnecessarily strict. This provides sufficient reasoning to reject detailed consideration of the alternative.

LCFS 46-297 The comment suggests that the objectives were developed to allow only for the proposed LCFS Regulation, and are defined narrowly in a way that allows for dismissal of Growth Energy's alternative. Please see response to comment ADF 17-10 for a discussion related to the reasons as to why the Growth Energy Alternative was rejected from detailed consideration, and Chapter 7 of the Draft EA for a discussion of alternatives to the proposed LCFS and ADF Regulations.

LCFS 46-298 The comment states that the Growth Energy Alternative is environmentally superior to the proposed ADF Regulation. This is contrary to the determination made by ARB staff. Please see responses to comments **LCFS 46-292** through **LCFS 46-297**, and **ADF 17-10**. No changes to the alternative discussion in the EA are required.

LCFS 46-299 The comment states that there are inconsistencies between the LCFS and ADF Regulations. In developing the proposed LCFS and ADF Regulations, staff made every effort to ensure consistency between the regulations. However, the LCFS and the ADF are two different regulations that have distinct regulatory notices and staff reports and will be considered by the Board in separate proceedings. The proposed ADF Regulation outlines a process by which ADFs are to be introduced into the California market, including the determination of mitigation measures to ensure no degradation in air quality, if necessary. The proposed ADF Regulation also includes in-use requirements for biodiesel. Conversely, the proposed LCFS Regulation is designed to decrease the CI of California's transportation fuel pool and provide an increasing range of low-carbon and renewable fuel alternatives. With different regulatory goals, these proposed regulations may include variations in definitions as appropriate. Staff evaluated the differences in definitions between the CARB Diesel Regulations and the proposed LCFS and ADF Regulations. Staff has harmonized these definitions where it was deemed appropriate and made 15-day changes to the proposed LCFS and ADF Regulations. However, these regulations serve differing but complementary purposes so staff elected to move forward with the original proposed definitions where a change was not appropriate.

The comment suggests the proposed ADF Regulation should be modified to ensure biodiesel blenders do not intentionally or unintentionally blend biodiesel in fuels that already contain biodiesel. The proposed ADF Regulation includes provisions to ensure that whenever a biodiesel fuel is blended, the blender must

report the blending event, to what blend level the biodiesel was blended, and what NOx controls were used, if required. Staff made 15-day changes to the reporting and recordkeeping provisions of the proposed ADF Regulation to clarify these reporting requirements. Staff made additional 15-day changes to clarify that the Stage 3A in-use requirements for biodiesel only apply to blends of B20 and below; blends above B20 cannot be sold in California under the Stage 3A provisions.

Ultimately, under the proposed ADF Regulation, blenders are responsible for ensuring that biodiesel is accurately blended and reported. For example, if a blender were to purchase a diesel fuel for biodiesel blending, they would need to test or be told from the seller what the biodiesel content of the diesel is, or take into account that the diesel may contain up to 5 percent biodiesel and blend conservatively to ensure they do not create a blend that has higher biodiesel content than intended. Accurate blending practices are required by both ARB for the purposes of this proposal, and CDFA for compliance with ASTM quality standards. Additionally ARB has the authority (e.g. HSC 41510) to sample and test biodiesel blends and other ADFs to ensure that they are properly mitigated based on their blend level.

Comment letter code: 60_OP_LCFS_CBD

Commenter: Brian Nowicki

Affiliation: Center for Biological Diversity

The following letter was submitted to the LCFS Docket during the 45-day comment period.

This page intentionally left blank.

60_OP_LCFS
_CBD

CENTER for BIOLOGICAL DIVERSITY Because life is good.

February 17, 2015

Via electronic submission

Mary Nichols, Chair
California Air Resources Board
1001 I Street, PO Box 2815
Sacramento, CA 95812

Dear Chair Nichols and Members of the Air Resources Board:

This letter is submitted on behalf of the Center for Biological Diversity ("Center") regarding the California Air Resources Board's ("ARB") proposed adoption of the Low Carbon Fuel Standard, or LCFS, and the associated Draft Environmental Impact Report ("EIR"). The Center for Biological Diversity strongly supports the LCFS as a crucial tool in addressing the large proportion of California's greenhouse gas emissions and other air pollutants that comes from the production, transport, refining, and combustion of transportation fuels.

The Center appreciates ARB's continuing work on the LCFS and other measures to address pollution from transportation fuels. The extraction, refining, transport, and combustion of transportation fuels is the source of nearly half of California's annual greenhouse gas emissions, and the equivalent of more than 217 million metric tons of carbon dioxide (CO_2e). This category of greenhouse gas emissions is accompanied by large amounts of nitrogen oxides and ozone pollution: 80 percent of California's total emissions of nitrogen oxides of nitrogen (NO_x), and 95 percent of diesel particulate matter (PM) emissions. These pollutants are major contributors to the dangerously poor air quality that affects many communities in our state. Without a doubt, California must pursue every option and opportunity to reduce emissions from transportation fuels.

These comments identify specific opportunities to strengthen the proposed rule with respect to hydraulic fracturing and forest-sourced biofuels, and to strengthen the EIR's treatment of impacts to food prices and availability. Some of the noted issues exist in the previously adopted rule but warrant additional consideration in the proposed rule. In all cases, the Center believes there are real solutions for addressing these issues and enacting a strong LCFS that best serves California.

I. The Carbon Intensities Must Account for Energy Inputs and Greenhouse Gas Emissions Specific to Hydraulic Fracturing and other Carbon-Intensive Oil Recovery Methods.

LCFS 60-1

The LCFS uses carbon intensity values generated via the Oil Production Greenhouse Gas Emissions Estimator (OPGEE) Version 1.1 Draft D, to provide average carbon intensities for

Alaska · Arizona · California · Florida · Minnesota · Nevada · New Mexico · New York · Oregon · Vermont · Washington, DC
P.O. Box 191122 · Sacramento, CA 95819 tel: (916) 201.6938 www.BiologicalDiversity.org

crude supplies by country or U.S. state, often specific to individual oil fields (including more than 150 different crudes in California). However, OPGEE Version 1.1, included by reference in the proposed rule, does not explicitly address fracking as a distinct category of crude production. As a result, it does not account for energy inputs and greenhouse gas emissions associated with many components of fracking and other enhanced oil recovery, such as: the pumping and transport of freshwater used in fracking fluid, manufacture and transport of constituent chemicals and fracking fluids, the manufacture and transport of frac sand, flowback emissions, and disposal of fracking fluids. These omissions are evident in the table of input categories for the OPGEE model, which lists input categories in some detail, and which is extensive for many oil production activities.[1] This oversight is also directly stated in the documentation for the OPGEE model.[2]

> Some techniques are not built in the current version of OPGEE, including CO2 flooding and hydraulic fracturing (also known as "fracking"). These modules will be added in the future.[3]
>
> Because waste treatment emissions only occur sporadically, they are likely to be small when amortized over the producing life of an oil field. For this reason, emissions from waste treatment are considered below the significance cutoff in OPGEE v1.1 Draft D. Possible exceptions could be the treatment and disposal of fracturing fluids and fracturing flow-back water, due to the large volumes produced. Future versions of the model may include these factors.[4]

LCFS 60-1 cont.

The undercounting of emissions and energy inputs specific to fracking raises concerns regarding the impacts associated with high carbon-intensity crudes (addressed in more detail in the next section). In addition, this undercounting undermines the ability of LCFS to effectively achieve its target reductions. Fracking and acidizing are major components of operations in many oil fields in California, North Dakota, and elsewhere. Correctly accounting for the emissions and energy inputs specific to fracking would significantly change both the carbon intensity values for many individual crudes as well as the state average crude carbon intensity used by the large refineries.

Furthermore, the inputs and calculations behind the carbon intensity lookup table indicate heavy use of standard default values instead of field-specific inputs.[5] For example, all California oil fields are given a default flaring-to-oil ratio of 13 scf/bbl oil, and a default pipeline transport distance of 100 miles. Similarly, the three oil fields listed for North Dakota all use the same default inputs for all values, resulting in identical carbon intensities, the relatively low 10.18. In

---

[1] Oil Production Greenhouse Gas Emissions Estimator (OPGEE) Version 1.1 Draft D

[2] http://www.arb.ca.gov/regact/2011/lcfs2011/opgee_userguide.pdf

[3] OPGEE v1.1 Draft D, User Guide & Technical Documentation, page 42.

[4] OPGEE v1.1 Draft D, User Guide & Technical Documentation, page 83.

[5] OPGEE Version 1.1 Draft Lookup Table MCON Inputs, http://www.arb.ca.gov/fuels/lcfs/lcfs_meetings/draft_lookup_table_mcon_inputs_opgee_v1_1_102914.xlsx

all of these cases, the LCFS is significantly underestimating carbon intensities for individual oil fields with heavy use of fracking and other high energy-intensity operations. The calculation documentation acknowledges as much with respect to many crudes, including the North Dakota crudes: "OPGEE does not account for emissions from fracking so the CI estimate will likely be low."[6]

We understand that ARB is currently developing these components--water pumping and transport, manufacture and transport of fracking fluid and acid constituents, the manufacture and transport of frac sand, flowback emissions, disposal of fracking fluids and flowback wastewater--to be included in future revisions to the LCFS. In the meantime, these emissions and energy inputs are either being undercounted or not counted at all in the carbon intensity value. Nonetheless, the proposed rule would explicitly include these faulty carbon intensity values, and incorporate the model inputs by reference. While the proposed rule states that ARB intends to update the LCFS at three year intervals, these low carbon intensity values would be in place until the LCFS is amended in the future.

LCFS 60-1 cont.

The Center strongly supports ARB's development of a model to assign values to the carbon impacts of fracking and other carbon intensive enhanced oil recovery methods. Correctly accounting for the carbon impacts associated with fracking is critical to demonstrating that the LCFS has successfully reduced fuel carbon intensities by 10% by 2020 and achieved the projected reductions expected from this sector under AB 32. The results of modeling the carbon impacts associated with fracking may lead to retroactive correction of baseline and compliance schedules. One approach, in the interim, would be to apply an additional default value to the standard carbon intensity for crudes produced in oil fields where fracking is common, until the model for estimating emissions associated with fracking is completed and the carbon intensity values can be corrected.

II. ARB Should Consider Additional Measures to Directly Discourage the Development and Production of High Carbon Intensity Crude Oils Under the LCFS.

In the years since the LCFS was first adopted, the greenhouse gas pollution from the production of transportation fuels has become a much more important and visible issue in California and nationwide. The import of high carbon-intensity crude into California from the expansive hydraulic fracturing operations in the Bakken oil play in North Dakota has increased from essentially zero in 2009, to millions of barrels a year by 2014.[7] This has raised concerns not only over the greenhouse gas impacts but also over the dangers associated with transporting crude by railroad through our state and our communities. Over that same period, California has become increasingly aware of the extensive use and rapid expansion in high-intensity extraction methods such as hydraulic fracturing (fracking) and acidizing. Furthermore, California is now receiving imports of crude from the Alberta tar sands that are the focus of international opposition due to their tremendous damage to the people, land, waters, and wildlife of Alberta and their immense implications for the global climate.

LCFS 60-2

[6] OPGEE v. 1.1 Lookup Table Inputs, USA-North Dakota.

[7] Energy Almanac by CEC, http://energyalmanac.ca.gov/petroleum/statistics/2014_crude_by_rail.html, and the LCFS, Appendix H: 2014 Mid-Year Crude Average CI Estimate.

In 2014, there were five crudes that were not in the 2010 slate, with a production and transport carbon intensity greater than 15 gCO_2e/MJ, for a total of 61.[8] There are 17 crude sources (i.e. oil fields) in California that surpass this carbon intensity, and five with production and transport carbon intensity values greater than 30 gCO_2e/MJ. While some of these high carbon-intensity crudes are relatively small components of the state's domestic crude supply, this still amounts to hundreds of thousands of barrels per field. For example, Placerita crude has a production and transport carbon intensity of 41.72 gCO_2e/MJ and produced 447,209 barrels in the first six months of 2014.

Other high carbon intensity fields are relatively large components of California's domestic crude supply. Coalinga produced 2.9 million barrels in the first half of 2014, with a carbon intensity of 32.82 gCO_2e/MJ; Cymric, 7.6 million at 21.48; Kern Front, 1.5 million at 29.65; McKittrick, 7.6 million at 28.72; Midway-Sunset, 14.4 million at 29.27; Poso Creek, 1.7 million at 32.09; Round Mountain, 2.1 million at 27.77; San Ardo, 3.5 million at 31.48.[9] All of these crudes have production and transport carbon intensity values greater than 15 gCO_2e/MJ even without accounting for many of the greenhouse gas emissions and energy inputs associated with high-intensity production methods such as fracking, an issue raised in the previous section.

LCFS 60-2 cont.

The initial LCFS regulation in 2009 included a "bright line" approach to high carbon-intensity crude oil ("HCICO"), in which HCICOs were treated as a distinct category separate from non-HCICO gasoline and diesel; the carbon intensities of the HCICOs were calculated separately and oil suppliers had to report the associated deficits compared to the baseline. The initial LCFS rule also required refinery-specific accounting of crude slates. This approach would have applied penalties specifically to refineries for crude oils that were above a "bright line" of 15 grams CO2 per mega joule and that were not part of the original 2006 crude oil slate.

When ARB amended the LCFS in 2012, the final regulation eliminated the bright line approach to HCICOs and replaced refinery-specific accounting with a statewide average crude carbon intensity. Although the amended rule did include provisions to require reporting of the carbon intensity of fuels by crude source, the current LCFS and the proposed rule were specifically designed to be "fuel-neutral" with respect to all crudes, including HCICOs.[10] Under this approach, an increase in carbon intensity at one refinery is not assigned to the responsible refinery, but is instead spread across the entire sector statewide, and refineries selling higher-carbon products to California will be debited only if the statewide carbon-intensity of all California refineries and importers increases over time. Such a system dilutes both the incentives for parties refining high-intensity crude to change their crude slates and any incentive

[8] Access Western Blend, Canada; Premium Albian Synthetic, Canada; Hamaca, Venezuela; Burrell, California; and Chico-Martinez, California. 2014 Mid-Year Crude Average CI Estimate.

[9] LCFS, Appendix H: 2014 Mid-Year Crude Average CI Estimate.

[10] "The LCFS is designed to encourage the use of cleaner low-carbon fuels in California, encourage the production of those fuels, and, therefore, reduce GHG emissions. The LCFS is performance-based and fuel-neutral, allowing the market to determine how the carbon intensity of California's transportation fuels will be reduced." ISOR at ES-2.

for refineries that may be maintaining or reducing the carbon-intensity of their crude oil slates to avoid higher-carbon crudes.

We urge the Air Resources Board to consider additional measures to directly discourage the development and production of high carbon-intensity crudes, such as the bright line approach to HCICOs and refinery-specific reporting.

LCFS 60-2 cont.

III. The CA-GREET pathway for cellulosic ethanol from "forest waste" does not account for the carbon impacts associated with generating forest-sourced feedstock.

The CA-GREET "Pathway for Cellulosic Ethanol from Forest Waste" does not account for fuels or energy inputs associated with the forest management activities that generate woody biomass feedstock (e.g. harvest, limbing, piling).[11] The "Forest Waste" pathway apparently considers all forest-sourced feedstock to be "residue" from some existing forest management activity, and the CA-GREET model accounts for inputs and emissions starting at the point of collection of the feedstock material, such as from a slash pile. The Forest Waste pathway also does not account for forest carbon impacts (i.e., loss of forest carbon stores and foregone carbon sequestration) from the harvest activities that generate the residue materials.

There is an obvious, if implicit, assumption that all forest-sourced feedstock is waste from forest management activities that had already occurred or would have otherwise occurred. This assumption is not explicated or supported. The Forest Waste pathway defines forest waste generally as " treetops, branches, small-diameter wood, stumps, leaves, dead wood and even poorly-formed whole trees, as well as undergrowth and low-value [tree] species."[12] This definition includes virtually every forest carbon pool other than soil and the boles of large, commercially-valuable saw timber, and there are no criteria with respect to demonstrating that these feedstock materials are the residue of some otherwise occurring forest management activity, rather than the primary driver for a logging project.

LCFS 60-3

If forest projects are planned, in whole or in part, in response to economic incentives created by the LCFS (for example, the availability of a nearby biofuels facility that makes forest projects more economically feasible than they would have been in its absence), the CA-GREET life cycle analysis would need to account for the carbon impacts associated with the forest management and harvest of those biofuels feedstocks. Such a scenario is already occurring in

[11] Detailed California-Modified GREET Pathway for Cellulosic Ethanol from Forest Waste, 2009. Available at http://www.arb.ca.gov/fuels/lcfs/022709lcfs_forestw.pdf

[12] "Forest waste typically refer to those parts of trees unsuitable for sawlogs such as treetops, branches, small-diameter wood, stumps, leaves, dead wood and even poorly-formed whole trees, as well as undergrowth and low-value species. Nearly 20 billion cubic feet of wood is removed on an annual basis from lands in the United States. Of that volume, 16 percent is classified as logging waste, according to U.S. Department of Agriculture (USDA). This material is mainly tree tops and small branches that have been considered uneconomical to harvest. The USDA Forest Service Inventory and Analysis program estimates that in 2001, 61 million dry tons of residuals are available annually from harvesting and fuel reduction activities. A recovery system, which would follow behind a conventional logging operation, could recover 60 percent or 40 million dry tons of this waste for potential bioenergy and bio-based product markets." CA-GREET Pathway for Cellulosic Ethanol from Forest Waste, at 2.

the southeastern United States, where the export of wood pellets to Europe to replace coal for electricity generation and residential heating under the European Commission's climate and energy package doubled in 2013, to 3.2 million metric tons annually.[13] Traditionally manufactured from mill waste, wood pellets can also be produced from unprocessed harvested wood, and may constitute a new and growing demand on forest resources.

Because the CA-GREET model does not include emissions and carbon impacts associated with land use and land use change, a separate methodology (the Detailed Analysis of Indirect Land Use Change, or iLUC) was developed to account for indirect land-use change impacts associated with biofuels.[14] This methodology primarily addresses the carbon impacts associated with the conversion of agricultural land from food crops to biofuel feedstocks, and with the clearing of land to plant agricultural feedstock.[15] With respect to forests, the land-use change component addresses only the potential carbon impacts of forest loss to agricultural development. As a result, it does not consider any forest carbon impacts associated with the generation of forest-sourced feedstock in the Forest Waste pathway or elsewhere. These impacts include but are not limited to reduction in forest carbon stocks and lost future sequestration resulting from harvest of trees that otherwise would have continued growing and sequestering carbon, regardless of whether they are considered "poorly-formed" or "low-value." In short, even if forest remains forest, the increased removal of materials for cellulosic ethanol production may affect both terrestrial carbon stocks and atmospheric CO2 concentrations. A model that considers only change from one type of land use to another will not capture these relevant effects.

In 2009, the ARB Board directed ARB staff to establish a LCFS Sustainability Workgroup charged with developing criteria for each biofuel feedstock category in order to limit the effects of biofuels on carbon stores, GHG emissions, food supplies, and ecological values. However, the Workgroup has not yet proposed any such standards with respect to forest-sourced biofuels, and the LCFS otherwise contains no guidance specific to forest-sourced feedstocks or biofuels.

LCFS 60-3 cont.

[13] US Energy Information Administration, "U.S. wood pellet exports double in 2013 in response to growing European demand. May 22, 2014. Available at http://www.eia.gov/todayinenergy/detail.cfm?id=16391

[14] LCFS, Appendix I: Detailed Analysis for Indirect Land Use Change.

[15] "Carbon intensities are calculated under the LCFS on a full life cycle basis. This means that the CI value assigned to each fuel reflects the GHG emissions associated with that fuel's production, transport, storage, and use. The CA-GREET model accounts only for such direct effects. In addition to these direct effects, some fuel production processes generate GHGs indirectly, via intermediate market mechanisms. To date, ARB staff has identified an indirect effect that has a measurable impact on GHG emissions: land use change. A land use change effect occurs when demand for a crop-based biofuel brings non-agricultural lands into production. When new land is converted, such conversions release the carbon sequestered in soils and vegetation. The resulting carbon emissions constitute the "indirect" land use change (iLUC) impact of increased biofuel production. For the LCFS, iLUC emissions are attributable to biofuels produced from crops." ISOR, at ES-5.

We urge ARB to ensure that the energy inputs and forest carbon impacts associated with forest-sourced feedstock are fully accounted for before a CA-GREET pathway for cellulosic ethanol from forest waste, or any other biofuel from forest-sourced feedstock, is certified. In addition, we strongly urge ARB to complete the work of the LCFS Sustainability Workgroup, and to adopt standards specific to forest-sourced feedstocks before certifying any related CA-GREET pathways.

LCFS 60-3 cont.

IV. The EIR Fails to Mitigate the Project's Foreseeable Impacts on Food Availability and Hunger among "the World's Poorest People."

The EIR indicates that increasing demand for biofuels can displace production of food crops in favor of biofuel feedstock crops.[16] The Detailed Analysis for the Indirect Land Use Change states that the economic model used to evaluate land use change impacts indicates that the LCFS will result in higher food prices, with some alarming outcomes.

> The LCFS, together with biofuel production mandates in the U.S. and Europe, will result in the diversion of agricultural land from food production to biofuel feedstock production. This diversion of agricultural land to biofuel production will exert an upward pressure on food commodity prices, and potentially lead to food shortages, increasing food price volatility, and inability of the world's poorest people to purchase adequate quantities of food. GTAP analysis predicts that price increases resulting from the additional demand for biofuels will result in reduced crop production, leading to lower food consumption.[17]

LCFS 60-4

In short, the iLUC analysis predicts that the LCFS can exacerbate hunger and food shortages for "the world's poorest people." The Analysis cites Tenenbaum (2008) for references to these impacts.[18] More recently, a Word Resources Institute working paper by Searchinger and Hemilch (2014) found that "bioenergy that entails the dedicated use of land to grow the energy feedstock will undercut efforts to combat climate change and to achieve a sustainable food future."[19] The working paper concludes that "[p]hasing out the dedicated use of land to generate bioenergy, particularly biofuels, would reduce the food gap and, perhaps even more importantly, keep it from greatly expanding."[20]

---

[16] "As discussed above, as demand for biofuel crops increases, it could displace production of food crops, resulting in conversion of both fallow and cultivated lands to biofuel feedstock crop production." Draft EIR, at 33.

[17] Appendix 1: Detailed Analysis for Indirect Land Use Change, at I-21.

[18] D. J. Tenenbaum , "Food vs. Fuel: Diversion of Crops Could Cause More Hunger.", Environmental Perspectives 116(6): A254-257, (2008).

[19] Searchinger, T. and R. Heimlich. 2015. "Avoiding Bioenergy Competition for Food Crops and Land." Working Paper, Installment 9 of *Creating a Sustainable Food Future*. Washington, DC: World Resources Institute, at 1. Available at http://www.worldresourcesreport.org.

[20] Searchinger and Heimlich (2015), at 28.

Currently, the LCFS includes no mechanism, either as part of the carbon intensity value or elsewhere, to account for these impacts. The Detailed Analysis for Indirect Land Use Change determines that the land use change model is incapable of modeling these impacts, and proposes to address the problem "in future updates."[21] Ultimately, the EIR finds that because ARB has no land use authority, it is not within ARB's authority to mitigate these impacts.[22]

LCFS 60-5

Exercising land use authority is not the only possible approach to reducing these impacts, and ARB may not point to its lack of land use authority as a reason for implementing no mitigation measures. That is, an agency may not claim that mitigation is infeasible unless that agency truly lacks any authority to implement any feasible mitigation measures. (*See, generally, City of Marina v. Board of Trustees* (2006) 39 Cal.4th 341.) ARB must instead consider all feasible options to mitigate or avoid any significant land use change effects identified. ARB is designing the program that creates the incentives that are producing the impacts, and is thus responsible under CEQA for analyzing and mitigating those impacts. (*Cf. California Unions for Reliable Energy v. Mojave Desert AQMD* (2009) 178 Cal. App. 4th 1225.) Nor may ARB avoid its responsibility to disclose and analyze these impacts by simply declaring that mitigation is infeasible and the impacts unavoidable. "An agency may not "travel the legally impermissible easy route to CEQA compliance" by making a significance determination without fully analyzing a project's effects. (*Berkeley Keep Jets Over the Bay Comm. v. Bd. of Port Comm'rs* (2001) 91 Cal.App.4th 1344, 1371).

LCFS 60-6

Accordingly, ARB is responsible not only for providing all the information it reasonably can about these indirect impacts, but also for considering whether there are any possible changes to the program itself (such as limitations on eligibility of particular feedstocks, eligibility requirements for biofuels, including a provision in the life cycle analysis that accounts for the potential of displacing food crops, or verification and certification requirements) that could change the incentives driving land use change and reduce the associated impacts. We urge ARB to take up every option for addressing this important issue.

LCFS 60-7

V. Conclusion

The Center for Biological Diversity strongly supports the LCFS as a crucial tool in addressing the large proportion of California's greenhouse gas emissions and other air pollutants

LCFS 60-8

[21] Some stakeholders maintain that global changes in food consumption are not a direct consequence of biofuel production and staff should not consider food impacts in the modeling of iLUC while others argue that reductions in food consumption would require an assessment of the calorific content of finished food products in the GTAP-BIO model. The model as currently structured, is not capable of modeling any changes in food consumption driven by calorific content. Staff is therefore, proposing to address this issue in future updates. Appendix 1: Detailed analysis for Indirect Land Use Change, at I-21.

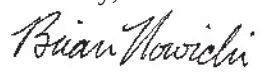
[22] "Potential agricultural and forest resource impacts could be reduced to a less-than-significant level by mitigation measures prescribed by local, State, federal, or other land use or permitting agencies (either in the United States or abroad) with approval authority over the particular development projects. However, because ARB has no land use authority, mitigation is not within its purview to reduce potentially significant impacts to less-than-significant levels." Draft EIR, at 47.

that comes from the production, transport, refining, and combustion of transportation fuels. The Center supports ARB's development of a model to assign values to the carbon impacts of fracking and other carbon intensive enhanced oil recovery methods, and the Center encourages the LCFS Sustainability Workgroup's to develop standards specific to forest-sourced feedstocks. LCFS 60-8 cont.

We urge ARB to strengthen the proposed rule with respect to hydraulic fracturing and forest-sourced biofuels, and to strengthen the EIR's treatment of impacts to food prices and availability. For those issues that may take longer than ARB is currently contemplating for adoption of this rule--such as additional measures to directly discourage the development and production of high carbon-intensity crudes, and mitigating impacts to food prices and availability--we urge ARB to initiate the process of developing these measures, in the resolution adopting the revised LCFS. LCFS 60-9

Thank you for your consideration of these comments. Please contact me with any questions or concerns.

Sincerely,



Brian Nowicki
Center for Biological Diversity
(916) 201-6938
bnowicki@biologicaldiversity.org

This page intentionally left blank.

Comment Letter 60_OP_LCFS_CBD Responses

LCFS 60-1

The comment is correct in stating that OPGEEv1.1, used to estimate the proposed CI values for crude oil, does not include some emissions associated with hydraulic fracturing and CO2 enhanced oil recovery (EOR). Therefore, while the proposed CI values for crudes produced using these techniques reflect the best available data at the time of the regulatory proposal, they may be somewhat underestimated. In mid-2014, ARB issued a contract to Adam Brandt of Stanford University. The project scope includes new pathways for tight oil and gas production using hydraulic fracturing and carbon capture with CO_2 enhanced oil recovery. The project is expected to be completed in 2016, at which time the draft model would be posted for public review and one or more workshops would be held to discuss the model changes. ARB staff intends to propose the new model, OPGEEv2.0, and new crude CI values for adoption in 2018.

While an estimated adjustment to the proposed CI values could be made for fracking and CO_2 EOR until the model revisions are adopted, staff decided against making such an adjustment for several reasons. First, insufficient information was available to accurately estimate the adjustment and, therefore, any adjustment would be somewhat arbitrary. Second, emissions associated with fracking in California are likely to be small as California wells are generally vertical and little fracking fluid is used for well stimulation as compared with operations in shale basins of the western US. Finally, very little crude oil from western US fields using fracking and CO_2 EOR is supplied to California. Therefore, the effect of such an adjustment on the Annual Crude Average CI value would likely be insignificant.

Finally, ARB staff agrees with the comment that the CI estimates for some crudes are heavily dependent on OPGEE default inputs and average data for the given production region. Unfortunately, the use of OPGEE defaults and average production data is often unavoidable as either the available data cannot be differentiated amongst the crudes produced in a region or data is not available at all. Staff is continually working to find new data sources and improve the sources for existing data used to make CI estimates. Staff does, however, note that in the absence of data for some input parameters, OPGEE makes use of “smart defaults.” Smart defaults are used by OPGEE for those parameters that can be correlated to other parameters that are often known. For instance, the produced water-to-oil ratio is often unknown, but this parameter

can be correlated to field age which is almost always known. See also response to **LCFS 37-3**.

LCFS 60-2 The comment objects to the California Average crude provision as it "dilutes both the incentives for parties refining high-intensity crude to change their crude slates and any incentive for refineries that may be maintaining or reducing the carbon-intensity of their crude oil slates to avoid higher-carbon crudes." The comment recommends that ARB "consider additional measures to directly discourage the development and production of high carbon-intensity crudes, such as the bright line approach to HCICOs and refinery-specific reporting."

ARB staff believes that the California Average approach is the best available approach at this time given the LCFS' fuel-neutral design, limitations on crude reporting, and availability of data mapping field production in California to pipeline blends delivered to and reported by refineries. As discussed in the ISOR on pages II-15 and II-16, staff evaluated refinery-specific calculation of incremental deficits and concluded that it wasn't currently possible for the large refineries.

LCFS 60-3 The commenter raises concerns related to the likelihood of carbon impacts from forest-sourced feedstock. ARB staff is continuing development of sustainability criteria for biofuel feedstocks. Future sustainability efforts initiated as part of the LCFS refinement process would consider standards to certify sustainability of forest-sourced feedstocks used in the production of transportation fuels. Since staff's work on sustainability criteria has not been completed, the current cellulosic ethanol pathway does not include considerations for ensuring the sustainability of this feedstock sourced from existing forests. As for land use change, the pathway accounts for 'residue' from existing forests and does not consider the potential for new forests to be grown to generate 'residue', an unlikely venture. Residue is currently considered a waste and is not expected to have significant adverse environmental impacts. As part of future LCFS refinements, however, ARB staff plans to complete a comprehensive evaluation of all 'waste' categories to evaluate potential land use or other indirect effects that could result from the diversion of 'waste' components to produce fuels.

LCFS 60-4 The commenter notes that, as demand for biofuel crops increases, it could displace production of food crops, resulting in conversion of both fallow and cultivated lands to biofuel feedstock crop production. This displacement would be expected to occur in

regions where prior crop displacement has taken place (see page 33 of the Draft EA). This issue is discussed under Impact 2.b: Agricultural and Forest Resource Impacts Related to Feedstock Cultivation, and considered to result in a potentially significant impact. As stated, "[t]hese shifts could lead to increased demand for and cultivation of fuel-based agricultural feedstocks that could displace food-based production on agricultural land currently used for row crops, orchards, and grazing. (See Section 4.B.11 below for a discussion of direct and indirect land use change.) This increased demand could, in turn, potentially result in indirect land use changes where food-based agriculture could shift to other areas, thereby increasing pressure for conversion of rangeland, grassland, forests, and other land uses to agriculture." It is further important to note that the LCFS and ADF Regulations would not increase the rate at which biofuels are cultivated, but rather, would incentivize certain low-CI feedstocks and fuels. The impact, in general, of conversion of farmland to other uses, can be reduced through mitigation measures such as, avoidance and preservation of important farmland and participation in agricultural land mitigation programs. However, this mitigation would be subject to local land use and/or permitting agencies for individual projects and is considered to result in a potentially significant and unavoidable impact.

LCFS 60-5

The comment correctly states that the Draft EA discusses the fact that ARB cannot mitigate for issues subject to local land use and/or permitting, such as conversion of land use for agriculture to biofuel cultivation. See also response to comment **LCFS 21-1** and **LCFS 46-282**.

LCFS 60-6

The comment states that exercising land use authority is not the only possible approach to reducing land use impacts, but does not provide any alternative suggestions. Because no additional mitigation measures have been identified, no changes to the document must be made.

The comment also states that ARB may not avoid disclosure and analysis of impacts by stating that mitigation is infeasible and impacts are unavoidable. The commenter is referring to conclusions made in the Draft EA for post-mitigation impact conclusions. These conclusions generally state that ARB does not have local planning and/or permitting authority, and therefore mitigation measures that rely on other agencies may not be implemented.

The comment refers to the case of *City of Marina v. Board of Trustees,* which holds that a mitigation measure requiring funding of offsite infrastructure improvements cannot be rejected as infeasible simply because the public agency undertaking the project and the environmental review is not the same agency that would be responsible for completing the offsite improvements. It is not clear how the commenter believes that this is applicable to the mitigation approach used in the Draft EA.

Furthermore, the commenter is correct in stating that ARB is required to disclose and analyze the environmental effects that could result from implementation of the Proposed ADF and LCFS Regulations and discuss feasible mitigation measures. The environmental impact analysis is provided in Chapter 4 of the Draft EA, based on a reasonably foreseeable compliance scenario discussed in Chapter 2 of the Draft EA. It is incorrect to state that the impacts are simply declared as unavoidable due to infeasible mitigation. An appropriate level of detail (i.e., programmatic) is provided in the Draft EA; however, a number of possible mitigation measures are generally under the purview of local agencies and therefore may not be adopted by ARB.

The EA contains a degree of uncertainty regarding implementation of mitigation for potentially significant impacts. While ARB is responsible for adopting the proposed LCFS and ADF Regulations, it does not have land use or permitting authority over all of the potential infrastructure and development projects that could be carried out in response to the proposed LCFS and ADF Regulations. Also, because the fuel standards are performance-based and not prescriptive, the proposed LCFS Regulation is not mandating any specific fuel or technology. Other agencies are responsible for the review and approval, including any required environmental analysis, of any facilities and infrastructure that are reasonably foreseeable in response to the ADF and LCFS Regulations, including the identification and adoption of feasible project-specific mitigation measures, and any monitoring of mitigation implementation. For example, local cities or counties must approve proposals to construct new facilities, such as for fuel blending or distribution. Additionally, State or federal permits may be needed for specific environmental resource impacts, such as take of endangered species, filling of wetlands, and streambed alteration.

Because ARB cannot precisely predict specific projects, nor does it have authority over implementation of specific infrastructure

projects that may occur, the programmatic analysis in this EA does not allow for a precise description of the details of project-specific mitigation. As a result, there is inherent uncertainty in the degree of mitigation that would ultimately need to be implemented to reduce any potentially significant impacts identified in this EA. Consequently, this EA takes the conservative approach in its post-mitigation significance conclusions (i.e., tending to overstate the risk that feasible mitigation may not be sufficient) and discloses, for CEQA compliance purposes, that potentially significant environmental impacts may be unavoidable, where appropriate. It is also possible that the amount of mitigation necessary to reduce environmental impacts to below a significant level may be far less than disclosed in this EA on a case-by-case basis. It is expected that facility and infrastructure projects would be able to feasibly avoid or mitigate to a less-than-significant level many of these potentially significant impacts as an outcome of their project-specific environmental review processes. See response to **LCFS 46-282**.

LCFS 60-7 The comment suggests that the proposed LCFS Regulation could consider possible changes to the program that could change the incentives that could affect land use change, including limitations on eligibility of particular feedstocks, eligibility requirements for biofuels (including a provision in the life cycle analysis that account for the potential for displacing food crops), or verification and certification requirements.

When considering the general purpose of LCFS, a notable intent is implementation of a performance-based and fuel-neutral standard that allows the market to determine how the overall CI of California's transportation fuels would be reduced. ARB chose to differentiate only based on a biofuel's lifecycle carbon intensity to maintain this fuel-neutral standard. For a discussion on how ARB may consider setting limitations on the types of feedstocks for biofuels receiving credit under the LCFS see the response to **LCFS 60-3**. For a discussion related to displacement of food crops, please see response to comment **LCFS 60-5**

LCFS 60-8 The commenter's support for LCFS is noted.

LCFS 60-9 The comment suggests that ARB strengthen the proposed regulations with respect to hydraulic fracturing, forest-sourced biofuels, and discussions related to food prices and availability. See responses to **LCFS 60-1** through **LCFS 60-8**.

This page intentionally left blank.

Comment letter code: 7_B_LCFS_CATF

Commenter: Jonathan Lewis

Affiliation: Clean Air Task Force

The following letter was submitted to the LCFS Docket during the First Board Hearing.

This page intentionally left blank.

7_B_LCFS
_CATF

Comments to the California Air Resources Board by the Clean Air Task Force

On the Proposed Re-Adoption of the Low Carbon Fuel Standard

February 19, 2015

SUMMARY

The Clean Air Task Force (CATF) appreciates this opportunity to comment to the California Air Resources Board on the Low Carbon Fuel Standard (LCFS). CATF is a nonprofit organization that works to help safeguard against the worst impacts of climate change by catalyzing the rapid global development and deployment of low carbon energy and other climate-protecting technologies through research and analysis, public advocacy leadership, and partnership with the private sector.

Our comments focus on the following points:

- ARB should readopt the LCFS through 2020. Achieving compliance with the 2020 target will be difficult, but the LCFS remains the most promising policy tool available for reducing the climate impacts of the transportation sector.
- The LCFS's promise is undermined by the proposed adjustment to the lifecycle emissions for corn ethanol, and by the likelihood that regulated entities will increase their reliance on corn ethanol to meet LCFS targets.
- The proposed adjustment to corn ethanol's lifecycle emissions score rewards corn for its negative impact on global food security. ARB must acknowledge and address this issue before it erodes the legitimacy of the LCFS program.
- The prospects for deep reductions in transportation sector GHG emissions are likely to improve significantly after 2020, particularly if liquid ammonia's potential as an affordable low-carbon fuel is proven out.

READOPTION OF THE LCFS

Consistent with an order issued by the California Court of Appeals in *POET, LLC v. California Air Resources Board*, 218 Cal.App.4th 681 (2013), ARB staff has reviewed and revised the LCFS, and is now

> proposing that the Board re-adopt the LCFS, replacing the current LCFS regulation in its entirety. The proposed LCFS regulation will maintain the basic framework of the current LCFS regulation, including: declining carbon intensity targets; use of life cycle analyses; inclusion of indirect land use change effects; quarterly and annual reporting requirements; and credit generation and trading.[1]

[1] California ARB, *Staff Report-Initial Statement of Reasons* (December 30, 2014) at ES-3.

CATF urges the Board to readopt the LCFS. California's LCFS is the country's most promising public policy for bringing low-C fuels into the transportation market. It has several key attributes, all of which positively differentiate it from the federal Renewable Fuel Standard (RFS):

- Dynamic requirements: Increasingly stringent annual reduction requirements dissuade regulated entities from investing in marginally effective compliance strategies.
- Dynamic analyses: There are important ongoing debates about the performance of lifecycle GHG analyses—both with respect to specific technologies and their overall effectiveness. Regular reanalysis of compliance strategies prevents "lock-in" of outdated analyses and ineffectual technologies.
- No grandfathering: Under the LCFS, compliance options are measured according to their performance. Under the RFS, corn ethanol—which is largely exempt from the program's GHG reduction requirements—accounted for 83% of the overall volume mandate finalized by the Environmental Protection Agency (EPA) in 2013, the most recent year in which final renewable volume obligations were issued by EPA.
- Not limited to biofuels: Climate change mitigation depends on strategies that are scalable. That poses a problem for biofuels: the climate benefits of conventional biofuels typically diminish as production scales up, and advanced biofuels tend to be difficult (or impossible) to produce at a large scale.
- Clear focus on GHG reductions: The LCFS cannot blind itself to critically important non-climate impacts, especially the effect that increased consumption of biofuels can have on food prices and global food security. With appropriate safeguards in place, however, ARB can pursue the program's singular goal of GHG reductions without having to accommodate related-but-different objectives like price support for the agricultural sector or energy security.

LCFS B7-1

A strong, stringent, flexible, intellectually honest LCFS creates a forum in which to consider new, truly low-carbon fuels, and a key market in which to commercialize them. It needs to succeed. However, that success must be achieved in terms of real GHG reductions, not merely on paper. CATF is concerned that a short-term reliance on conventional biofuels—especially corn ethanol—could pull the LCFS in the wrong direction, and imperil its prospects for long term success.

NET GHG EMISSIONS FROM CORN ETHANOL

When assessing a biofuel's net GHG emissions in the context of a given policy, an important—and complicated—component is the carbon release associated with land use changes. Of particular concern is indirect land use change (ILUC), or the amount of land use change that occurs as agricultural markets accommodate new policy-driven demand for biofuel feedstocks, and the amount of soil and plant-carbon that is released into the atmosphere as a consequence of those changes.

LCFS B7-2

As supply margins for corn and other crops tighten in the face of competition from policy-driven demand for biofuels, the price of foodstuffs increases. The increase in food prices encourages farmers around the world to cultivate previously unfarmed land—a process that

results in substantial losses of soil- and plant-carbon to the atmosphere. Accordingly, a biofuel must "pay back" this "carbon debt" (via CO_2 sequestration by subsequent energy crop growth) before it can be credited with any net climate benefits as compared to petroleum-based fuels (which have comparatively insignificant land use-related carbon impacts).

LCFS B7-2 cont.

ARB staff have proposed that the ILUC score for corn ethanol should be reduced from the current score of 30 gCO_2/MJ. Adopting the proposed reduction would be wrong, both as a matter of emissions accounting and as a matter of climate mitigation policy. The proposed reduction would make corn ethanol a more viable LCFS compliance strategy. Heavier reliance on corn ethanol would limit the near- and long-term GHG reductions that can be achieved by the LCFS and would undermine the program's innovation-forcing objective—despite corn ethanol's status as an outmoded technology, the significant uncertainty about whether corn delivers any climate benefits, and the concerns about the non-climate environmental damage associated with its production.

Reducing the ILUC score for corn would be wrong from an emissions accounting perspective because it ignores a host of relevant factors that ARB has not yet been able to effectively quantify in CA GTAP-BIO, but which it knows will raise the ILUC score if/when the factors are correctly incorporated into the model. These factors have been identified by ARB staff[2] and in comments submitted by CATF and other stakeholders.[3] They include:

LCFS B7-3

- The effect of water scarcity constraints on projected crop expansion. Researchers from Purdue University who used GTAP to examine the likely role of water scarcity on crop expansion found that earlier ILUC analyses "likely underestimated induced land use emissions due to ethanol production by more than one quarter."[4] As discussed below, ARB has not yet succeeded in sensitizing CA GTAP-BIO to water constraints, so the effect that such constraints have on LUC patterns and resulting emissions are not fully accounted for.
- GTAP's inability to differentiate commercial forest from non-commercial forests, which means that the model wrongly assumes that markets respond to the conversion of both land types in the same way.
- The yield improvement assumptions in GTAP overlook important differences among crops and growing regions, they fail to incorporate new research on future corn yields in the Midwest United States, and they do not adequately address the climate impact associated with the increased use of nitrogen-based fertilizers to sustain yield growth.

These issues are described more fully in the appended comments that CATF submitted to ARB in May 2014.

---

[2] John Courtis, Anil Prabhu, Farshid Mojaver, and Kamran Adili. iLUC Analysis for the Low Carbon Fuel Standard (Update), California Air Resources Board, (March 11, 2014).

[3] CATF, Comments on ARB Proposed ILUC Analysis (May 2014) (http://www.catf.us/resources/filings/biofuels/20140519-CATF%20Comments%20on%20ARB%20Proposed%20ILUC%20Analysis.pdf)

[4] Farzad Taheripour, Thomas W. Hertel and Jing Liu. 2013. The Role of Irrigation in Determining the Global Land Use Impacts of Biofuels. ENERGY, SUSTAINABILITY AND SOCIETY.

Even if the fundamental concerns described above are put aside for a moment, the proposed ILUC reduction for corn ethanol is problematic because the materials prepared by ARB staff appear to consider two different reduced scores. The first—19.8 gCO_2/MJ—is the unweighted average of the thirty different production scenarios run on CA GTAP-BIO.[5] ARB's potential reliance on this value implies that it believes all thirty scenarios are equally plausible—a position that ARB has not, and cannot, justify. The second score—21.8 gCO_2/MJ—was derived by performing a Monte Carlo simulation (MCS). ARB's Expert Working Group has urged the use of MCS because of its "ability to represent arbitrary input and output distributions, ... perform global sensitivity analysis (e.g., contribution to variance) to identify which input parameters contribute most to the variance in the output, and ... represent parameter correlations."[6] As between the two scores, the value that was derived from the Monte Carlo simulation—*i.e.*, 21.8 gCO_2/MJ—is superior.

A recent paper by Bruce Babcock and Zabid Iqbal of Iowa State University asserts that ILUC models utilized by ARB and EPA have overestimated land use changes by "attribut[ing] all supply response[s] not captured by increased crop yields to land use conversion on the extensive margin."[7] The paper argues for the use of lower ILUC scores by attempting to prove that "the primary land use change response of the world's farmers from 2004 to 2012 has been to use available land resources more efficiently rather than to expand the amount of land brought into production."[8] The paper has several shortcomings, however:

- Babcock and Iqbal only consider intensification techniques such as double cropping rather than analyzing yield increases over this time period.
- The paper dismisses data on extensive land use changes in Africa on the grounds that the linkage between global food prices and those in rural Africa is weak (implying that biofuel policies in the US and EU have little effect on African food prices and land use change)—even though the authors note a correlation between global food prices and food prices in urban Africa.
- The paper makes overly generous assumptions about the extensiveness of double cropping. As Jeremy Martin of the Union of Concerned Scientists wrote in recent comments to ARB, double cropping is not widely used in Southeast Asia where palm oil plantations have moved into formerly uncultivated areas. Nor is double cropping widely adopted in parts of the Midwest where most U.S. biofuels feedstocks—primarily corn and soybeans—are grown. The Babcock and Iqbal paper also fails to account for increased GHG emissions from increased fertilizer usage where it does assume the use of additional double cropping in response to higher crop prices.
- Finally, the authors assume the "only net contributor to US cropland from 2007 to 2010 was a reduction in [Conservation Reserve Program (CRP)] land," but this too is an inappropriate assumption, because several studies (from South Dakota State University and even U.S. Department of Agriculture Economic Research Service, Farm

LCFS B7-4

[5] California ARB, *Staff Report-Appendix I: Detailed Analysis for Indirect Land Use Change* (December 30, 2014) at I-25.
[6] *Id.* at I-38, I-17.
[7] See Bruce A. Babcock and Zabid Iqbal, *Using Recent Land Use Changes to Validate Land Use Change Models* (Staff Report 14-SR 109) (http://www.card.iastate.edu/publications/dbs/pdffiles/14sr109.pdf)
[8] *Id.*

Service Agency, and Natural Resources Conservation Service data) show that cropland conversions exceeded acres exiting CRP, with huge impacts on GHG emissions.[9]

Reducing the ILUC score for corn ethanol would also be a mistake in terms of climate mitigation policy. The use of highly complex models like CA GTAP-BIO to determine the net emissions associated with biofuels produces values that have the veneer of objective validity. But the modeling outputs are enormously dependent on the data that are fed into the system and on the system's assumptions about how those data affect physical and economic processes.

A recently published paper examines the extent to which subjective decisions about incorporating different assumptions and data into a lifecycle model can affect the outcome.[10] Plevin *et al.* used a Monte Carlo simulation to characterize the parametric uncertainty associated with the two components of the lifecycle analysis that California used to evaluate biofuels: "an economic modeling component that propagates market-mediated changes in commodity production and land use induced by increased demand for biofuel globally, and a carbon accounting component that calculates the GHG emissions associated with (some) of these induced changes."[11]

LCFS B7-5

The authors found that three parameters have particularly strong influences on the uncertainty importance for ILUC emissions intensity:

- Elasticity of crop yield with respect to price (YDEL) (in the economic model);
- Relative productivity of newly converted cropland (in the economic model); and
- Ratio of emissions from cropland-pasture to cropland, as compared to the ratio from converting standard pasture (in the emissions factor model).[12]

Among these factors, "[b]y far, the greatest contributor to variance in the estimate of ILUC emissions was YDEL, the elasticity of crop yield to price;" in fact, in ILUC analyses for corn ethanol, YDEL accounts for "nearly 50%"of the variance among possible modeling results.[13] ARB currently uses a YDEL value of 0.25 in GTAP-BIO—a subjective decision that is

---

[9] See Christopher K. Wright and Michael C. Wimberly. 2013. *Recent land use change in the Western Corn Belt threatens grasslands and wetlands*. PNAS 4134–4139 (doi: 10.1073/pnas.1215404110) (http://www.pnas.org/content/110/10/4134.abstract); Steven Wallander *et al. The Ethanol Decade: An Expansion of U.S. Corn Production, 2000-09*. Economic Information Bulletin No. EIB-79 (August 2011) (http://www.ers.usda.gov/publications/eib-economic-information-bulletin/eib79.aspx); U.S. Department of Agriculture Farm Service Agency. *Cropland Conversion* (July 31, 2013) (http://www.fsa.usda.gov/FSA/webapp?area=newsroom&subject=landing&topic=foi-er-fri-dtc); U.S. Department of Agriculture Natural Resources Conservation Service and Center for Survey Statistics and Methodology, Iowa State University. *Summary Report: 2010 National Resources Inventory* (September 2013) (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1167354.pdf); *see also* Lark, TJ, Salmon, JM, Gibbs, HK. *Cropland expansion outpaces agricultural and biofuel policies in the United States*. ENVIRONMENTAL RESEARCH LETTERS. Expected Spring 2015.

[10] Richard Plevin, *et al.* 2015. Carbon accounting and economic model uncertainty of emissions from biofuels-induced land use change. ENVIRON. SCI. TECHNOL. (doi: 10.1021/es505481d)

[11] *Id.*

[12] *Id.*

[13] *Id.*

increasingly difficult to justify in light of separate analyses conducted for ARB by Steven Berry and David Locke. Berry reviewed a collection of studies on yield price elasticity (YPE) and, according to an ARB staff report, "concluded that YPE was mostly zero and the largest value that could be used was 0.1."[14] Locke ran a statistical analysis of a similar set of studies and found "that based on methodologically sound analyses, yield price elasticities are generally small to zero."[15] ARB has nonetheless chosen to include YPE values up 0.35 in its ILUC analyses.[16] [[Id. at Attachment 1-6]]

Developing the relevant data and determining which datasets to use (and which to exclude) are highly subjective exercises, as are the processes of choosing and programming the relational assumptions that drive the model. Viewed in this context, the proposal to reduce the corn ethanol ILUC score can be more appropriately understood as the product of a subjective process—one that reflects the current availability of certain data and analyses that would contribute to a lower ILUC score, but fails to account for a host of countervailing factors that ARB does not yet understand how to model.

LCFS B7-5 cont.

The Board should recognize these limitations, as well as the necessary role that it and ARB staff play in interpreting and acting upon modeling results. The Board should exercise its best judgment in light of the overarching policy objective of the LCFS, which CATF understands to be a meaningful reduction in GHG emissions from the transportation sector. Because corn ethanol's lifecycle GHG emissions are—at best—only slightly lower than those from gasoline, and because increased reliance on corn ethanol would frustrate the development of more innovative and effective compliance options, the proposal to reduce the ILUC score for corn ethanol undermines the objectives of the LCFS. Accordingly, CATF urges the Board to table the proposal.

CORN ETHANOL'S IMPACT ON FOOD SECURITY

Another critically important way in which ILUC estimates are the product of subjective decisions (and not just objective calculations) relates to the treatment of food price increases associated with policy-induced demand for biofuels. As Plevin *et al.* (2015) write, "ILUC emission estimates depend on various modeling choices, such as whether a reduction of food consumption resulting from biofuel expansion is treated as a climate benefit."[17] ARB currently chooses to count GHG reductions that result from reduced food consumption when analyzing the lifecycle emissions of biofuels, but that—again—is a subjective decision. (Moreover, doing so implies that ARB assumes that national governments would not subsidize food consumption in the face of rising food prices.)

LCFS B7-6

If instead ARB chose to assume that society would limit the extent to which food consumption would decline (especially taking into consideration a growing world population demanding significantly more calories and protein), its ILUC analysis would produce different results. For

[14] California ARB, *Staff Report-Appendix I: Detailed Analysis for Indirect Land Use Change* (December 30, 2014) at Attachment 1-2.
[15] *Id.* at Attachment 1-5.
[16] *Id.* at Attachment 1-6.
[17] Plevin *et al.* (2015), *supra.*

example, Thomas Hertel *et al.* (2010) found that if food consumption were held constant in GTAP, the estimated emissions from biofuel expansion would increase by 41%.[18]

Similarly, Plevin *et al.* (2015) examine the effect of food consumption assumptions by comparing three model outputs for corn ethanol and other biofuels: the ILUC emissions factor; the non-CO_2 emission factor (*i.e.*, methane and nitrous oxide); and the total emission factor, which sums the ILUC factor and the non-CO_2 factor on a trial-by-trial basis.[19] When food consumption is held constant (or fixed) in non-Annex I countries, ILUC emissions for corn ethanol increase by more than 5 gCO_2/MJ as compared to a scenario in which food consumption is not fixed.[20] Total emissions from corn ethanol under a "food fixed" scenario increase by approximately 10 gCO_2/MJ (from roughly 35 gCO_2/MJ to roughly 45 gCO_2/MJ), while the upper limit of the confidence interval for the total emission factor reaches approximately 70 gCO_2/MJ.[21]

LCFS B7-6 cont.

As with the other factors discussed above, the problematic and highly subjective treatment of reduced food consumption reinforces the point that ARB is not obligated to reduce the ILUC score for corn ethanol on the basis of the most recent—but highly incomplete—modeling results.

More generally, CATF urges ARB to reconsider how it accounts for reduced food consumption within the LCFS context, before the issues erodes the legitimacy of the LCFS program.

EMISSION REDUCTION OPPORTUNITIES POST-2020

ARB is appropriately interested in using the LCFS to achieve deep, long-term reductions.

> Although post-2020 goals for the LCFS are not part of this proposed rulemaking, continuing these policies beyond 2020 will ensure that fuel carbon intensity continues to decline and that low-carbon alternatives to petroleum are available in sufficient quantities in the long term. Achieving California's mid and long-term greenhouse gas and air quality goals will require a renewable portfolio of transportation fuels—including electricity and hydrogen—well beyond the current policy trajectories. Accordingly, ARB, in a future rulemaking, will consider extending the LCFS with more aggressive targets for 2030.[22]

An unwarranted reduction to the corn ethanol ILUC score would do more than undermine the actual climate benefits that the LCFS can achieve through 2020; it would lower the ceiling on the long-term effectiveness of the program by extending the period in which marginally beneficial technologies can compete with the far better options that will be available to California after 2020. Chief among these better options may be ammonia, a hydrogen-based energy carrier that CATF has previously discussed with ARB management and staff.

LCFS B7-7

---

[18] TW Hertel, *et al.* 2010. *Effects of US Maize Ethanol on Global Land Use and Greenhouse Gas Emissions: Estimating Market-Mediated Responses.* BIOSCIENCE. 60:223-231(doi: 10.1525/bio.2010.60.3.8).
[19] Plevin *et al.* (2015), *supra.*
[20] *Id.* at Fig. S2.
[21] *Id.*
[22] California ARB, *Staff Report-Initial Statement of Reasons* (December 30, 2014) at ES-1.

The potential benefits associated with ammonia fuel ammonia are enormous, both for the environment and for the prospects of the LCFS:

- Zero-carbon ammonia can be produced using air, water, and electricity generated by renewable or nuclear power plants, or by fossil fuel-based generating stations equipped with carbon capture and storage systems.
- A wide range of engines and fuel cells can use ammonia to generate electricity or to power vehicles, and can do so without emitting CO_2.
- Substantial global ammonia production and transport infrastructure is already in place. At 150 million metric tons per year, it is the third largest chemical produced globally.
- At $3.27 per gallon (on an energy equivalent basis to gasoline, at current prices) and $1.78 per gallon (when compared against gasoline's 10-year average price), ammonia is affordable. And as a liquid, it can be more easily transported and stored than hydrogen and natural gas.

The steps that need to be taken before a widespread transition to ammonia fuel can occur are significant—but not insurmountable. These include:

- Building awareness among industry, regulators, and other stakeholders about the economic and environmental advantages of using ammonia fuel for power generation and transportation (especially, at the outset, rail and long-haul truck fleets).
- Helping innovators and investors identify small volume/high profit projects to jumpstart the ammonia energy industry.
- Highlighting opportunities to shift ammonia production to zero-carbon processes (e.g., using stranded or otherwise underutilized wind power assets for ammonia synthesis).
- Detailing ammonia's toxicity risk (which is similar to that of LPG), describing how that risk is managed by farmers globally, and outlining protocols for how it can be managed in the power and transportation sectors.
- Developing a long-term roadmap for building up ammonia production and distribution capacity to the scale of a global energy commodity.

LCFS B7-7 cont.

Since CATF briefed ARB on ammonia in July 2014, research in Texas (on ammonia-gasoline blending in internal combustion engines), Toronto (on the use of ammonia to fuel locomotives), and California have continued to validate the concept and develop demonstration projects.

The California project—which involves the University of California at Los Angeles (UCLA), California Energy Commission, and South Coast Air Quality Management District (SCAQMD)—is among the most interesting efforts to date. UCLA is spearheading a comprehensive program to utilize advanced engines from Sturman Industries for a multifuel (gas and ammonia), low NO_x combined-heat-and-power system. The system will be designed, installed, and optimized at a metals foundry in Los Angeles called California Metal-X (CMX). The project goal is to provide power at $0.097/kwh compared to a current base load cost of $0.18/kwh and peak power costs ranging from $0.20-$0.50/kwh from the grid. These cost savings come along with the potential to prove out an ammonia-based, scalable power source that meets the stringent air quality requirements implemented by SCAQMD.

The system will be designed to run in a wide range of modes including pure ammonia as a peak fuel and a variety of combined heat/power modes depending on power pricing, air quality standards, process efficiency, and power export profitability. UCLA, Sturman Industries, and other project partners will instrument the system to test and optimize ammonia engines, emissions, costs, maintenance, safety and other aspects of these types of operations in the real world. This project is being designed to provide a robust prototype for low cost, clean electricity across the California economy. If successful, the project will provide a technology and engineering basis for installing ammonia power in various markets around the world.

LCFS B7-7 cont.

CONCLUSION

CATF urges ARB to readopt the LCFS through 2020. Although significant challenges remain, the LCFS is the most promising policy tool available for reducing the climate impacts of the transportation sector.

LCFS B7-8

However, that promise is undermined by the proposed adjustment to the lifecycle emissions for corn ethanol, and by the likelihood that regulated entities will increase their reliance on corn ethanol to meet LCFS targets. The proposed adjustment to corn ethanol's lifecycle emissions score rewards corn for its negative impact on global food security. ARB must acknowledge and address this issue before it erodes the legitimacy of the LCFS program.

LCFS B7-9

An unwarranted reduction to the corn ethanol ILUC score would also lower the ceiling on the long-term effectiveness of the program by extending the period in which marginally beneficial technologies can compete with the far better options that will be available to California after 2020. The prospects for deep reductions in transportation sector GHG emissions are likely to improve significantly after 2020, particularly if liquid ammonia's potential as an affordable low-carbon fuel is proven out.

LCFS B7-10

Respectfully submitted,

Jonathan F. Lewis
Senior Counsel
Clean Air Task Force
617.624.0234
jlewis@catf.us
www.catf.us

Estimating Indirect Land Use Change Emissions from Biofuels

CLEAN AIR TASK FORCE

Comments by Clean Air Task Force to California Air Resources Board
On the ILUC emissions estimate discussed in ARB's presentation
"iLUC Analysis for the Low Carbon Fuel Standard (Update)" (March 11, 2014)

May 19, 2014

Overview

The Clean Air Task Force (CATF) is a non-profit environmental organization that works to protect the earth's atmosphere by improving air quality and reducing global climate change through scientific research, public advocacy, technological innovation, and private sector collaboration. CATF is pleased to submit the following comments to the California Air Resources Board concerning ARB's review of the indirect land use change (ILUC) emissions associated with biofuels and how those emissions are accounted for within the state's Low Carbon Fuel Standard (LCFS).

Although research into the effect that biofuels have on climate change is marked by uncertainty and controversy, it is increasingly evident that the production and consumption of some types of biofuels are undermining efforts to reduce greenhouse gas (GHG) emissions. As compared to other policies being used to promote biofuels—most notably, the federal Renewable Fuel Standard—the LCFS represents a significantly better platform for evaluating net GHG emissions and rewarding the fuels with the lowest carbon intensities. CATF is therefore committed to helping ARB ensure that the best and most current research is used to inform its assessments of the carbon intensities of different fuels, especially biofuels. LCFS B7-11

These comments highlight three factors that ARB should take into account as it evaluates the ILUC emissions estimate used to calculate the carbon intensity of biofuels in the LCFS context:

- Studies that supposedly demonstrate a trend toward lower ILUC emissions estimates—including versions of the Global Trade Analysis Project (GTAP) model that ARB relies upon to implement the LCFS—typically ignore how water scarcity constraints will impact crop expansion. A recent analysis that takes water scarcity into account finds that earlier studies "likely underestimated induced land use emissions due to ethanol production by more than one quarter." LCFS B7-12
- GTAP's inability to differentiate commercial forest from non-commercial forests means that the model wrongly assumes that markets respond to the conversion of both land types in the same way. LCFS B7-13
- The yield improvement assumptions in GTAP overlook important differences among crops and growing regions, they fail to incorporate new research on future corn yields LCFS B7-14

> in the Midwest United States, and they do not adequately address the climate impact associated with the increased use of nitrogen-based fertilizers to sustain yield growth.

LCFS B7-14 cont.

Each of these factors separately suggest that the GTAP model is currently under-counting ILUC emissions. Taken together, they indicate that a reduction to the ILUC emissions estimate discussed in ARB's March 11, 2014, presentation, "iLUC Analysis for the Low Carbon Fuel Standard (Update),"[1] would not be appropriate. CATF therefore urges ARB to keep the ILUC estimate at its current level until ARB can more fully account for the issues raised here and at the March workshop.

LCFS B7-15

[I] The "Trend" Toward Lower ILUC Emission Estimates Is Illusory

In California (as in Washington DC), the ethanol industry has aggressively promoted the idea that ILUC emissions estimates for corn ethanol are steadily trending downward as new lifecycle analyses are published. The industry places particularly high value on particular publications by Purdue researchers Wally Tyner and Farzad Taheripour that point toward relatively low estimates of ILUC emissions, e.g., a 2012 paper that reduces the estimated land requirements for US ethanol production by 25%.[2] The cited studies have important shortcomings, however—a problem that is exemplified by the way in which the studies have ignored real-world constraints on the amount of water available for new agriculture.

In fact, more recent work by Taheripour is intended to correct this oversight. In a 2013 study he co-authored by Thomas Hertel and Jing Liu, two other researchers from Purdue, he writes: "[I]n contrast to the recent trend in such studies, incorporating explicit modeling of irrigation, and associated constraints, *significantly raises the land-based emissions associated with biofuel expansion*."[3]

LCFS B7-16

Taheripour *et al.* (2013) opens with two key points. First, water availability is essential to understanding the land use impact of biofuel expansion, especially with water availability projected to decrease over the next two decades.

> [T]he question of whether expansion of global cropland cover involves irrigated or rainfed lands make a significant difference in terms of how much new land will be required to provide the additional production called for in the presence of biofuels ... [I]f the expansion of irrigated land is constrained, either due to insufficient water or due to insufficient pumping capacity, then it is likely that more cropland area will be required to meet the additional global demand induced by ethanol production.[4]

The authors cite recent studies that predict large water deficits, including an analysis by McKinsey which estimates that by 2030 water demand will exceed water supply by 40%. "In summary," Taheripour *et al.* write, "it appears that water for agricultural irrigation will become much more expensive in the future – no doubt spurring considerable efficiency gains, but also raising the cost of production and therefore limiting the amount of land on which irrigated crops can be economically grown."[5]

Second, refining land use change models to account for real-world constraints on water availability reveals a greater likelihood that biofuels expansion will drive displaced agricultural

LCFS B7-17

production into areas that are rainfed. "These regions tend to be more carbon rich and therefore exhibit higher ILUC emission factors," write Taheripour *et al.* "Therefore, earlier models which ignore the role of irrigation in crop expansion tend to underestimate the ILUC emissions due to biofuel expansion."[6]

LCFS B7-17 cont.

One such model is GTAP-BIO, which Taheripour and Tyner used in the earlier 2012 study to assess the land use impacts of the 2015 ethanol mandate in the US Renewable Fuel Standard.[7] (GTAP-BIO, of course, is used to generate the emissions estimates for biofuels that ARB relies upon to implement the LCFS.) The enhancements that Taherpour *et al.* make to GTAP in the 2013 study allow the model to recognize water scarcity constraints and distinguish between rain-fed and irrigated land. Figures 3 and 6 from Taheripour *et al.* (2013) illustrate the extent to which the intensity of global land use change can differ when models are programmed to distinguish between irrigated crops and rainfed crops, and when constraints on water availability are introduced:

Fig. 3 from Taheripour et al. (2013)

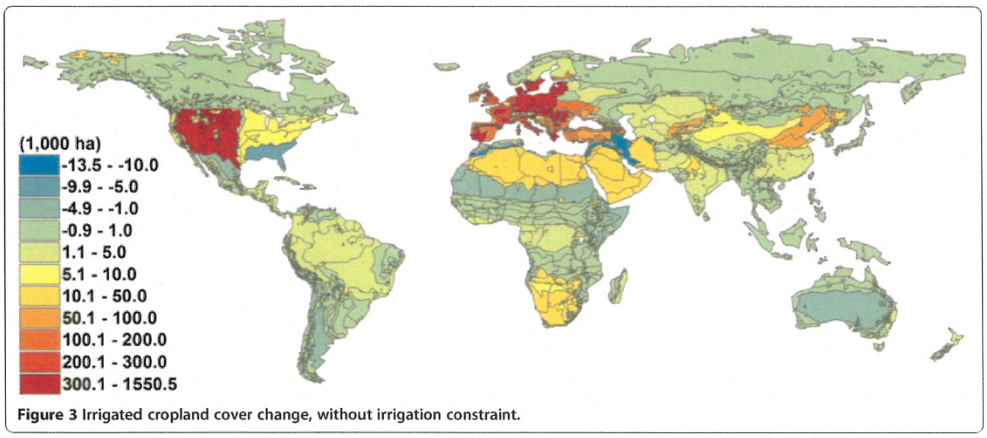


Figure 3 Irrigated cropland cover change, without irrigation constraint.

Fig. 6 from Taheripour et al. (2013)

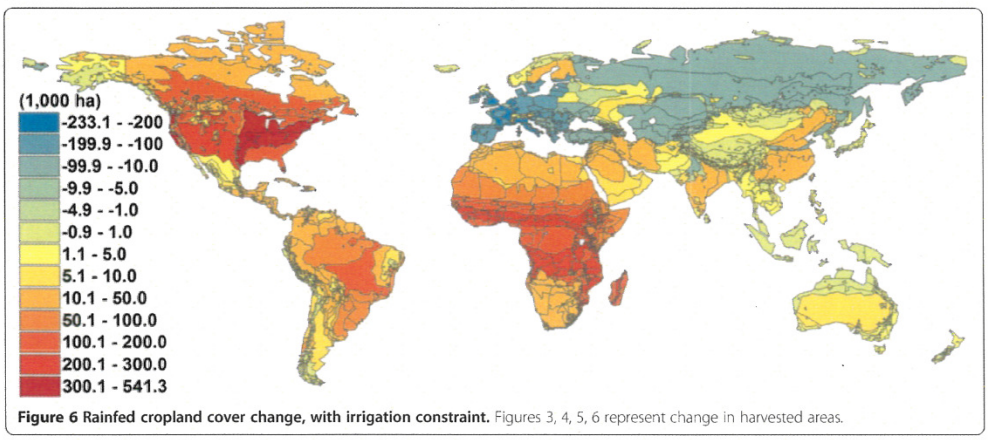


Figure 6 Rainfed cropland cover change, with irrigation constraint. Figures 3, 4, 5, 6 represent change in harvested areas.

LCFS B7-18

By sensitizing the model to these factors, the 2013 study finds that ILUC emissions are likely to be substantially higher than prior estimates:

> [I]ncreasing US ethanol production from its 2001 level to 56.78 billion liters causes about 35.6 g CO2e/MJ emissions if there is no irrigation constraint across the world. Factoring in the physical limitations on irrigation expansion increases the land-based emissions to 45.4 g CO_2e/MJ. This means that the physical water scarcity adds 27.5% to the emissions due to land use changes induced by ethanol expansion. As shown in Table 5 [excerpted below], the constrained case also generates 27.5% more emissions compared to the case wherein we ignore irrigation altogether. This means that earlier studies, which failed to distinguish rainfed from irrigated lands, likely underestimated induced land use emissions due to ethanol production by more than one quarter.[8]

LCFS B7-18 cont.

Table 5 from Taheripour et al. (2013)

Table 5 Land use emissions due to US ethanol production

Simulations	Ethanol production (billion liters)	Annualized ILUC emissions	
		(g CO_2e/MJ)	Deviation from no-irrigation (%)
Unconstrained	50.08	35.6	−0.05
No-irrigation	50.08	35.6	0.0
Constrained	50.08	45.4	27.5

An additional point worth noting in this context is that both of the values cited in the 2013 study for corn ethanol—35.6 and 45.4 g CO_2e/MJ—are higher than the central values that ARB presented at the March 11 workshop (30.0 and 23.2 g CO_2e/MJ).[9]

In its March 2014 presentation, ARB staff notified the Board that the current version of GTAP fails to differentiate between the irrigated and rain-fed land and assumes that the water availability (or, rather, the unavailability of water) does not affect the model's estimates concerning the conversion of new land for crop production. Staff flagged two of the problems connected with this assumption—water is not an unlimited resource, and it cost money to irrigate newly converted cropland—and pointed out that, "Crop expansion and crop switching decisions will require availability of water resource and may change model predictions."[10] According to the presentation, staff plans to collect data on water availability, productivity differences, and land elasticity, and integrate those data into a revised GTAP model within the next few months.[11]

LCFS B7-19

This effort to incorporate water-related restrictions on biofuel demand-driven cropland expansion is likely to materially affect ARB's estimate of the net GHG emissions associated with the LCFS. The 2013 study by Taheripour *et al.* indicates that ignoring the role of irrigation in cropland expansion "introduces systematic biases in the measurement of the size and pattern of global land use changes and therefore the land use emissions due to production of biofuels."[12]

We therefore encourage ARB to ensure that water constraints are accounted for in the lifecycle emissions analyses used to assess the treatment of biofuels within the LCFS.

[II] GTAP's Treatment of Forest Conversion Artificially Suppresses ILUC Emissions

Currently GTAP represents three land-use classes: forestry, pasture, and cropland. These are economic uses of land, however, not land-cover types. That is, GTAP does not represent forests generally; it represents economically productive timberland. As a result, the model assumes that any conversion of forestry land causes a reduction in timber supply, which in turn creates upward pressure on timber prices. This assumption has two effects that are likely to produce lower projected ILUC emissions.

First, the opportunity cost of converting commercial forestry land is greater than the opportunity cost of converting forestland that is not in economic use. The assumption within GTAP that all forestland is commercially managed therefore exaggerates the economic limits on non-commercial forest conversion. Consequently, the model likely projects less overall forest conversion than it would if it differentiated between commercial and non-commercial forests and made both types available for conversion.

Second, once commercial forestland is converted, there is an *afforestation* response elsewhere that makes up some portion of the lost timber supply. GTAP fails to appreciate that the conversion of non-commercial forestland would not produce a similar afforestation response. LCFS B7-20

Notably, other models used to estimate land-use change emissions—including IFPRI's MIRAGE, MIT's EPPA, and PNNL's GCAM—allow for the conversion of non-commercial forestland.

ARB staff referenced these concerns in their presentation for the March 2014 workshop, explaining that GTAP's inability to differentiate between forest categories "creates unrealistic deficit from wood products in the forestry sector."[13] A temporary fix involving adjustments to the Land Transformation Elasticity (ETL) values was proposed, with a completion target of April 2014.[14] It is not clear from ARB's website whether this fix has been executed or how the adjustment impacts the ILUC estimate. CATF cannot specifically comment on the proposed fix until we have reviewed the results of the ETL adjustment, but we are encouraged that ARB has identified this problem and is committed to addressing it. We urge ARB to ensure that its ILUC determination is based on land use modeling that effectively differentiates between commercial and non-commerical forestland.

[III] Aspects of GTAP's Treatment of Yield Problematically Affect ILUC Analysis

Several of the ways in which GTAP treats future crop yields are suppressing the model's ILUC emission projections. These include the model's assumption that price-induced yield improvements for all crops in all regions will match the improvement rate projected for Midwestern US corn, the model's current failure to accommodate new research suggesting that future corn yield improvements in the Midwest US could decelerate, and model's ongoing failure to adequately address the climate impact associated with the increased use of nitrogen-based fertilizers to sustain yield growth. LCFS B7-21

[A] GTAP's Handling of Yield Price Elasticity Suppresses ILUC Estimates

Yield price elasticity is perhaps the most controversial parameter in the GTAP model. GTAP utilizes a single number which determines how much yields—of all crops, in all regions—increase in response to price increases. Most arguments about price-induced yield improvements have focused on the "correct" value for this parameter, while failing to recognize that no such parameter exists in the real world: no single value can properly capture the substantial variability across crop types, climatic conditions, and economic conditions.

In practice, nearly all of the discussion about this parameter is informed by studies of one crop grown in one region—*i.e.*, corn grown in the US Corn Belt. There is little reason to expect that the yield effects measured for corn in the Midwest, a growing region characterized by fertile soil and readily available capital, to be representative of the effect that minor price increases have on, say, rice yield in developing regions.

When setting a range of values to consider for yield price elasticity within GTAP, ARB must treat this parameter as representing the *average* yield elasticity for all crops, in all regions, which is likely to be lower than what has been achieved by corn growers in the United States. The high values suggested for the US corn should be treated as the maximum obtainable. If GTAP assumed (appropriately) that not all crops grown around the world will achieve the same level of yield price elasticity as US corn, estimated ILUC emissions would likely increase.

LCFS B7-22

[B] GTAP Does Not Incorporate New Research on Future Corn Yields

The assumptions made in GTAP about future crop yields do not yet take into account important new research by David Lobell and others on the impact that future drought conditions will have on Midwest US corn yields over the next 50 years. According to the study—Lobell *et al.*, "Greater Sensitivity to Drought Accompanies Maize Yield Increase in the U.S. Midwest," SCIENCE (May 2, 2014)—a greater incidence of midsummer drought conditions will slow the steady improvement in corn yields that farmers have historically achieved by increasing their cropping density. Assuming that finding is corroborated, it should be incorporated into GTAP's assumptions about future yield improvement.

According to the study, a handful of factors have allowed farmers to increase the density at which they plant corn and soy—e.g., no-till agricultural, higher ambient CO_2 concentrations, and genetic enhancements. Increased density has contributed to yield improvements, but it also "can be detrimental under drought conditions because of excessive stress exposure for individual plants."[15] The authors examined how corn and soy respond to various environmental stresses to determine "the net effect of recent genetic, agronomic, and environmental changes on drought sensitivity." They find that corn yields are particularly sensitive to increases in daytime vapor pressure deficit (VPD), "a widely used measure of atmospheric water demand that depends on air temperature and humidity." VDP increases appear to be especially impactful when they occur 2-3 months after a corn crop is sowed.[16] As Figure 4(B) from Lobell *et al.* shows, VDP during that timeframe (July, approximately) is expected to climb significantly over the next forty years:

LCFS B7-23

Fig. 4 from Lobell et al. (2014)

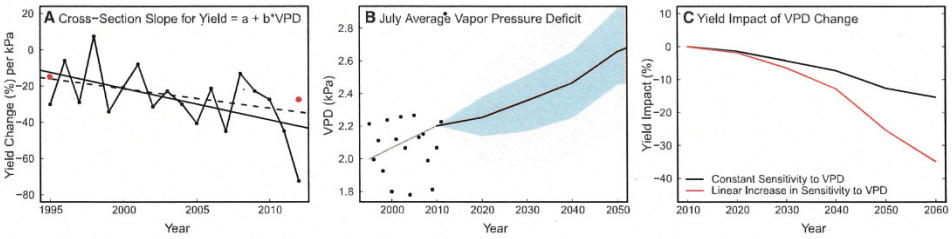


Fig. 4. Changes in vapor pressure deficit and its impacts. (**A**) Estimates of maize yield sensitivity to VPD 61 to 90 days after sowing from a cross-sectional regression for each year in the study period, along with best-fit trend lines with (solid) or without (dashed) including 2012 for computing the trend. Red dots indicate sensitivity estimates from APSIM simulations with sowing densities corresponding to the start and end of the study period. (**B**) Average July VPD in the study region for historical and projected periods. Dots show individual year observations, gray line shows linear trend for 1995 to 2012, black line shows mean VPD projected using 29 climate models, blue shading indicates 25th to 75th percentile of model projections, and gray shading indicates 5th to 95th percentiles. (**C**) Estimated impact of mean VPD projections on average maize yields using either constant yield sensitivity of −27.5% per kPa or a linear increase in sensitivity at the historical rate of 7% per kPa per decade.

The study concludes that if corn-growing regions continue to experience hotter and drier Julys, current projections for corn yield improvements are unlikely to be met:

> One implication is that climate change effects may be more severe than predicted by models that assume current crop genetics and management. Climate model projections indicate that July VPD for this region will become more severe, with an expected increase in average VPD of roughly 20% over the next 50 years (Fig. 4B), driven both by higher temperatures and reduced relative humidity. At current VPD sensitivity, these VPD trends would reduce yields by about 15% over the next 50 years. If maize yields continue to become increasingly sensitive to VPD, then yield losses from VPD trends could be as much as 30% (Fig. 4C).[17]

LCFS B7-23 cont.

In addition to casting doubt on long-term yield projections for corn (the feedstock used to produce more than 80% of the biofuel consumed in the United States in 2013), Lobell *et al.*'s findings support the point made above that ARB should not use a yield price elasticity value for corn as a proxy for the elasticity of other crops' yields. Lobell *et al.* demonstrate that there are important physical constraints on corn yields that farmers may not be able to overcome through the commitment of additional resources. Accordingly, the study suggests that GTAP's yield price elasticity value for corn may not be appropriate for corn, much less for other crops.

Consequently, ARB should ensure that the new work by Lobell *et al.* informs future yield projections and the effect those projections have on ILUC estimates.

[C] ARB's Modeling Framework Undercounts N_2O Emissions

The modeling framework used by ARB assumes that yields for a wide range of crops will climb in response to increased demand for biofuel feedstocks, but it does not adequately account for the extra emissions associated with the farming techniques that will be utilized to achieve those higher yields. The likely result of ARB's approach is that ILUC emissions are undercounted.

LCFS B7-24

Adding fertilizer, for example, results in additional emissions of nitrous oxide (N_2O), a potent greenhouse gas. ARB's modeling framework currently accounts only for the N_2O emissions that result from fertilization of the feedstock crops used to produce biofuels. This approach

ignores the additional use of fertilizer for other crops, even when that additional usage is tied to an overall rise in crop prices brought about by new demand for energy crops. Under the existing modeling framework, therefore, the benefit of price-induced yield increases are counted, while the cost to climate of achieving those increases is not. If ARB accounts for both sides of the equation—*i.e.*, improved yields *and* higher N_2O emissions—as it should, estimated ILUC emissions are likely to increase.

LCFS B7-24 cont.

In the March 2014 presentation, ARB staff acknowledged that both crop intensification and crop extensification associated with increased biofuel demand could result in additional N_2O emissions.[18] We urge ARB to fully account for these emissions when estimating ILUC emissions.

[D] GTAP's Treatment of Marginal Crop Yields Increases Uncertainty

One of the recent changes to GTAP that contributed to the proposed reduction in ILUC emissions relates to how the model represents yield on newly converted cropland. GTAP previously relied on a single value of 0.66 to represent the relative productivity of newly converted land,[19] until Taheripour *et al.* (2012) used the Terrestrial Ecosystem Model (TEM) to estimate relative yields on a regional basis.[20] The shift to regionalized estimates is an improvement conceptually, but the implementation of this change creates additional uncertainty—leaving in doubt whether this change produces a better representation of reality.

To implement this change, Taheripour *et al.* estimated the average net primary productivity (NPP) of a single crop—based on corn grown in the US Corn Belt—for land not currently used for crop production in each Region-AEZ combination, and the average NPP of land currently in crop production in that Region-AEZ.[21] The ratio of these NPP values—truncated to a maximum value of 1.0[22]—is used as a proxy for the relative yield of newly converted cropland.[23] This approach implicitly incorporates the following assumptions:

- *That Iowa's 1996 corn season is an appropriate proxy for all crops grown around the world.* (TEM is parameterized using data for corn grown in 1996 in Iowa, one of the world's most productive corn producing regions.)
- *That NPP is a good proxy for yield, and the difference in yield between these two land-use classes is best represented as a constant ratio (A/B) rather than, say, a constant difference (A-B).*
- *That TEM's estimate of NPP is correct.* (Pan *et al.* (1996) performed sensitivity analysis on the TEM model (version 4.0), showing that estimated NPP is sensitive to different assumptions about soil texture, temperature, precipitation, and radiation—all of which may vary within a given Region-AEZ.[24])
- *That the average NPP of all land not in crop production is a good approximation of NPP on the land actually converted.* (This assumption holds true only when land selection is random or there is little variability of NPP across land in the Region-AEZ. Neither of these are claimed to be the case in the study.)
- *That truncating some of the NPP ratios to 1.0 produces a valid estimate of marginal yield.* (Taheripour *et al.* make this adjustment in their 2012 study as a way of recognizing the unlikelihood that yields are better on land not being used for production. It remains unclear, however, why this adjustment is necessary if the basic method of computing

LCFS B7-25

NPP and using the ratio is valid. In other words, if the method produces values that are believed to be unrealistically high in some cases, what basis is there to believe that the other values produced by TEM (*i.e.*, those <1.0) are not likewise too high?)

LCFS B7-25 cont.

In principle, regionalized estimates of marginal yield can produce more accurate model results. Whether this is true in practice, however, depends on how the regionalized values are determined. It is unclear whether the present implementation brings GTAP results closer to reality or further from it.

Conclusion

CATF believes that California's LCFS can play a globally important role in identifying and promoting fuels that can meaningfully reduce GHG emissions from transportation. We therefore appreciate the opportunity to help ARB ensure that the best and most current research is used to assess the carbon intensities of different fuels, particularly biofuels.

LCFS B7-26

In order to develop a more reliable ILUC estimate, CATF urges ARB should ensure that its model fully appreciates the extent to which water scarcity will constrain future crop expansion, effectively differentiates commercial forest from non-commercial forests, and utilizes the most comprehensive and up-to-date data on yield improvements.

LCFS B7-27

Sincerely,

Jonathan F. Lewis
Senior Counsel—Climate Policy
Clean Air Task Force
18 Tremont Street, Suite 530
Boston, MA 02108
jlewis@catf.us
617.624.0234

ENDNOTES

[1] John Courtis, Anil Prabhu, Farshid Mojaver, and Kamran Adili. iLUC Analysis for the Low Carbon Fuel Standard (Update), California Air Resources Board, (March 11, 2014) (hereafter "March 2014 Staff Presenation").
[2] Farzad Taheripour, Quinlai Zhuang, Wallace E. Tyner, and Xioliang Lu. Biofuels, Cropland Expansion, and the Extensive Margin. ENERGY, SUSTAINABILITY AND SOCIETY 2012 (hereafter "Taheripour *et al.* (2012)")
[3] Farzad Taheripour, Thomas W. Hertel and Jing Liu. The Role of Irrigation in Determining the Global Land Use Impacts of Biofuels. ENERGY, SUSTAINABILITY AND SOCIETY 2013. 3 (emphasis added) (hereafter "Taheripour *et al.* (2013)").
[4] *Id.* at 1-2.
[5] *Id.* at 2.
[6] *Id.* at 2.
[7] Taheripour *et al.* (2012) at 6.
[8] Taheripour *et al.* (2013) at 9.
[9] March 2014 Staff Presentation at 61.
[10] March 2014 Staff Presentation at 42.
[11] *Id.* at 43.
[12] Taheripour *et al.* (2013) at 1.
[13] *Id.* at 45.
[14] *Id.* at 45.
[15] David B. Lobell *et al.* Greater Sensitivity to Drought Accompanies Maize Yield Increase in the U.S. Midwest. SCIENCE 2014. 516.
[16] *Id.* at 517.
[17] *Id.* at 519.
[18] March 2014 Staff Presentation at 47-48.
[19] See Thomas W. Hertel *et al.* Global Land Use and Greenhouse Gas Emissions Impacts of US Maize Ethanol: Estimating Market-Mediated Responses. BIOSCIENCE 2010.
[20] See Taheripour *et al.* (2012).
[21] *Id.* at 3.
[22] *Id.* at 8.
[23] *Id.* at 3.
[24] Yude Pan, *et al.* The Importance of Climate and Soils for Estimates of Net Primary Production: A Sensitivity Analysis with the Terrestrial Ecosystem Model. GLOBAL CHANGE BIOLOGY 1996.

This page intentionally left blank.

Comment Letter 7_B_LCFS_CATF Responses

LCFS B7-2 The comment addresses issues related to indirect land use change. The adjustments to the CIs of corn ethanol, as well as the adjustments for other biofuels, are based on the latest and improved modeling analysis.

The current modeling analysis takes into account the changes in prices (e.g., commodities, land resource, etc.) and the resultant effects on land use as well as the carbon losses from land conversion. These carbon losses estimated by ARB staff include worldwide losses of soil and plant carbon to the atmosphere where predicted by the model. Please see responses to comments **LCFS 29-3, LCFS 29-5, LCFS 29-6,** and **LCFS 29-7**.

LCFS B7-3 The commenter disagrees with reducing iLUC scores for corn. The current approach used by ARB is appropriate because it includes the most current and best available data, and the latest modeling structure. The current ARB GTAP model does account for water availability throughout the biofuels production system and uses the latest water scarcity data from the World Resources Institute. In the previous analysis that the commenter cites, Taheripour et al. used an older (2001) database and an older model that is different than the current ARB model. Also, in their analysis the assumptions related to rainfed and irrigated land is outdated. Furthermore, the older model used by Taheripour et al. does not include current elasticity structures and does not disaggregate crops. Please see responses to comments **LCFS 29-3, LCFS 29-5, LCFS 29-6, and LCFS 29-7**.

LCFS B7-6 The comment states that ARB staff should reconsider how it accounts for reduced food consumption within the LCFS context. Please see response to **LCFS 29-3**.

LCFS B7-9 The comment suggests that the corn ethanol emission score would have a negative impact on global food security. See response to **LCFS B7-6**.

LCFS B7-10 The comment suggests that the use of the corn ethanol score would affect the implementation of marginally beneficial new technologies for post-2020 timeframe (i.e., ammonia). The proposed reduction in the CI for corn ethanol is appropriate since it reflects the latest and best available data and the upgraded modeling framework. Because LCFS is a performance-based regulation, all biofuels, including corn ethanol, can participate

based on their performance and based on their CI score. The structure of the proposed LCFS Regulation allows innovative approaches for biofuel production to be evaluated and reflected in the CI scores of biofuels.

Most transportation fuels are subject to the requirements of the proposed LCFS Regulation, which requires lowering CI by 10 percent by 2020. Other fuels such as ammonia, or hydrogen-based energy carriers, to the extent when used in the transportation sector, can contribute to the goals of the LCFS. However, LCFS is a performance-based standard and both existing fuels and new innovative fuels can contribute to the LCFS goals. Please see responses to comments **LCFS 29-3, LCFS 29-5, LCFS 29-6, and LCFS 29-7**.

LCFS B7-12 The comment states that iLUC emissions estimates typically ignore how water scarcity constraints would impact crop expansion and this likely underestimates induced land use emissions to ethanol production. ARB staff does not concur with commenter because the iLUC analysis takes into account water scarcity constraints in agriculture. See also response to **LCFS 29-5**.

Comment letter code: 9_FF_LCFS_ALON

Commenter: Gary Grimes

Affiliation: Alon USA

The following letter was submitted to the LCFS Docket during the First 15-day comment period.

This page intentionally left blank.

9_FF_LCFS
_ALON

ALON USA

June 19, 2015

Via electronic submittal to: http://www.arb.ca.gov/lispub/comm/bclist.php

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

Subject: Comments on the 15 Day Regulatory package for the LCFS Regulation

Alon USA Energy (Alon) strongly supports the Low Carbon Fuel Standard's (LCFS or regulation) provisions for Low Complexity – Low Energy Use Refiners (LCLE Refiners). These provisions recognize that not all refineries are the same. We believe that there are solid policy and technical justifications for this distinction to be codified in the LCFS. The Air Resources Board (CARB or Board), as well as, the U.S. Environmental Protection Agency have traditionally recognized in their regulatory programs the unique value small refiners (LCLE) occupy in both the oil and finished fuel markets, as well as, their unique configurations and operating constraints. Additionally, smaller, less complex refiners also have the added distinguishing characteristic that they produce finished fuel with a lower Carbon Intensity (CI), the heartbeat of the LCFS. Recognizing that difference is a very positive step. LCFS FF9-1

That being said Alon, is very disappointed that the proposed final regulatory provisions for the re-adoption of California's Low Carbon Fuel Standard (15-day changes) fails to recognize Alon's Bakersfield Refinery as a low carbon fuel producer (LCLE). The facility is configured and engineered to produce lower CI fuels. Alon, CARB staff and the Board have been actively discussing the concept of a LCLE refiner provision since 2011, including adopting previous resolution language on the subject matter. Over the past four years, the policy construct behind recognizing the inherently lower carbon intensity of smaller, less complex refineries has been fully agreed upon. It is for this reason that Alon is saddened that staff was unable to agree on a solution that would include all of California's truly LCLE refineries. Unfortunately, the final limited LCLE definition has several negative implications, including: creating an uneven competitiveness within the smaller refinery subsector, increasing statewide GHG emissions from California's transportation fuel sector, not recognizing the true economic impact on Bakersfield, and setting a precedent regarding use of data. Finally, it locks into place a significant regulatory and economic obstacle to restarting the Alon Bakersfield refinery. **Alon strongly urges the Board to direct staff to revisit this issue at the earliest opportunity.** LCFS FF9-2

The LCLE provision was intended to be an all-encompassing policy acknowledgment by the Board that there are refineries in California that produce transportation fuels while consuming substantially less energy per finished gallon. Nobody would ever say the Alon Bakersfield facility looks or operates like California's biggest refineries.

As we know, the LCFS regulation impacts refineries that are both operating AND may resume operations shortly by providing the "rules of the game" for many years to come. This regulation will not only impact Alon's Bakersfield refinery but could have consequences for Alon's Paramount refinery where we are in the process of modifying some of the process units to produce renewable diesel from animal and vegetable fats. [1]

LCFS FF9-2 cont.

California's smaller, less complex refineries are few in number and have been historically acknowledged by CARB to operate at a market disadvantage. This historical recognition started in the earliest of CARB rulemakings on California's transportation fuel (clean diesel and reformulated gasoline). Recent regulatory actions by the agency to implement AB 32 have not been consistent in recognizing these differences. In fact, rationale provided to Alon by CARB staff for not recognizing small refiners under the Cap and Trade program was that this issue would be better suited for the LCFS regulation. Now both regulations have been updated, and both regulations leave Alon's Bakersfield refinery abandoned.

LCFS FF9-3

The staff recommendation itself was disappointing, but Alon is equally disappointed that neither the Bakersfield refinery, or its data were considered when analyzing the LCLE provisions initially, even though we had been in active discussion with staff for years. At the direction of CARB Alon waited almost a year for new Mandatory Reporting (MRR) to be collected and analyzed for the statewide refinery fleet. Unfortunately, the updated MRR did not include the requirement for over-the-fence purchased hydrogen data which would further demonstrate the large difference in carbon intensity between the LCLE refineries and the other refineries in the state. Soon after learning that the data needed to help draw the distinctions wasn't coming, the draft LCFS regulation was written to exclude the Bakersfield refinery from the LCLE category without the benefit of its data. Since that point, staff has not wanted to adjust the eligibility criteria. The inertia of the initial draft was significant. Alon feels the Bakersfield refinery was a victim of the regulatory adoption system.

LCFS FF9-4

Though Alon's Bakersfield refinery is currently operating in a very limited mode, Alon is actively working to bring production back to 2008 levels and has spent millions of dollars in the environmental review process. The Kern County Board of supervisors has approved an Environmental Impact Report to allow Alon to reconfigure the Refinery and the necessary engineering work has commenced. The impacts of the LCFS and the potential mitigating effects of the LCLE refiner provisions are significant economic considerations for the facility. By leaving the Bakersfield Refinery outside the LCLE universe CARB staff has substantially increased the economic impact that the facility will need to overcome and decreased the likelihood that California will receive the low carbon fuel supplies that it could provide.

LCFS FF9-5

Alon believes that the inclusion of the Bakersfield refinery in the LCLE would have been a win for the environment and a win for the central valley economy -- Because the CI of the Bakersfield facility is materially lower than the average California refinery, the fuels produced by the facility would save as much as 400,000 metric tons of GHG emissions annually over what would otherwise

LCFS FF9-6

[1] The Paramount Refinery meets the LCLE criteria and an economic evaluation will be needed to determine if it is economic to produce low carbon intensity conventional fuel at the facility.

be emitted by an average in-state refinery and its inclusion would have helped assure good middle class construction and refinery jobs in the economically hard it central valley. LCFS FF9-6 cont.

The potential loss of these GHG reductions is a significant environmental impact. In fact, it is almost equal to the GHG emission reduction benefits of an entirely new Major Regulation currently proposed—The Crude Oil and Natural Gas Operations regulation. That entire regulation, estimated to cost more than $50 million dollars to California business is anticipated to only achieve 556,000 tons of reductions The failure to analyze the environmental impacts associated with the Bakersfield refinery being in the LCLE universe is a serious CEQA issue. Alon worked diligently over the past year trying to understand CARB's concerns. The 15- Day package was an opportunity to make the LCFS's LCLE provisions work for all low carbon intensity refineries in California, and Alon offered various compromise proposals, including proposals to limit the benefit any single LCLE refiner could receive in an attempt to deal with staff's concerns regarding "regulatory creep" and "breaking the bank". Unless the Board directs staff to revisit this issue at the earliest of re-openings, Alon must wait years for the next scheduled LCFS revision in 2018. LCFS FF9-7

In summary, while Alon strongly supports the concept of LCLE provisions, the proposed LCLE provisions missed the mark because the LCLE eligibility criteria of "5/5" isn't reflective of the complete category of refineries that fit its important policy goal. **Alon respectfully asks the Board to direct staff to revisit this decision as soon as practicable.** LCFS FF9-8

If you have any questions on these comments please contact Gary Grimes at 562-531-2060 (ggrimes@ppcla.com).

Respectfully submitted,

Glenn Clausen

Glenn Clausen
Vice President, Refining
Paramount Petroleum

314711021.1

This page intentionally left blank.

Comment Letter 9_FF_LCFS_ALON Responses

LCFS FF9-6

The comment states that the Low Complexity/Low Energy Use (LC/LE) provision as written effectively excludes the Alon-Bakersfield refinery from the benefits of the provision. The comment further argues that inclusion of this refinery in the LC/LE provision would be a win for the environment and would save 400,000 metric tons of GHG emissions annually as compared to an average in-state refinery.

ARB staff disagrees that the Alon Bakersfield refinery is being excluded from the LC/LE provision. The current design of the LC/LE provision does not prevent Alon from qualifying as an LC/LE refinery. As stated in their comment letter, Alon Bakersfield is currently running in a very limited fashion and is working through the permitting process to bring the refinery back to its 2008 operating level. Based on the data Alon supplied to staff, the refinery could be configured to qualify under the currently proposed LC/LE provision.

Alon is requesting ARB loosen the qualification standards of the LC/LE provision and argues that this would be a win for the environment as it would save GHG emissions. Staff disagrees with the commenter and believes that raising the 5/5 qualification metrics to 7/7 could result in GHG increases, rather than savings, since the other refineries that qualify as a LC/LE refinery under the current proposal would be able to increase their energy consumption, and hence their GHG emissions, while still qualifying.

LCFS FF9-7

The comment states that the Bakersfield refinery should be considered a Low Energy Use Refiner, under the LCFS Regulation. Please see response to **LCFS FF9-6**.

The comment mischaracterizes a decision to not designate the Bakersfield refinery as a Low Energy Use Refiner to be an environmental impact under CEQA. Environmental impacts are associated with physical changes to the existing environment caused by implementation of a project. The designation or lack of designation, of the Bakersfield refinery would not involve a physical change to the environment, and would, therefore, not result in a significant environmental impact under CEQA.

This page intentionally left blank.

Comment letter code: 43_FF_LCFS_WSPA

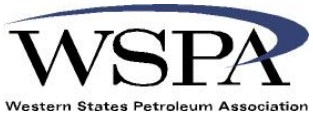
Commenter: Catherine Reheis-Boyd

Affiliation: Western States Petroleum Association

The following letter was submitted to the LCFS Docket during the First 15-day comment period.

This page intentionally left blank.

43_FF_LCFS _WSPA



Western States Petroleum Association
Credible Solutions • Responsive Service • Since 1907

Catherine H. Reheis-Boyd
President

June 19, 2015

Clerk of the Board, Air Resources Board
1001 I St., Sacramento, CA 95814
Via electronic mail to http://www.arb.ca.gov/lispub/comm/bclist.php

Dear Clerk of the Board,

Re. Proposed Re-Adoption of the Low Carbon Fuel Standard
Notice of Public Availability of Modified Text and Availability of Additional Documents and Information

The Western States Petroleum Association (WSPA) is a non-profit trade association representing twenty-five companies that explore for, produce, refine, transport and market petroleum, petroleum products, natural gas and other energy supplies in California and 5 western states.

Attached is a set of comments – both general and specific – that continue to concern WSPA. We support the inclusion of an additional Periodic Review of the LCFS in 2017. We are prepared to engage again next year, in advance of the 2017 review, in updating the data relative to the projected feasibility and health of the program. LCFS FF43-1

If there are any questions or a need for additional clarification of our comments, please contact Gina Grey of my staff (ggrey@wspa.org) to arrange for further dialogue with WSPA.

Sincerely,

c.c. S. Wade – ARB

Western States Petroleum Association's Comments on ARB's 15-day Notice of Public Availability of Modified Text and Availability of Additional Documents for the Amendments to the Low Carbon Fuel Standard Regulation.

General

WSPA believes that regulations should be based on sound science and free market principles, including a level playing field for all parties. Regulations should also include cost/benefit considerations and provide a clear and reasonable regulatory framework. Several elements of the amendments in the ARB's LCFS 15 day package do not satisfy these criteria; thus we respectfully request ARB revise this package to include these considerations.

Some of our core comments are presented below, with more detailed comments included in the following pages:

- WSPA continues to strongly object to the extremely limited accountability placed on electricity providers in generating LCFS credits. This is in dramatic contrast to the extremely rigorous application process and detailed record-keeping and reporting required on the part of liquid fuel suppliers and does not support the notion of a "fuel neutral" program as the LCFS is purported to be. LCFS FF43-2

- ARB proposes several new and modified methods of credit generation, but with arbitrary and disparate effective dates. This seems to serve no purpose other than to favor one credit generation methodology over another. Staff should move immediately to align the effective dates of all applicable segments of the regulation (e.g., electricity, refinery investments, and innovative crude pathways) to ensure fairness in the treatment of compliance options. LCFS FF43-3

- Credit accounting continues to be exceedingly complex, and the amendments in this 15-day package exacerbate these issues. With over 250 pathways approved by ARB, the lack of ARB oversight as to the validity of those credits and pathways, and a changing regulatory environment in which all fuel pathways must be recalculated using new model criteria, ARB cannot reasonably expect fuel suppliers to verify those credits with such an overly complex accounting system. LCFS FF43-4

- Credit generation from light and heavy duty rail use is inconsistent with both the intent and the ISOR for the LCFS, and should be removed from the program.
    - The use of light and heavy duty rail existed prior to the implementation of the LCFS; as such, its use is not further reducing GHGs from the transport sector.
    - If ARB chooses not to remove these provisions, then ARB must account for such credits distinctly in ARB's quarterly summaries from other electricity credits so stakeholders can understand the contribution from these pre-existing sources. LCFS FF43-5

- The Credit Clearance Market, in which deficit holders must participate, exacerbates an infeasible target, is not market-based, and does not provide the opportunity for fuel suppliers to evaluate the validity of credits. In addition, the publication of a list of Credit Clearance Market LCFS FF43-6

participants and each party's outstanding deficit obligation violates confidential business information practices. The inappropriate disclosure of this information has the distinct possibility of harming a given participant's competitive position in the market.

LCFS FF43-6 cont.

- It is critical that staff clarify the language in §95488 apparently prohibiting the sale of credits or fuel with obligation associated with new fuel pathway applications for up to two years. Staff has acknowledged that the currently proposed draft language does not represent what was intended and a very clear message must be issued to allow fuel producers some certainty.

LCFS FF43-7

- WSPA does not believe credits generated from the refinery investment credit provisions (as written) will contribute substantially to meeting fuel suppliers' compliance obligation. Despite some positive changes in the 15 day package, the characterization of these provisions as "pilot programs" and the significant barriers that still exist in the draft language substantively impede valid credit generation in apparent conflict with what ARB hopes to incentivize with the measure.

LCFS FF43-8

- ARB should not delete the multimedia evaluation provisions from the proposed regulations; to the contrary, ARB should be undertaking a multimedia evaluation for the LCFS as required by California Health & Safety Code. Multimedia evaluations are necessary in order to obtain a full and independent assessment of the range of potential environmental impacts of any newly proposed fuel regulations across all media. ARB's ADF multimedia evaluation and failure to undertake the required multimedia evaluation for the LCFS have not addressed the significant water demands associated with the production and use of biofuels under the LCFS, which may potentially exacerbate the severe drought California currently faces.

LCFS FF43-9

Specific

Revised Compliance Schedule

WSPA received confirmation from ARB staff that new compliance information will be provided to the ARB Board at the July 23rd hearing, and we'd like ARB to once again confirm that this information will be provided prior to the July hearing. Additionally, the revised compliance schedule is missing from the staff package. WSPA requests it be re-included.

LCFS FF43-10

Arbitrary Dates for Credit Generation

The LCFS reauthorization regulations contain multiple internal inconsistencies with respect to measuring CI reductions and the generation of credits. For example, even though the base year for measuring CI reductions under the regulations is 2010, the regulation as proposed uses refinery energy consumption data from 2011 through 2013 as the basis for estimating the petroleum refining process CI, rather than 2010 data.

Further, credit generation for fixed guideway systems and electric forklifts is permitted without regard to when these projects began operation. Yet, energy efficiency improvements implemented in petroleum refineries between 2010 and 2016 cannot generate credits, despite the fact that they have reduced the CI of the products.

LCFS FF43-3 cont.

Innovative crude production credits are available for solar steam and carbon capture and sequestration (CCS) projects that became operational as early as 2010, but are not available until January 1, 2015 for all other innovative crude production projects. There appears to be no consistency in the regulation's various segments as to a common date threshold of eligibility for credit generation.

The following chart illustrates this observation:

Element	***Proposed Code Section***	***Effective Date After Which Credits Can Be Generated***
Fixed guideway systems	95483(e)(6)	No threshold for eligibility—credits can be generated regardless of when operation began
Electric forklifts	95483(e)(7)	No threshold for eligibility—credits can be generated regardless of when operation began
Solar steam and CCS projects	95489(d)(1)(B)	2010
All non-solar steam and carbon capture and sequestration innovative crude projects	95489(d)(1)(B)	2015
Low-energy intense refineries	95489(e)(4)(B)	2015
Refinery investment credits	95489(f)	2017 (Permits received by 1-1-2016 –projects take at least 1 year to construct)

LCFS FF43-3 cont.

It is well-settled under California law that "logic and reason demand that [an] agency explain the basis for its decision." *McBail & Co. v. Solano County Local Agency Formation Com'n* (1998) 62 Cal.App.4th 1223. During the rulemaking process, an agency must provide a rationale for the elements of the proposed regulations; to be valid, regulations must be consistent. *Harris Transportation Co. v. Air Resources Board* (1995) 32 Cal.App.4th 1472, 1479; *see also Voss v. Superior Court* (1996) 46 Cal.App.4th 900, 916.

Federal courts agree that "an internally inconsistent analysis is arbitrary and capricious." *National Parks Conservation Association v. EPA*, Case No. 12-73757 (9th Cir. June 9, 2015), *see also Gen. Chem. Corp. v. United States*, 817 F.2d 844, 857 (D.C. Cir. 1987). An agency cannot simply mandate key elements or formulas within a regulation without an explanation of the basis for that decision. *National Parks Conservation Association, at *15-16*. Instead, an agency must explain the basis for exercising its discretion to craft a regulation in a particular manner; failure to do so will render the regulation invalid as arbitrary and capricious. *Id. at *17*.

But here, ARB proposes an internally inconsistent regulation with no explanation regarding the selection of incongruous dates to serve as the bases for credit generation for certain elements of the

regulation. WSPA objects to this level of inconsistency between elements and proposes that ARB adopt consistent dates for credit generation across the board. At the very least, ARB must offer its basis for the existing inconsistency between dates.

LCFS FF43-3 cont.

California Reformulated Gasoline and Ethanol Denaturant Calculator Spreadsheet

WSPA understands staff has made changes to the California Reformulated Gasoline and Ethanol Denaturant Calculator Spreadsheet since it was last posted. Since this spreadsheet is used not only to calculate the new baseline CaRFG values but also the new ethanol CI values, WSPA requests that the final version of this spreadsheet be posted for public review.

LCFS FF43-11

§ 95481.(a) Definitions

(9) "Biodiesel Blend" - The term "biodiesel blend" is not used anywhere in the LCFS regulation outside this section. The definition should be deleted.

(63) "Petroleum Product" - It is inappropriate to include co-processed biomass in the definition for "petroleum product." Staff should consider a broader term like "refinery product" to avoid confusion.

(67) "Product Transfer Document" - We continue to object to the redefining of "product transfer document" as a single document consolidating information from existing documents. This term should follow the traditional definition to allow flexibility for regulated parties.

(71) "Renewable Hydrocarbon Diesel" – we would prefer the definition include a reference to "elemental composition primarily of hydrogen and carbon". We also have concerns with the definition indicating that a fuel additive may be defined as "Renewable Hydrocarbon Diesel" as currently written.

Suggested language:

(71) "Renewable hydrocarbon diesel" means a diesel fuel that is produced from nonpetroleum renewable resources but is not a mono-alkyl ester, with an elemental composition primarily of hydrogen and carbon, and which is registered as a motor vehicle fuel under 40 Code of Federal Regulations Part 79.

LCFS FF43-12

§95483 (a)(2)(A-D). Regulated Parties

We are opposed to the deletion of this section and the associated edits in this section.

Striking a significant block of language related to the identification of regulated parties under the LCFS as part of a 15-day package, with no prior discussion of the change in the many workshops on the LCFS re-adoption, is arbitrary and capricious. Furthermore, this change does not add value to the program and does not address any issues with current compliance. What it does do is introduce an element of risk into compliance by removing the automatic transfer of obligation between regulated parties as product moves through the distribution system upstream of the terminal rack. Summarily removing this language increases the risk of discrepancies between the reports of regulated parties and unnecessarily complicates the nature of transactions between regulated parties. While staff characterizes this as "an unnecessary and complicated provision" in their explanation of the proposed change, the time to address such an issue would have been at the establishment of the program, not several years after the regulated community has developed business processes based upon the provision.

LCFS FF43-13

§95483. (e)(2), (e)(3)(A), (e)(3)(B), (e)(4), (e)(5)

As WSPA has stated numerous times in the past, we strongly oppose ARB's electricity provisions, and continue to propose that electricity NOT be part of the LCFS program. ARB should account for the GHGs from electricity separately and reduce the compliance obligation within the LCFS proportionally based on ARB's anticipated success of the roll-out of electric vehicles (EVs). LCFS FF43-14

In addition, we have new concerns specifically related to changes in the 15-day proposed rulemaking package. In general, WSPA feels these changes:

- Are substantive and should not be included in a 15-day regulatory package, LCFS FF43-15
- Are not explained or justified in the Notice of Public Availability, LCFS FF43-16
- Exasperate the un-level playing field for electricity providers, by further reducing their public accountability, recordkeeping, and metering requirements. LCFS FF43-17
- Increase concern regarding validity of credits generated from the electricity sector, and the decreasing amounts of due-diligence and reporting required by providers of electricity as a "transportation fuel". LCFS FF43-18
- Are not clear in regards to whether anyone will make sure there is a true accounting of credits generated from electric vehicle charging. LCFS FF43-19
    - If electricity providers are generating credits from residential charging from registration records and average electricity demand, will ARB subtract credits generated from private / workplace charging?
    - From fleet charging?
    - From public charging?

WSPA strongly opposes the following 15-day changes related to §95483(e) provisions:

1. ***Removal*** of the requirement that Electrical Distribution Utilities to "Use all credits proceeds to benefit current or future EV customers" (§95483(e)(1)(A)) from credits generated from public access charging, EV Fleets, or private EV charging (§95483(e)(2 - 4)). We urge ARB to correct the following reference in all parts of §95483(e) from:
   "must meet the requirements set forth in section 95483(e)(1)(B) through (D)."

   To:

   "must meet the requirements set forth in section 95483(e)(1)(A) through (D)." LCFS FF43-20
2. Under §95483(e), ARB's modifications make the electric distribution utility the default credit generator in essentially all EV charging cases. This approach could have the consequence of the utilities using their power to restrict innovation and experimentation within the electric vehicle charging industry. Instead, ARB should allow the market and customer choice to guide development by allowing companies installing electric vehicle charging stations to generate credits by default. LCFS FF43-21
3. Removal of the list of efforts that may be used to educate the public in 95483(e)(1)(B). LCFS FF43-22
4. Removal of the requirement that ARB post supplemental information for public review each year. LCFS FF43-23

5. The modification to allow investor owned utilities to use Public Utility Commission reporting in lieu of LCFS specific supplemental information. LCFS FF43-24

Furthermore, technology exists to directly measure residential EV electricity use and therefore should be required, consistent with recordkeeping required for other LCFS pathways. We incorporate by reference our February 2015 comments on the electricity provisions in our response to comments for the 45-day rulemaking package. LCFS FF43-25

Combined, these proposed modifications further reduce the standards that electricity providers are held to, as compared to liquid fuel providers. As WSPA has stated in the past, there is also a fairness issue. Liquid fuel providers are expected to submit extremely detailed records for reporting and comply with extensive application processes for obtaining a CI pathway (and the record-keeping requirements for some pathways). The proposed reduction in accountability and reporting requirements for electricity providers, combined with the "estimates" of electricity used for residential charging, does not support the notion of a "fuel neutral" program, and provides inconsistent treatment at best. LCFS FF43-26

In addition, it is not clear from the proposal whether a proper accounting of total credits from electric vehicle charging will be performed by ARB. LCFS FF43-27

§95485. Demonstrating Compliance (Cost Containment Mechanism)

WSPA's concerns regarding the Cost Containment Mechanism (CCM) contained in the LCFS re-adoption package remain, as the proposed 15-day package revisions do not implement any substantial modifications to address the previously-raised concerns regarding this tool's ability to accommodate systemic and prolonged LCFS credit shortages. WSPA remains opposed to the inclusion of the CCM in the LCFS because we do not believe that it will accomplish its stated objective (contain prices) and will instead have a number of undesirable (and unintended) consequences. More specifically, the Credit Clearance Market (CCM): LCFS FF43-28

Offers no certain path to retire carryover deficits

The CCM provisions in the LCFS re-adoption package (post the proposed 15-day package revisions) continue to obligate parties to participate in the year-end credit clearance market at prices as high as the pre-determined "cap" price and parties have no recourse but to carry over any remaining deficit into the following year with interest. The CCM provisions stipulate a five-year maximum deficit carryover period but no specific pathway to retire deficits if shortages persist year to year. Instead, obligated parties face the prospect of an ever-increasing accrued financial liability that is essentially outside their control. In a market that is consistently short credits year after year, the ability to defer unsatisfied obligations (with interest) offers little comfort to the regulated community who remained concerned with the possibility of ever-increasing deficits with no method to retire part of the obligation generated by an infeasible standard. LCFS FF43-29

May drive credit costs up

The CCM provisions in the LCFS re-adoption package (after the proposed 15-day package revisions) may not keep credit prices in check during periods of rising prices (i.e., credit shortages in the open market). The CCM to clear the market at the end of the year is meaningless during a credit-short environment as there will not be any remaining credits to be brought to the table by sellers. The LCFS FF43-30

compounding of interest on the carryover/deferred balances will make it likely that credit buyers will soak up the available pool of real LCFS credits in the market during the year and not wait for the CCM. The pool of real LCFS credits available is fixed – it is only their price that remains in question. Staff's setting of the price cap at $200/ton will likely serve as the benchmark for credit prices in that environment.

Conversely, during periods of stable or declining prices (i.e., credit surplus in the open market), the CCM cap price creates an artificial "floor" value below which sellers may be hesitant to offer real LCFS credits for sale to the regulated community at substantially lower prices. This may artificially increase compliance costs – as credit prices could be artificially raised to (or near) the ARB cap with the likely result of fewer transactions taking place before the end-of-year sale. Credit trading could be seriously impaired as the open market may not be allowed to function as it should.

LCFS FF43-30 cont.

<u>Provides no liability protection against invalid credits</u>

The LCFS re-adoption package (after the proposed 15-day package revisions) continues to lack an acceptable liability defense provision or protocol to protect obligated parties from potentially fraudulent credit sellers. The only protection buyers of credits have is to perform due diligence and carefully screen the parties they choose to engage as partners in LCFS credit-buying transactions. It appears that buyers will not be afforded this luxury in the credits they are obligated to purchase (pro-rata share) through the CCM. Moreover, the timetable being put in place by ARB to organize and complete the CCM does not give parties comfort that the agency will be doing any such screening of the credits that are pledged by sellers for the CCM. WSPA objects to the fact that parties may potentially wind up in a position of non-compliance through no fault of their own simply because there is a credit shortage and buyers need to participate in the CCM where they have no control over what credits they buy and from whom.

LCFS FF43-31

<u>Offers no connection to LCFS program sustainability</u>

LCFS credit market liquidity (measurable potentially through a number of different indicators) is not only essential to the program's success but, also, the absence of such liquidity (as evidenced through the CCM) should be viewed as a clear signal that the program's CI reduction targets are overly aggressive and that the regulated community is finding it difficult to meet its obligations and remain in compliance. There is no connection in the CCM provisions of the
LCFS re-adoption package (after the proposed 15-day package revisions) to bring about a comprehensive program review should the potential trend of systematic credit shortages materialize and persist.

LCFS FF43-32

<u>Does not clarify the mechanics of deficit carryover</u>

The CCM provisions of the LCFS re-adoption package (after the proposed 15-day package revisions), while improved over the initial ISOR version, remain lacking in the execution/implementation details that would allow parties to understand exactly how the CCM would work. We recognize that staff has added some clarification to indicate that parties cannot retire accrued previous years' obligations until they have satisfied (met) their obligation for the immediately previous year. Staff has also included clarification of when the interest on accumulated carryover obligations will occur (i.e., in May each year prior to the start of the CCM in June).

LCFS FF43-33

While this seems to be pointing to a Last-In-First-Out (LIFO) accounting method, it does not explicitly indicate how older obligations are to be addressed. For example: Can parties retire (through blending or purchases) obligation carryover from four years ago before they retire corresponding deficits carried over from two years ago? Moreover, the application of a LIFO method (if indeed that is staff's intent) appears punitive in that it would maximize the accrued interest on obligation deficits carried over from previous years. We emphasize that such obligation carryovers could occur through no fault of the parties (i.e., even after they have made every best faith effort to cover their annual obligation) and find it objectionable that, not only will there be an interest penalty levied for carryovers through the CCM, but that this penalty will be maximized by not allowing the oldest obligations to be retired first. LCFS FF43-34

Furthermore, while we understand at what point during the year the interest will be levied (i.e., in May), we are uncertain as to whether the immediately preceding year's unmet obligation will also be included in the calculated interest. We do not believe that should be the case as parties should be given the opportunity to cover an additional part of any such remaining obligation from the immediately preceding year through the CCM. We believe this to be staff's intent but request clarification that interest will be applied the May following the Credit Clearance Market or one year after the initial annual report is submitted. We propose the following language for section 95485. (c)(5)(A): LCFS FF43-35

(A) Compound Interest on Accumulated Deficits. Regulated Parties with an Accumulated Deficit will be charged interest to be applied annually to all deficits in a regulated party's Accumulated Deficit account. Interest will be applied in terms of additional deficits that must be retired pursuant to section 95485(c)(1)(B), above, at a rate of 5 percent annually, applied May 1, 20XX, where 20XX = compliance year +2.

Based on the proposed 15-day package revisions, the criteria and conditions for retiring deficit carryovers in paragraph 95485(c)(5)(C) appear confusing in that they could be interpreted to limit a regulated party's ability to retire older deficits through the CCM. While we disagree with staff's apparent selection of the LIFO credit accounting method as indicated above, we would like staff to explicitly indicate their intent that regulated parties can buy more credits from the CCM than their immediate prior year's obligation shortfall as long as: a) they have used up all their accumulated credits and still have a carryover balance from years other than the immediately preceding year, and b) they first retire their immediate prior year's obligation through the credits obtained through the CCM. LCFS FF43-36

Additional comments on specific provisions under the CCM are as follows:

§95485. (c)(4)(B)

WSPA continues to strongly object to ARB publishing a list of Credit Clearance Market participants and each participating party's pro-rata share of pledged credits, and WSPA feels ARB's decision to list this information without any explanation or basis is arbitrary and capricious. LCFS credit and/or deficit balances and the individual entity names should be treated as highly confidential business information because the release of this information could adversely impact business operations. This proposal to make public the long and short credit positions of regulated parties violates the principles underlying protection of confidential business information. A regulated party's competitive position could be seriously compromised by the publication of this information. In addition, this information would give competitors both an understanding of a regulated party's compliance strategy and a view LCFS FF43-37

into the regulated party's fuel and credit acquisition activity for the year. Using this information and average market pricing, one could estimate the financial impact of LCFS compliance on a regulated party. It is well-established that this information is protected from disclosure under California law, and ARB should treat it as the highly confidential information it is. *See, e.g,* Cal. Gov. Code § 6254; Cal. Evid. Code §1060.

LCFS FF43-37 cont.

§95485. (c)(5)(D)

WSPA understands ARB is proposing to prohibit entities that have a roll-over deficit under the credit clearance approach from transferring/selling credits to another party until the deficit is "paid back." WSPA understands this prohibition is only intended to apply to "separated" credit transactions and not to the transfer of obligation with physical fuel. We are requesting that ARB confirm this in writing. WSPA still requests clarification that the prohibition on credit transfers and sales does not include credits attached to biofuels that move by default in the transactions. This could be handled in a response to comment or guidance.

LCFS FF43-38

§95486. (a)(4)(B)(4)(b) Generating and Calculating Credits and Deficits

WSPA supports ARB allowing regulated parties to use Carryback Credits to minimize any compliance shortfalls.

Section 95486(c) - Credit Generation Frequency. Beginning 2011 and every year afterwards, a regulated party may generate credits quarterly after data are reconciled with its business partner.

WSPA believes the new proposed language is unworkable in its current form. WSPA supports the goals of staff of accurate reporting, and we support the new reporting provisions requiring an initial report followed by a 45 day reconciliation period. Section 95491 Reporting and Recordkeeping (a)(1)(A) calls for reporting parties to "work in good faith with their counter parties to resolve any fuel transaction discrepancies between the parties". WSPA supports this but notes this does not ensure there will not be any discrepancies between reporting parties. To be consistent with section 95491, WSPA believes the language of 95486(c) should be modified to state (proposed change in red):

> (c) Credit Generation Frequency. Beginning 2011 and every year afterwards, a regulated party may generate credits quarterly after ~~data are reconciled with its business partner.~~ the quarterly report has been submitted in the LRT. Regulated parties shall **make a good faith effort to** reconcile their data with their business partners before submission.

LCFS FF43-39

§95487. (c)(1)(B) Credit Transactions - Confidentiality

ARB proposes to remove the following language from the regulation:

> "Except as provided in section 95487(d) below, the Executive Officer will treat information submitted in the online Credit Transfer Forms as Confidential Business Information."

WSPA objects to ARB's removal of the language and requests that it be reinstated. Protection for such information is well-established under California law. Pursuant to the Government Code, such confidential business information is excluded from responses to Public Records Act requests. *See, e.g,* Cal. Gov. Code § 6254; Cal. Evid. Code §1060. This information has always been designated as Confidential Business Information under the LCFS, and ARB has provided no explanation as to why it

LCFS FF43-40

should be classified differently as part of this rulemaking. Removal of this language without explanation is arbitrary and capricious, and ARB must continue to fulfill its statutory obligation to protect such information from disclosure. Accordingly, WSPA requests that the stricken language be added back into section 95487(c)(1)(B). LCFS FF43-40 cont.

§95488. (a)(3) Obtaining and Using Fuel Pathways.

During the original revisions to the LCFS re-adoption, released in December, 2014, there were apparently significant revisions to Section 95488 relating to Provisional Pathways. The 15-day package released in June of 2015 further revised this section by including Tier 1 pathways. While the regulation does say that "Based on timely reports, the applicant may generate provisional credits", it also says, "such credits may not be sold, transferred, or retired for compliance, nor may fuel with a provisional CI be transferred with obligation." The revised regulation also goes on to say that "The applicant may not sell credits generated under a provisionally-approved pathway, or transfer the provisional fuel with obligation, until the Executive Officer has adjusted the CI or informed the producer that the provisional CI has been successfully corroborated by operational records covering a full two years of commercial operation".

Upon becoming aware of this revision (with respect to the addition of Tier 1 pathways in the 15-day package as well as the original language apparently revised in December 2014), understandable concern was raised by fuel investors and compliance entities alike as this section could be interpreted to mean that start-up facilities and pathways cannot sell credits or sell fuels (with an obligation) until they have operated for 2 full years. Obviously if this interpretation were to hold, this section of the regulation would significantly undermine the innovation that the LCFS itself seeks to encourage. Few, if any, plants or new pathways would be economic if they were not able to sell credits – or sell fuel with obligation– within the first 2 years of operation – a critical time period in the lifetime of a new operation. An Argus article dated June 11 discussed the potential impact of these revisions on the market as follows: LCFS FF43-41

> *The point of the program is to help commercialize new low-carbon fuels, but the provisional credit provision creates two years of uncertainty for affected producers unless they are comfortable with waiting up to two years before they can sell the credits and bank their cash value.*
>
> *The regulations could lock up significant amounts of credits or actual fuel supplies from new conventional low-carbon fuel producers, said Philip Sheehy, a technical specialist at consultant ICF. Credit prices could rise up to near the program's price cap of $200/t in 2018 or 2019, according to recent ICF forecasts that account for the provision credits system.*

In subsequent conversations, staff acknowledged that this section of the regulation was poorly drafted and that it is not the intent of the regulation to prohibit generation of credits or sale of fuels from start-up operations. It is crucial that staff immediately clarify the language of this section of the regulation by an appropriate mechanism. It is critical that both investors and regulated parties clearly understand the intent of this section of the regulation.

§95489. Provisions for Petroleum-Based Fuels (Refinery Investment Credit and Hydrogen Co-processing)

WSPA's primary concern throughout the process of developing the specific provisions and eligibility criteria related to the refinery investment credit and hydrogen co-processing provisions has been that the stringency of the provisions and criteria not be so restrictive that no projects will be eligible to generate credits. Most of the changes WSPA recommended leading up to the February Board meeting and in subsequent discussions with staff on the 15-day package were aimed at preserving the ability to generate credits from eligible projects.

Staff has made some improvements in addressing our comments consistent with the idea that more projects will be eligible. Unfortunately, some provisions remain problematic despite the changes CARB has proposed; and CARB has added new provisions that go in the wrong direction with respect to enhancing opportunities for project eligibility.

Improvements in the Proposal

- We appreciate staff's revision to allow potential criteria pollutant and/or toxics increases associated with candidate projects to be offset as provided in the applicable project permitting requirements. This was one of the key changes WSPA had identified as necessary to make the proposal viable and equitable. LCFS FF43-42
- WSPA is also in agreement with staff's decision to remove the proposed 50% discount for any credits generated by "less efficient refiners," as the methodology employed was rather arbitrary and had the potential to discriminate against complex refineries or penalize refineries that may have made prior investments in GHG reduction projects. LCFS FF43-43
- WSPA also appreciates staff's decision to reduce the 10% bio-feedstock minimum in the Hydrogen Co-processing provision which should make it more likely for such projects to move forward. LCFS FF43-44

Provisions that were not Sufficiently Addressed

- Staff did not act to avoid other arbitrary restrictions and thresholds to encourage innovative GHG reductions, most notably the 0.1 gCO2e/MJ minimum CI improvement for RIC project eligibility. This remains an inequitable provision as the standard will be much more difficult to meet for larger, fully integrated refineries. WSPA continues to maintain that supplementing this standard with an alternative flat 5,000 metric ton of CO_2e per year project impact threshold would allow more credit generation without unduly burdening staff with an overwhelming number of applications involving small projects. LCFS FF43-45
- While we are well aware of staff's unwillingness to provide retroactive credit for projects that have already started up (even if the start date was after the start of the LCFS program), we are completely puzzled by staff's refusal to implement a simple, practical and equitable criterion for project eligibility pivoting off the project's start date, i.e., the date GHG reduction benefits LCFS FF43-46

begin to accrue. We also highlight the potential unintended adverse impact that the current criterion (permit to construct issued after January 1, 2016) might have on projects currently underway in that it could provide an incentive to delay such projects and potentially withdraw/refile permit applications to ensure that the permit to construct is not issued before January 1, 2016 (rendering the project ineligible for RIC credits). We believe that this was not staff's intent. WSPA continues to maintain that staff's proposed RIC eligibility criteria penalizes early actors.

As stated above, WSPA feels the base year should be consistent across all elements of the LCFS. However, at a minimum we recommend that, if staff wants to utilize the permit to construct data issuance (instead of project startup date) as the eligibility threshold, at a minimum staff should utilize January 1, 2015 as the associated date and not January 1, 2016.

LCFS FF43-46 cont.

- Lastly, WSPA notes staff's reiteration in the LCFS 15-day package of the earlier attempt to differentiate RIC candidate projects based on whether they are capital projects or part of routine refinery turnarounds and/or maintenance. We remain uncomfortable with the lack of specificity of the proposed language that calls for identification of the primary purpose or intent of a candidate project. We continue to believe that non-capital projects that offer sustained GHG improvements should be included since many energy efficiency upgrades are considered non-capital and may be part of a multi-pronged refinery strategy to simultaneously upgrade equipment for improved reliability, reduced maintenance and enhanced energy efficiency. Such projects could include shutdowns (i.e., replacement of a fired heater with heat exchangers) and should not be excluded from generating a credit. Staff should clarify that projects whose primary intent is increased energy efficiency but involve equipment shutdowns are not excluded.

LCFS FF43-47

<u>New Provisions or Changes that are Problematic</u>

- Staff has removed entirely the ability to generate RIC credits from co-processing liquid bio-feed stocks at facilities, leaving Hydrogen co-processing as the only viable option available to some. While the opportunity to seek dedicated pathway approvals for such applications is still provided, staff's action eliminates substantial flexibility for parties' smaller scale projects/applications that may not warrant the dedication of time and resources to the rigors of the specified pathway approval processes.

LCFS FF43-48

- WSPA is disappointed with staff's apparent "change of heart" regarding the RIC as evidenced by staff's recasting of this provision (as well as the Hydrogen Co-processing provision) as "pilot programs" designed to allow staff "time to evaluate the credit potential from these provisions and prevent any unanticipated impacts, if the volumes outstrip current expectations."

  In WSPA's view, this is a fundamental change in staff's approach to what had been a significant part of the LCFS 45-day proposal– one that was discussed extensively during the nearly year-long workshop process leading to the February Board hearing and one that our industry had invested extensive time and resources to ensure it is a workable and practical provision. The implication of a pilot program designation is one of potentially temporary

LCFS FF43-49

provisions that may be terminated in future program revisions. This leaves our industry with uncertainty as far as proceeding with the necessary investments to implement GHG reduction projects at facilities where projects may be consistent with what was perceived as the original intent of including the RIC provision in the LCFS.

LCFS FF43-49 cont.

- Further evidence of staff's concern in this regard can be found in the implementation of largely unsubstantiated "caps" on the potential contribution from the RIC (at 20% of a regulated party's annual credit obligation) and the Hydrogen Co-processing provision (at 10%) whose sole purpose appears to be to provide further "insurance" that our industry could not actually rely on these provisions for anything more than a small percentage of the overall compliance obligation. Such an approach is inconsistent with the concept of 'neutrality" that staff (and the Board) have reiterated upon numerous occasions involving the variety of LCFS compliance options available to regulated parties. .

LCFS FF43-50

- The RIC and Hydrogen Co-processing provision included in the LCFS 15-day package go even further in curtailing the practical utility of these provisions in limiting the ability of a party that generates such credits to do anything other than use them for their own compliance purposes, (i.e., prohibiting the sale of such credits in the marketplace).

LCFS FF43-51

We understand that this may not be staff's intent and that this flexibility-limiting provision may be simply the result of limitations in staff's ability to bring about the necessary LRT revisions in a timetable consistent with the LCFS re-adoption schedule. Nevertheless, WSPA once again needs to point out the rather arbitrary application of "neutrality" in that other eligible credit generating mechanisms in the regulations (e.g., electricity) are not limited in the volume of credits that can be generated, or in their ability to participate in the credit markets.

LCFS FF43-52

Despite some improvements made by staff in the 15-day package, WSPA still believes that the current proposal substantively impedes valid credit generation in conflict with what ARB hopes to incentivize with the measure. These impediments not only manifest themselves as direct limitations to the quantity of credits that can be generated, but also by creating uncertainty that erodes credit generation prospects. As a result, few, if any, credits are likely to be generated from the provision as written – particularly while the provision remains a "pilot" program.

LCFS FF43-53

§95490. Multimedia Evaluation

WSPA strongly disagrees with ARB's decision to completely eliminate the multimedia evaluation provisions in section 95490, as well as the proposed elimination of the definition of "multimedia evaluation" from section 95481(a)(59) and the proposed deletion of the application requirements related to multimedia evaluations in section 95488(c)(4)(G)6.d.

LCFS FF43-54

WSPA also strongly disagrees with ARB's statement, in its Notice of Public Availability of Modified Text, that the LCFS "does not establish any fuel specifications." *Notice of Public Availability at 9.* As discussed in our February 17, 2015 comments on the proposed regulations, carbon intensity as established by the LCFS is a criterion or "specification" to which motor vehicle fuels must comply. The Health & Safety Code itself recognizes a fuel specification for light-duty vehicle exhaust emission standards—standards that, like the LCFS, are based on overall emissions from fuels as opposed to quantification of their particular components. Cal. Health & Safety Code § 43018(d)(1). Even the Ninth Circuit has already considered the LCFS to be a fuel control measure. *See Rocky Mountain*

LCFS FF43-55

Farmers Union v. Corey, 730 F.3d 1070 (9th Cir. 2013) (recognizing that the LCFS is "a control respecting a fuel or fuel additive and was enacted for the purpose of emissions control"). LCFS FF43-55 cont.

ARB should not delete the multimedia evaluation provisions from the proposed regulations; to the contrary, ARB should be undertaking a multimedia evaluation for the LCFS as required by California Health & Safety Code. Multimedia evaluations are necessary in order to obtain a full and independent assessment of the range of potential environmental impacts of any newly proposed fuel regulations across all media. ARB has enough information regarding the types and blends of fuels that will likely be used to meet the LCFS to conduct a multimedia evaluation for the regulation. LCFS FF43-56

Given the severe drought conditions California currently faces, the multimedia evaluation must take into account the significant water demands associated with the use of biofuels, which are outlined in more detail in the peer-reviewed study by Julian Fulton of the Energy and Resources Group at U.C. Berkeley and Heather Cooley of the Pacific Institute. The multimedia evaluation for the ADF regulations fails to evaluate these potential impacts. LCFS FF43-57

The LCFS' carbon intensity fuel specifications stand to promote the use of multiple types of fuels that have not been fully evaluated for potential water impacts. As Fulton and Cooley note:

> "California's Low Carbon Fuel Standard…has reinforced demand for bioethanol as a means to reduce the greenhouse gas intensity of transportation fuels. Although early LCFS policy assessments raised the issue of water demands and impacts from increased biofuel production, any subsequent efforts to track or address those impacts through policy have been lacking." Fulton and Cooley, The Water Footprint of California's Energy System, 1990-2012 (February 26, 2015) at 10.

LCFS FF43-58

The potential for significant impacts makes a multimedia evaluation for the LCFS all the more critical. The evaluation should be completed as soon as feasible to comply with the Health & Safety Code. LCFS FF43-59

§95491. Reporting and Recordkeeping - Table 12

- WSPA recommends that the requirements for ARB in determining the annual average crude carbon intensity be included in Table 12. LCFS FF43-60

§95491(a)(7) Reporting and Recordkeeping

We object to the removal of annual reports from the section related to Correcting a Previously Submitted Report. There may be instances in which an annual report may also need to be re-opened for corrective edits and resubmittal. The removal of annual reports from this section essentially dis-allows regulated parties to correct previously submitted annual reports. LCFS FF43-61

§95494. Penalties

As discussed in WSPA's comments of February 17, 2015, WSPA opposes a per-day penalty, but does not oppose a maximum penalty of $1000 per tonne of deficit. While AB 32's enforcement provisions provide for per day penalties when a violation results in the emission of an air contaminant, where, as here, no actual emission of air contaminant is occurring on a per day basis, the imposition of such a penalty would be unjustifiably punitive, excessive and onerous. *See* Cal. Health & Safety Code §§ LCFS FF43-62

42400.1, 42400.3. A per deficit penalty approach is authorized by the Health & Safety Code. *See* Cal. Health & Safety Code § 38580(b)(3).

The proposed changes to section 95494(c) appear to embrace a per-deficit penalty, but the vague language needs to be clarified. The proposed language currently reads:

> "Each deficit that is not eliminated at the end of a compliance period or carried over as permitted by section 95485 constitutes a separate day of violation, subject to a penalty not to exceed $1000 per deficit."

LCFS FF43-62 cont.

The addition of the words "day of" essentially turns the per deficit penalty into a per-day penalty for each deficit, which WSPA strongly opposes as unduly onerous and unjustifiably excessive —all the more so because ARB has removed regulated parties' ability to request that their annual reports be re-opened for correction. WSPA suggests the following language be adopted:

> "Each deficit that is not eliminated at the end of a compliance period or carried over as permitted by section 95485 constitutes a separate ~~day of~~ violation, subject to a penalty not to exceed $1000 per deficit."

§95495. Defining "Material Information"

Including in the definition of "material Information" "information that would affect by any amount the Executive Officer's determination of a carbon intensity score…" potentially broadens ARB's authority to suspend, modify, or revoke credits. As discussed in WSPA's February 17, 2015 comments, the regulations penalize credit holders if they hold invalid credits, even if that occurs despite a regulated party's best efforts to hold valid credits. ARB may not require entities to participate in the credit scheme without providing some level of certainty that credits validly represent the reductions they purport to represent. *See* Cal. Health & Safety Code § 38562(d)(1) ["Any regulation adopted by the state board pursuant to this part or Part 5 [market-based compliance mechanisms] shall ensure all of the following: (1) The greenhouse gas emission reductions achieved are real, permanent, quantifiable, ***verifiable***, and enforceable by the state board …"] [emphasis added].

LCFS FF43-63

An appropriate definition of "material information" as used in the subsection would help to minimize the risk of arbitrary invalidation by limiting the bases for invalidation under proposed section 95495(b)(1). WSPA therefore requests that section 95495(b)(1)(G)1 be stricken from the regulation.

§95496. Regulation Review

Assuming continuation of the LCFS program, we support the addition of a 2017 Progress Report on the LCFS to the ARB Board and the inclusion of public review of the Progress Report findings.

LCFS FF43-64

Comment Letter 43_FF_LCFS_WSPA Responses

LCFS FF43-9

The comment states that multimedia evaluation provisions from the proposed LCFS Regulation should not be removed. As ARB explained in its first notice of 15-day changes in the proposed LCFS rule, the deletion of section 95490 from the proposed LCFS Regulation would eliminate a provision that largely restated the statutory requirement for a multimedia evaluation that is found at Health and Safety Code Section 43830.8. The LCFS provision that restated the multimedia evaluation requirement would have been made even more redundant of other provisions of law in light of the proposed ADF Regulation, which is proposed to provide more detailed rules for multimedia review under section 43830.8 for alternative diesels fuels that are introduced to California. Even with the deletion of section 95490 as initially proposed in December 2014, a multimedia evaluation meeting statutory requirements would continue to be required before ARB establishes a fuel specification for a new fuel. See also responses to comments **LCFS FF45-4** and **LCFS FF45-5**.

The proposed LCFS Regulation does not contain any fuel specifications. Therefore, no multimedia assessment is required for the LCFS Regulation. As noted elsewhere, multimedia assessments would be conducted under section 43830.8 when any new fuels are introduced that require establishment of a new fuel specification, or in the case of new alternatives to diesel, before the fuel is considered for Stage 3 sales under the proposed ADF Regulation. See response to comment **LCFS 40-23**.

The comment also states that water demands associated with the production and use of biofuels should be addressed. Impact 18.a in the Draft EA ("Increased demand for water, wastewater, electricity, and gas services") addresses potential changes in water demand associated with changes to crop types and the need for new or modified facilities. The Draft EA acknowledges that, "Changes in land use, associated with biofuel feedstock production are likely to change water demand to support new crop types, depending on the size, location, and existing uses. This could result in an increase or decrease in water demand, and would be subject to availability and regulatory requirements (page 101 of the Draft EA)." Additionally, the impact analysis goes on to explain that, "any new or modified facilities, no matter their size and location, would be required to seek local or State land use approval prior to their development (page 101 of the Draft EA)." Mitigation Measure 18.a is recommended to reduce potentially significant impacts, and

includes the following recognized practices that are routinely require to avoid and/or minimize utility and service-related impacts:

Proponents of new or modified facilities constructed as a result of reasonably foreseeable compliance responses would coordinate with local or State land use agencies to seek entitlements for development including the completion of all necessary environmental review requirements (e.g., CEQA). The local or State land use agency or governing body would certify that the environmental document was prepared in compliance with applicable regulations and would approve the project for development.

Based on the results of the environmental review, proponents would implement all mitigation identified in the environmental document to reduce or substantially lessen potentially significant impacts on utilities and service systems. The definition of actions required to mitigate potentially significant utility or service-related impacts may include the following (however, any mitigation specifically required for a new or modified facility would be determined by the local lead agency):

- Comply with local plans and policies regarding the provision of water supply, wastewater treatment, and storm water drainage utilities, and solid waste services.
- Where an on-site wastewater system is proposed, submit a permit application to the appropriate local jurisdiction.
- Where appropriate, prepare a Water Supply Assessment (WSA) consistent with the requirements of Section 21151.9 of the Public Resources Code/ Section 10910 et seq. of the Water Code. The WSA would be approved by the local water agency/purveyor prior to construction of the project.
- Comply with local plans and policies regarding the provision of wastewater treatment services.

As stated in the draft EA on page 102, “the authority to determine project-level impacts and require project-level mitigation lies with land use and/or permitting agencies for individual projects, and the programmatic analysis [in the EA] does not allow project-specific details of mitigation, there is inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts.” As a result, impacts associated with increased demand for water, as well as wastewater, electricity, and gas

services, are considered in this EA to be potentially significant and unavoidable.

California is currently facing a drought, as noted in the comment. To address concerns related to water resources, the text to the Draft EA, on page 101, has been modified as follows:

> …Changes in land use, associated with biofuel feedstock production are likely to change water demand to support new crop types, depending on the size, location, and existing uses. This could result in an increase or decrease in water demand, and would be subject to availability and regulatory requirements.
>
> The areas in which new water demands, associated with the proposed regulation, may occur cannot currently be known because the regulations do not mandate specific locations. Water supplies within California and elsewhere are generally not predictable over long periods of time (e.g., decades), and change according to factors, such as rainfall, temperature, and snowpack, as well as land use and population changes. Planning for these changes and consideration of water allocations is on-going and subject to federal, state, and local regulations. Regardless, the proposed LCFS and ADF Regulations do not dictate the particular location of cultivation, or type, of feedstocks that may be used to produce biofuel. The ability to produce low carbon fuels and alternative diesel fuels would be subject to the availability of locally available resources, including water, and other physical and economic factors.

These changes would not affect the impact conclusion or mitigation measures provided in the Draft EA, under Impact 18.a.

LCFS FF43-54 The comment expresses strong disagreement with ARB's elimination of the multimedia evaluation provisions from the proposed LCFS Regulation. ARB notes the comment. See responses to **LCFS FF43-9**, **LCFS FF45-4**, **LCFS FF45-5, and LCFS FF45-54** through **LCFS FF45-58** for responses to comments raising more specific objections to ARB's elimination of the multimedia evaluation provisions from the LCFS proposal.

LCFS FF43-55 The comment expresses strong disagreement with ARB's view that the proposed LCFS Regulation does not establish a fuel specification; the LCFS proposal establishes carbon intensity for

fuel, and the comment asserts that carbon intensity is a fuel specification that triggers the need for a multimedia evaluation. ARB disagrees. The LCFS proposal only prescribes declining average carbon intensity standards for transportation fuels consumed in California in a given year. It does not require a particular carbon intensity standard for any particular fuel or fuel type, and it does not specify required physical or chemical properties for a fuel. Furthermore, the LCFS is not limited to vehicle exhaust emissions but instead on lifecycle emissions of the fuel. While the LCFS may be considered a fuel control measure in that it controls the average lifecycle carbon intensity of the state's transportation fuel pool, it does not establish a specification for any fuel and cannot be considered a fuel specification. See response to **LCFS 40-23**.

LCFS FF43-56 The comment states that instead of deleting the multimedia provisions in the LCFS Regulation, ARB should have subjected the proposed LCFS Regulation for multimedia evaluation based on information that ARB has regarding the types and blends of fuels that would likely be used to meet the standard. See response to **LCFS 40-23** for an explanation of why ARB does not believe a multimedia evaluation of the LCFS is required. ARB also disagrees with the comment's suggestion that a meaningful multimedia evaluation could be performed based on information regarding what fuel types would be used to meet the proposed LCFS standard. The fuel volumes in ARB staff's illustrative compliance scenario are merely ARB's assessment of one possible scenario by which the standard could be met given anticipated fuel availability, and actual fuel supplied to California may vary substantially from that scenario based on market developments, including the decisions of fuel producers and suppliers. Furthermore, and most fundamentally, the LCFS proposal contains no provisions that would alter existing state and federal fuel specifications that apply to transportation fuels that would be used in California. This means that agencies involved in an attempted multimedia evaluation of the LCFS Regulation would have nothing to review that was not already required by existing law, e.g., U.S. Environmental Protection Agency fuel specifications.

LCFS FF43-57 The comment states that, given the severe drought conditions in California, the multimedia evaluation must take into account the significant water demands associated with the use of biofuels. ARB staff disagrees with this statement. The multimedia evaluation guidelines must be based on specific statutory requirements, and those do not include recommendations to address water demand.

At a meeting held on June 23, 2015, the Multimedia Working Group found that the Biodiesel MME complies with state laws and regulation. Potential impacts associated with water demand are discussed in response to comment **LCFS FF43-9**.

LCFS FF43-58 The comment states that multiple types of fuels have not been fully evaluated for potential water impacts. Please see response to comment **LCFS FF43-9**.

LCFS FF43-59 The comment says a multimedia evaluation of the LCFS is especially critical because of the potential for significant impacts, including, based on the preceding comment, the impacts on water supply. ARB notes that the multimedia evaluation process is not intended to duplicate environmental impact analysis conducted under CEQA. Rather, the multimedia analysis evaluates a fuel's physical and chemical properties compared to the fuel it replaces and the potential impacts on human health and on air, water, and soil. See responses to **LCFS 43-9** and **LCFS 43-57** on the issue of water supply impacts.

This page intentionally left blank.

Comment letter code: 45_FF_LCFS_GE

Commenter: Joshua Willter

Affiliation: Growth Energy

The following letter was submitted to the LCFS Docket during the First 15-day comment period.

This page intentionally left blank.

45_FF_LCFS
_GE

Growth Energy's Comments on June 4, 2015, 15-Day Notice for the Proposed Revisions to the LCFS Regulation

On December 30, 2014, CARB circulated for public review an Initial Statement of Reasons (the "ISOR") and an Environmental Analysis ("EA") for CARB's proposed revisions to the Low Carbon Fuel Standard (the "LCFS regulation"). Following a February 19, 2015, public hearing on the LCFS regulation, the Board directed staff to consider modifications to the LCFS regulation, and respond to environmental comments.

CARB released proposed modifications to the LCFS regulation through its June 4, 2015, Notice of Public Availability of Modified Text and Availability of Additional Documents (the "15-Day Notice"). Due to various concerns regarding the LCFS regulation, including issues raised in the 15-Day Notice, Growth Energy submits the following comments on the proposed modifications to the LCFS regulation under the California Environmental Quality Act, the California Administrative Procedures Act, and the Health & Safety Code.

A. CARB's LUC Value for Corn Ethanol of 19.8 gCO_2e/MJ Is Not Supported By Substantial Evidence, and Would Result in Adverse Climate Change Impacts

CARB's proposed revisions to the LCFS regulation contemplate a land use change ("LUC") value for corn ethanol of 19.8 gCO_2e/MJ. This value, however, is not supported by substantial evidence. Specifically, to calculate the corn ethanol LUC, CARB staff used the average of five price-yield values [0.05, 0.10, 0.175, 0.25, and 0.35], which is 0.19. LCFS FF45-1

As explained in the accompanying declaration of Tom Darlington, a price-yield of 0.19 is contrary to the evidence, as the value recommended by Purdue is 0.25. (Decl. Darlington ¶ 5.) Lower price yields such as 0.05 and 0.10 are also inconsistent with CARB's own modeling. The research that could be read as supporting such low price-yields is based on short-term shock, while CARB's GTAP model uses medium- and long-term shock. (*Id.*)

Moreover, the only study relied upon by CARB to support a low price-yield value was prepared by David Rocke of UC Davis. The Rocke analysis is based on only one set of data – a 2012 dissertation by Juan Francisco Rosas Perez, who concluded that price-yield response was approximately 0.29. Despite the use of this data set, the Rocke study concluded – based on his own "statistical analysis" – that the price yield should be lower. (*Id.* ¶ 6.)

The rulemaking file does not contain an explanation as to how the Rocke study reached this conclusion or performed his statistical analysis. While commenting parties have requested this data, CARB staff has never supplied the data to the public. As a result, there is no evidentiary support for the lower price-yield values, and CARB should eliminate the lowest two values – 0.05 and 0.10 – due to a complete lack of evidentiary support for those values. (*Id.* ¶¶ 5-7.)

This failure is not merely academic. If the lowest two price yield values are eliminated, CARB's average price yield for corn ethanol would be 0.26. This would result in a

LUC value for corn ethanol of 15.53 gCO_2e/MJ, compared to 19.84 gCO_2e/MJ, (*id.* ¶ 7, Table 1), which would in turn lower the Carbon Intensity ("CI") Value for corn ethanol. LCFS FF45-1 cont.

In addition to the practical consequences on the use of corn ethanol in the marketplace, CARB's reliance on unsupported price-yields also has real environmental consequences. The LUC values are a component of the CI Value placed on a fuel by CARB. If CARB inaccurately calculates the LUC (and thus the CI value) of a fuel as being too high, it will incentivize the use of fuels that have a higher carbon intensity, creating an adverse climate change impact. In the rulemaking for the first LCFS regulation, CARB's consultants explained the importance of accurately calculating the CI Values in the Lookup Table: LCFS FF45-2

> [I]f we make a mistake in one direction in estimating these numbers, we'll use too much of a biofuel that's actually higher carbon [than] we thought and will therefore increase global warming. And if we use numbers that are too low, then we'll use too little of a biofuel that's lower carbon than we thought and will therefore increase global warming.

(Attachment "C" at 73-74 [excerpts from April 23, 2015, CARB Meeting].)

To avoid these potential adverse consequences, and to develop LUC Values (and thereby CI Values) that are based on scientific data, CARB should eliminate the lowest two values – 0.05 and 0.10 – for its average price-yield for corn ethanol.

B. CARB's LUC Value for Brazilian Cane Ethanol Is Not Supported By Substantial Evidence, Due to Errors in the GREET Model

LCFS FF45-3

The most recent version of the GREET model made available in June 2015 contains an error in its estimation of emissions resulting from ethanol produced from sugar cane in Brazil. Specifically, as explained in the accompanying declaration of Tom Darlington, an error in the GREET model results in cane ethanol plants with no mechanized harvesting having the same emissions as plants with 100% mechanized harvesting. (Decl. Darlington ¶ 10.) The correction of this error would obviously result in an increase in the CI Value for cane ethanol.

C. CARB Should Not Eliminate the Multimedia Evaluation Provisions From the LCFS

LCFS FF45-4

The 15-day Notice for the revised LCFS regulation suggests that CARB is proposing to eliminate the multimedia evaluation ("MME") provisions for new fuels contained in Sections 95490, 95481(a)(59), and 95488(c)(4)(G). As explained in the Declaration of Jim Lyons, the removal of the MME for new fuels has the potential to result in additional emissions and other adverse impacts. (Decl. Lyons ¶¶ 7-10.) Further, this change is not sufficiently related to the original text of the regulation such that a member of the directly affected public could have been put on notice that the changes had the potential to occur. Thus, CARB should reinstate the MME provisions and/or recirculate the proposed LCFS regulation for a full 45-day public review.

1. The Elimination of the MME for New Fuels Could Result in Additional Emissions

The elimination of the MME requirement for new fuels will result in potentially significant environmental effects. First, the MME process provides important safeguards to help ensure new fuels will not result in increases in emissions. (See, e.g., Health & Saf., § 43830.8.) Without such safeguards, fuels can be allowed in California that result in additional emissions of criteria pollutants.

For example, CARB permitted the introduction of biodiesels into the California market without requiring a MME under Section 43830.8. (Decl. Lyons ¶ 8.) "Based on CARB staff estimates, in 2014, biodiesel use for compliance with the LCFS regulation allowed by CARB without an approved [MME] . . . resulted in increased NOx emissions of 1.2 tons per day statewide." (*Id.*) Had CARB adopted fuel specifications, and required biodiesels to complete the MME process in 2009, these increased emissions could have been eliminated. (*Id.* ¶¶ 8-9.) CARB should learn from its past mistakes – not repeat them – and require new fuels to undergo the MME evaluation process.

LCFS FF45-5

2. The Elimination of the MME Requirement for New Fuels Is Not Sufficiently Related to the Original Text, and Requires Recirculation of the LCFS Regulation for a 45-Day Comment Period

California law provides that "[n]o state agency may adopt, amend or repeal a regulation which has been changed from that which was originally made available to the public . . . unless the change is . . . ***sufficiently related*** to the original text that the public was adequately placed on notice that the change could result from the originally proposed regulatory action." (Govt. Code, § 11346.8(c) [emphasis added].) To be "sufficiently related," changes must be such that "a reasonable member of the directly affected public could have determined from the [original text of the] notice that these changes to the regulation could have resulted." (1 Cal. Code Regs, § 42.)

California generally requires all new fuels to undergo the MME process under Section 43830.8 of the Health & Safety Code. Neither the original LCFS regulation nor the revised LCFS regulation circulated for a 45-day public review suggested that new fuels would be exempt from the MME process. Despite this, the 15-day notice now suggests many new fuels will be exempt from the MME requirement. Because Section 43830.8 is a preexisting requirement for new fuels that is unrelated to the LCFS regulation, the public could not have anticipated that the MME requirements would be eliminated by CARB. Thus, the elimination of the MME requirement for new fuels is not "sufficiently related" to the original text and, unless the MME requirement is reinstated, CARB must recirculate the revised LCFS regulation for a new 45-day public review period. (Govt. Code, § 11346.8(c); 1 Cal. Code Regs., § 42.)

LCFS FF45-6

D. CARB Failed to Include All Required Documents in the Rulemaking File

CARB recently added a series of email documents to the LCFS rulemaking file (see LCFS 15-Day Notice at 13), all of which date from 2013 or 2014. According to CARB, it is adding those materials to the rulemaking file, and inviting public comment on them, because the documents "might be characterized as containing non-privileged factual information submitted to ARB from ARB consultants." (*Id.* at 13.)

Those emails, likely along with many other documents from 2013 and 2014 submitted to CARB in connection with the proposed regulatory amendments, should have been included in the rulemaking file that CARB opened at the time of the notice of proposed rulemaking, which was dated December 16, 2014. CARB cannot cure this self-evident violation of section 11347.3 of the Government Code by adding those materials to the rulemaking file and inviting 15-day comments; CARB must cure this deficiency, along with numerous other violations of the governing statutes and regulations, by noticing the LCFS regulation for another public hearing after allowing 45-days for public comment.

The requirements of the Government Code are clear. Section 11347.3 of the Government Code requires CARB to maintain a "file of [the] rulemaking proceeding" for any proposed regulatory action subject to the APA, including the LCFS regulation." The rulemaking file must include, among other items, the following:

> (6) All *data and other factual information,* any studies or reports, and written comments submitted to the agency in connection with the adoption, amendment, or repeal of the regulation.
>
> (7) All data and other factual information, *technical, theoretical,* and *empirical studies or reports*, if any, on which the *agency is relying* in the adoption, amendment, or repeal of a regulation, including any cost impact estimates as required by Section 11346.3.

LCFS FF45-7

(Govt. Code, § 11347.3, subds. (b)(5), (b)(6) [emphasis added].) The entire rulemaking file, including the foregoing material, must be "available to the public for inspection" from the time when the first notice of the proposed rulemaking is published in the California Regulatory Notice Register, (*id.* at § 11347.3, subd. (a)), which in the case of the low-carbon fuel standards occurred on March 6, 2009. (See Cal. Reg. Notice Reg., Vo. 10-Z at 371.)

As the above-quoted text makes clear, rulemakings at ARB must include the creation of a rulemaking file that includes "*[a]ll* data and other factual information, any studies or reports, and written comments submitted to the agency" in connection with the proposal. (Govt. Code § 11347.3, subds. (a), (b)(6) [emphasis added].) To assure immediate public access to the supporting materials as soon as the 45-day materials are released, the APA requires that the 45-day notice include a statement that the agency on the date of the notice "has available *all* information upon which [the] proposal is based." (*Id.* § 11346.5, subd. (a)(16) [emphasis added].) A separate provision confirms that the agency must in fact make those records, and any

other "public records, including reports, documentation, and other materials, related to the proposed action," available. (*Id.* § 11346.5, subd. (b).)

The "written comments" that must be placed in the record are not simply those submitted to the agency in a particular manner or at a particular time, such as during the period between publication of the notice of a public hearing and public hearing – an agency must put "all" it receives "in connection with" a regulatory proposal in the rulemaking file. The Legislature's choice of words to describe what comments must be placed in the file – "in connection with" – sweep with intentional breadth, and require inclusion of any comments that bear on the subject of the regulatory effort. In addition, the period of public availability must "[c]ommenc[e] *no later than* the date that the notice of the proposed action is published." (*Id.* § 11347.3, subd. (a) [emphasis added].) The use of the term "no later than" makes it clear that the Legislature expected written comments submitted in connection with a proposed regulatory action and received before publication of the required notice to be included in the rulemaking file. LCFS FF45-7 cont.

In addition to failing to include these new, late-added documents in the rulemaking file, CARB has not properly construed or applied the relevant provisions of the Government Code. In particular, the rulemaking file is not to be limited to "factual information" that comes from "consultants" to CARB: Section 11347.3(b)(5) does not use the word "consultant," and it covers "any . . . written comments submitted to the agency in connection with" the adoption or amendment of a regulation. If "factual information" from sources that CARB defines as "consultants" received before CARB opened the rulemaking file for the current LCFS rulemaking warrant inclusion into the rulemaking file, so do any other written comment submitted to CARB in connection with the adoption or amendment of the LCFS regulation, or the adoption of the proposed alternative diesel fuels regulation. In addition, materials received from external sources, such as consultants, are presumptively not "privileged" and must be included in the rulemaking file. LCFS FF45-8

Growth Energy therefore requests the following:

- An explanation of the reasons, if any, why CARB does not interpret section 11347.3 to require that all written comments received from any source in connection with the adoption or amendment of the LCFS regulation, or the adoption of the proposed alternative diesel fuels regulation, be included in the rulemaking file; LCFS FF45-9
- An explanation of the reasons why the 2013-2014 documents that have now been added to the rulemaking file were not included in the rulemaking file at the time the file was first opened for public access; and LCFS FF45-10
- An identification of each record from a consultant (or any person or entity retained by CARB) that would otherwise have been placed in the rulemaking file has not been placed in the file under color of privilege, so that compliance with section 11347.3 can be assessed by the public. LCFS FF45-11

E. CARB Failed to Perform an Adequate External Scientific Peer Review for the Revised LCFS Regulation

This portion of Growth Energy's comments addresses the requirements of section 57004 of the Health and Safety Code, and CARB's failure substantially to comply with those requirements in the LCFS rulemaking.[1] LCFS FF45-12

1. Factual and Legal Background

Section 57004 of the Health and Safety Code creates several mandatory duties that must be fulfilled before CARB can take "any action" to adopt the proposed regulation to replace the current LCFS program. (Health & Saf. Code, § 57004, subd. (d).) Those duties include the following:

- CARB must submit "the scientific portion of the proposed rule" — in this instance, the regulation that the staff has proposed for final approval by the Board as a replacement for the current LCFS regulation — for review by an appropriate "external scientific peer review entity," along with "a statement of the scientific findings, conclusions, and assumptions on which the scientific portions of the proposed rule are based and the supporting scientific data, studies, and other appropriate materials." (*Id.*, § 57004, subd. (d) (1). LCFS FF45-13
- The "external scientific peer review entity" must then "prepare a written report." That report must "contain[] an evaluation of the scientific basis for the proposed rule." (*Id.*, § 57004, subd. (d)(2).) LCFS FF45-14

Memoranda sent by the CARB staff to the Manager of the Cal/EPA Scientific Peer Program dated November 19, 2014, and January 21, 2015, indicate an intent to comply to with section 57004. A letter from the Manager of the Cal/EPA Scientific Peer Program dated May 5, 2014, appears intended to convey the results of the external scientific peer review entity created for the proposed new LCFS rule. Neither the memoranda to the Manager of the Program nor the Manager's letter indicate that compliance with section 57004 in the current rulemaking was not mandatory, or that complete compliance with section 57004 was not required. Nor does the record indicate that there was insufficient time to permit CARB to ensure compliance with the requirements of section 57004. Those who were responsible for compliance with section 57004 had twice the time to complete their work than the public was provided to comment on the proposed regulation, the scientific portions of which were to receive review by the external scientific peer review entity.[2] LCFS FF45-15

[1] CARB posted some of the external scientific peer review materials for the new LCFS regulation on May 21, 2015, and additional materials on May 27, 2015 (*see* Attachment A), even though the peer review materials appear to have been completed weeks prior to May 21.

[2] There were 104 calendar days from January 21, 2105, to May 5, 2015. The rulemaking notice for the proposed regulation was dated December 16, 2014, but was not announced on the CARB website and made available to the public along with some supporting material until

Comment on the May 5, 2014 letter and its attachments is appropriate now, because the letter and its attachments comprise Reference 26 on the list of Additional References and Supplemental Documents in the staff's June 4, 2015, 15-Day Notice. Related materials also appear as References 27-29 on the same list.

Section 57004 of the Health and Safety Code defines the "scientific portions" of a proposed rule to include "those foundations of a rule that are premised upon, or derived from, ***empirical data*** or ***other scientific findings, conclusions, or assumptions*** establishing a regulatory level, standard, or other requirement for the protection of public health or the environment." (Health & Saf. Code, § 57004, subd. (a)(2) [emphasis added].) As indicated in the May 5 letter, the Manager of the Cal/EPA Scientific Peer Program intended that the "reviewers" selected for participation in the work would be "ultimately responsible for assessing the relevance and accuracy of ***all information*** upon which the staff report is based." (May 5 Letter at 2 [emphasis added].) While the May 5 letter is not clear about the identity of the "staff report" to which it refers, the reference may refer to the four summary documents that the CARB staff apparently prepared for consideration by the external scientific peer review entity; regardless, because those four documents are derived from the December 2014 Initial Statement of Reasons ("ISOR") for the proposed regulation, the external peer review entity was responsible for assessing the relevance and accuracy of all the information on which the ISOR was based. If CARB disagrees with that interpretation of the scope of the external scientific peer review entity's responsibilities in the current rulemaking, Growth Energy requests that CARB fully explain its reasons for disagreement in the response to these 15-day comments required by the California Administrative Procedures Act (the "APA"). LCFS FF45-16

Finally, it is important to be clear on one other point. The CARB staff memoranda to the Manager of the Cal/EPA Scientific Peer Program specified the number of reviewers whom the CARB staff considered necessary for various elements of the proposed LCFS regulation, and the required expertise for the reviewers who were to comprise the external scientific peer review entity. Nevertheless, Cal/EPA requires the "UC Project Director," following "careful consideration of the information" submitted by an agency, to determine the number of reviewers and the expertise required of the reviewers, presumably before the review gets under way.[3] Any such determination by a UC Project Director appears to be missing from the rulemaking file, and for all that appears, is mandatory in order for CARB substantially to comply with the provisions of the Health and Safety Code. LCFS FF45-17

Growth Energy requests an explanation for that omission in response to this comment as required by the APA.

December 30, 2014. There were 50 calendar days from December 30, 2014 to February 17, 2015, the deadline established by the Executive Officer for comment on the LCFS proposal, and 52 days from December 30, 2014 to the public hearing on February 19, 2015.

[3] G.W. Bowes, "Exhibit F -- Cal/EPA External Scientific Peer Review Guidelines" (Nov. 2008) at 8, *available at* http://www.arb.ca.gov/fuels/lcfs/peerreview/exhib_f.pdf.

2. CARB Has Failed to Comply With Section 57004 Because it Did Not Obtain an Evaluation of the "Scientific Portions" of the LCFS Regulation By an "Entity," as the Statute Requires, and Instead Has Provided Disaggregated Comments by Individual Reviewers

The text of Section 57004 makes plain that the evaluation of the scientific portions of a rule must be conducted by an "external scientific peer review entity," which must prepare "a written report," and that the entity must make certain findings. Individuals who participate in the work of that entity are not, acting themselves, the same as the "entity." (Health & Saf. Code, § 57004, subd. (d)(2).) When the statute refers to individual reviewers, who are called "person[s]," (*id.*, § 57004, subd. (c)), it does so explicitly, in establishing the minimum credentials for participation in the work of the external scientific review entity. (*Id.*, § 57004, subds. (b),(c).) The report and the findings of the "entity" are to come from the entity, as a singular being, and not separately from each individual reviewer: thus, if the "entity finds," (*id.*, § 57004, subd. (d)(2)), one or another conclusion to be true — and not what multiple reviewers might "find" — various consequences follow. The stature requires "a report," (*id.*, § 57004, subd. (d)(2)), not multiple reports.

A single, unitary "entity" must do what the statute requires, for any number of reasons (though no specific reasons need be identified, given the clarity of the statute). A report that reflects the evaluation of more than one external reviewer might, for example, have been expected to have greater balance and to reflect a collective and therefore more thoughtful insight and analysis that what could be expected from a single reviewer. If the Legislature had intended for individual reviewers to make the necessary report and findings, it would have used the term "reviewer" in subsection 57004(d)(2), as it was able to do in other portions of the statute, such as subsection 57004(c). If the words used by the Legislature are to have any real meaning, "reviewer[s]" are not the same as the "external scientific review entity" in section 57004.

LCFS FF45-18

Against that statutory backdrop, CARB has not complied, substantially or otherwise, with the clear requirements of the statute. The collection of the separate reviews of the four individuals as attachments to the May 5 letter, which itself does not and cannot make any competent findings of the type required by the statute, do not constitute an "entity" of any type, much less the external scientific peer review entity that the statute requires, nor is the May 5 letter itself a "report" as the statute requires. The fact that CARB may not have complied with the statute in the past does not change the requirements of the statute: repeated noncompliance with section 57004 does not change that section's requirement. CARB cannot take "any action" to finally approve the proposed LCFS regulation until it has obtained the necessary report and findings from an external scientific peer review entity as the statute requires. Once that report and those findings have been obtained, CARB must permit at least the same opportunity for public review and comment that it has provided with respect to the materials for which comment was invited on June 4. There is time for CARB to undertake and complete this process consistent with its goal of completing consideration of amendments to the LCFS regulation this year.

3. The Individual Evaluations of the Four Separate Peer Reviews Do Not Each Demonstrate Full or Adequate Command of the "Scientific Portions" of the LCFS Proposal and Do Not, Alone or on a Consolidated Basis, Adequately Evaluate the Proposed Regulation's Lifecycle Emissions Analysis

Four individuals have provided written documents that appear intended to address various aspects of the scientific portions of the proposed LCFS regulation. Even if one could ignore the statutory text that requires a written report and certain findings from an entity, rather than from four separate reviewers, the four memoranda attached to the May 5 letter do not constitute competent and fully informed and considered reports that meet the purposes of the statute, which include providing a fully informed and well-considered external review of the CARB staff's scientific analysis.

Dr. Clarens' Memorandum. Starting with Dr. Clarens' memorandum, which is only two pages in length, it is apparent that Dr. Clarens did not have a basic understanding of some of the main features of the lifecycle analysis on which the proposed rule is based. Perhaps for reasons beyond his control, Dr. Clarens did not even know the indirect land-use change value being assigned in the proposed rule to corn ethanol. Thus, he states: "The report does not provide the actual value of the iLUC contribution that CARB is using but I found it online (30 g/MJ) . . . ." (Clarens memorandum page 2.) The proposed ILUC value for corn ethanol of 19.8 g/MJ appears on page ES-6 of the ISOR. Dr. Clarens was obliged to conduct an "online" search to ascertain the ILUC values for alternative fuels like corn ethanol, and thought it important enough to include what he found "online" in his report (which is only two pages). Nevertheless, his online research gave him an obsolete and incorrect value for the indirect land-use emission factor assigned to corn ethanol. It is unclear what, if any, indirect land-use change values, for other alternative fuels, Dr. Clarens assumed or applied in his analysis, whether he considered those emissions factors for any alternative fuels other than corn ethanol, or indeed if he understood that different alternative fuels have been assigned different ILUC values that he needed to evaluate. While Dr. Clarens may be "confident" that the "methods" reflected scientific portions of the proposed rule that he reviewed "are based on sound science and represents [*sic*] the state of the art in CI estimation," no one reading his report can have any confidence in Dr. Clarens' analysis. LCFS FF45-19

In addition to his clear error concerning ILUC values, Dr. Clarens shows confusion about the treatment of coproducts in GREET in this portion of his brief memorandum:

> As written, the report states that the source must be directly consumed in the production process. But this is ambiguous in certain contexts such as those fuels that produce co-products. For example, if a corn feedstock were used to make ethanol and the stover were also used to make fuel (but was not consumed in the same production process) would that not trigger a switch from Tier 1 to Tier 2? It seems like it should but as written it might not. Clarifying this language is key for groups seeking to obtain co-product credit through the CA-LCFS.

In this statement, Dr. Clarens is referring to coproducts, corn feedstock, and stover. In his question, it is not clear whether he believes stover is a coproduct of the corn feedstock, or is a separate feedstock. If he believes stover is a coproduct of corn ethanol, clearly it is not. If he understands that both corn and stover are by themselves feedstocks, then it is not clear why he is mentioning the impact of coproducts the Tier 1/Tier 2 categories. In any event, Dr Clarens imagines a relevant confusion among "groups seeking to obtain co-product credit" that evades Growth Energy.

LCFS FF45-19 cont.

Insofar as Dr. Clarens is one of the reviewers expected to evaluate the OPGEE portions of the proposed rule, all he says is that the OPGEE model "goes into great detail" and that "the results are fascinating." Yet there is no indication that Dr. Clarens actually reviewed any models in order to prepare his evaluation: his memorandum refers only to "reviewing … three staff reports." The May 5 letter claims that it was the responsibility of individual reviewers to assess the "relevance and accuracy" of 'all information" on which the staff's reports are based. (See *supra*.) Dr. Clarens' memorandum raises serious questions about the staff's efforts to facilitate review of their proposal, or the process of selecting external reviewers and the standards applied in accepting materials from the reviewers for publication, or perhaps both. For the foregoing reasons, Dr. Clarens' memorandum cannot properly be used in order to comply with CARB's duties under section 57004.

Dr. Matthews' Memorandum. Turning next to Dr. Matthews' memorandum, there are also clear signs that Dr. Matthews lacked an adequate understanding of the scientific portions of the proposed rule, although his errors may seem not so blatant as those of Dr. Clarens'. Dr. Matthews's comment — which he calls his "first impression" — that "the net effect on a CO2e basis would be neutral between increasing VOC and decreasing CO emissions factors," to the extent his comment is intelligible, does not appear to be directed at what the CARB staff and Cal/EPA would call the "Big Picture." Conversely, Dr. Matthews (the reviewer with a background most heavily concentrated in economics) does not take account in his discussion of "the actual reduction in greenhouse gas emissions" of the fact that fuels to which higher CI values are assigned can and are produced and sold outside California regardless of the LCFS program. That effect, so-called "fuel shuffling," has been conceded by the CARB staff, and it should have been part of the scientific basis for the proposed regulation to be evaluated, insofar as what Dr, Matthews calls the "actual" impacts on greenhouse gas emissions are relevant, in his opinion, to the proposed rule.

LCFS FF45-20

Dr. Matthews then makes the following observations about the CA-GREET results in one of the documents supplied by the CARB staff:

> The CA-GREET results shown on pages 14-15 (Tables 1 and 2) are presented as 'CI lookup tables'. As presented, it was not clear what these were. However from reading the ISOR my understanding is that these are default values determined ex ante by staff for a generic production of a Tier 2 fuel used for Method 1 (as a default value that would apply for a particular supplier unless they wanted to show a lower value from other use of the methods like 2A or 2B). My lack of understanding has no effect on the scientific merit of the work.

In the above passage, and putting his point more directly, Dr. Matthews is stating that he did not really understand the values presented in the materials supplied to him in order for him to evaluate CA-GREET, but that those values must be acceptable because the CARB staff must have had some basis for using them, and that in any event his own "lack of understanding has no effect on the scientific merit of the work," so that he did not need to do anything further to address his lack of a complete understanding of the CA-GREET results.

With all due respect to Dr. Matthews, the approach to his assignment revealed in the quoted passage reflects substantial abdication of his responsibility as an external peer reviewer. Whether or not his ignorance about CA-GREET or the results of CA-GREET have any impact on the "scientific merit" of the CARB staff's work, if those results were significant enough to warrant the mention that he gives them in his memorandum, he had a duty to assess their scientific merit. Stated another way, the issue is not whether Dr. Matthews' ignorance affects the quality of the scientific portions of the proposed rule, but whether Dr. Matthews was equipped to review the model and the results of the model that he agreed to review, and that he was presumably paid to review. Dr. Matthews may or may not have understood his assignment, but there is no question that his evaluation of the CA-GREET model, such as it is, is incomplete if not useless, and cannot be relied upon in order to demonstrate compliance with section 57004. As with Dr. Clarens' work, Dr. Matthews' work either exhibits a level of ignorance concerning the scientific basis for the portions of the proposed rule for which he was a primary reviewer that requires CARB not to rely on his memorandum, or fails to demonstrate sufficient technical or scientific competence for his assignment to permit such reliance. By either standard, Dr. Matthews' work cannot properly be used to try to demonstrate compliance with section 57004 of the Health and Safety Code. LCFS FF45-20 cont.

Further questions about whether Dr. Matthews possessed an orientation to his assignment making his work useful in an external review process comes at the end of his memorandum, where he adverts to GTAP:

> **Component 3 -- GTAP/Indirect Land Use Model**
>
> While my area of expertise is connected with the first two models, I did my best to read through the third modeling area. While I was unable to comprehend the model, data, or inputs at the same level of critical insight, I found nothing associated with that work that caused me to doubt its credibility. I thus agree with the staff's conclusion, have no big picture issues, and have no doubt that the work done was based on sound science. LCFS FF45-21

Again putting Dr. Matthews' statement more simply: he has "no doubt" that the "work done" to assess indirect land-use change was based on sound science, even though, as he states, "I was unable to comprehend the model, data, or inputs" at the "same level of critical insight" as he displayed in his evaluation of CA-GREET. This begs the question: what is Dr. Matthews' reason for having "no doubt" about the scientific basis for the staff's indirect land-use analysis?[4] While the existence of bias is not necessary to demonstrate that Dr. Matthews'

[4] Dr. Matthews states at the outset of his memorandum that it was an "honor" to "look at" the CARB staff's work, and he calls the "work done by this evolving team over time "to have

analysis should not form a part of CARB's external peer review, Growth Energy has never read an external peer review for any CARB rulemaking that reflects bias in the same manner and to the same extent as Dr. Matthews' analysis.

LCFS FF45-21 cont.

Dr. McCarl's Memorandum. Compared to the work by Dr. Clarens and Dr. Matthews, a more skeptical and informed analysis might have been expected from the memorandum provided by Dr. McCarl, who holds a Chair at Texas A&M University, and who has experience in econometric analysis of agricultural markets. At the outset, it should be noted that it is possible that the version of Dr. McCarl's memorandum published by CARB was not his final memorandum: on page 7 of the memorandum (which lacks page numbers), the memorandum refers to "G tab," obviously a phonetic version of GTAP, and a sure sign that the published document was dictated but not reviewed by Dr. McCarl (or by the Cal/EPA official in charge of collecting peer review materials, or by the CARB staff). Later, the draft memorandum attributed to Dr. McCarl states:

> In GTAP I believe that there also are increases in emissions from intensification (more irrigation or fertilization) so that the characterization of it only in terms of indirect land use change is not accurate. … In improving the indirect land use analysis when you're looking at corn ethanol byproducts there are also newer developments in terms of extracting corn oil from the DDGs.

LCFS FF45-22

There are no increases in emissions in GTAP attributed to intensification, and so the first quoted statement is untrue, as anyone who has rudimentary knowledge of GTAP would understand. The second statement reflects no understanding of, or consideration of, the fact that the amount of corn oil converted to biodiesel is unknown. As with Dr. Clarens' memorandum, though perhaps for different reasons (such as CARB's apparent failure to obtain from Dr. McCarl a final version of his evaluation), Dr. McCarl's memorandum raises questions about the process used by CARB and the reviewers to provide or obtain adequate understanding of the scientific portion of the proposed rule, the competence of the reviewer to perform the evaluation, or both. Putting those questions aside, the memorandum attributed to Dr. McCarl that has been placed in the public docket reveals that a lack of understanding of GTAP should prevent CARB from attempting to rely on that memorandum in order to demonstrate adequate external review of the scientific portion of the proposed rule.

been "one of the most impressive scholarly efforts I have seen in my career." Dr. Matthews, who from the preamble of his memorandum makes it clear that he is a strong supporter of the LCFS program, imagines on page 4 of his memorandum a distinction between "scientific credibility of the method" used in the regulatory proposal, on the one hand, and what he calls the "magnitude of the overall potential benefits of the program." How Dr. Matthews believes that he can separate the "scientific credibility of the method" from the assessment of the potential impacts of the proposed regulation is unclear, unless he considers a "method" that does not permit an assessment of the potential benefits of a proposed regulation to possess scientific credibility, despite that deficiency. The question presented for Dr. Matthews is therefore this: what is the purpose of scientific credibility in a rulemaking intended to establish or create environmental benefits?

One indication that the deficiencies originate at least in part with the CARB staff appears on page 11 of Attachment 1 to CARB's January 21, 2015, memo. There, the CARB staff claims that 2004 is the "most recent year for which a complete global land use database exists." That statement is not correct, and should have been known to the CARB staff not to be correct at the time when written. A report by Iowa State University ("ISU") researchers, which the CARB staff reviewed in the fall of 2014, and which was the subject of testimony at the February 2015 public hearing, used a more recent complete global land-use database, inter alia to impeach or challenge the credibility of CARB's use of the 2004-based GTAP system. It is unknown how and why the CARB staff could advise their reviewers that a data set more than a decade old is the "most recent" that exits. If the CARB staff's use of the word "complete" in the phrase, "complete global land use database" is studied, then the lack of candor and transparency of the CARB staff in presenting relevant information to their reviewers makes a mockery of the peer-review process required by the Health and Safety Code, and makes that process as applied to this rulemaking substantially noncompliant with the statute. To obtain an external review of the scientific basis for the proposed rule with respect to GTAP, CARB must provide the external reviewers with, at a minimum, the ISU study that was a subject of interest to the CARB staff last year, and that was included in the comments filed with the Board prior to the February public hearing.

LCFS FF45-22 cont.

Overall Issues Concerning the Selection of Peer Reviewers. Growth Energy also believes the process used to select the external reviewers for the proposed LCFS regulation did not provide for sufficient depth of review because none of the reviewers expressed, or could have been identified from prior work to have possessed, any skepticism about the scientific portions of the current LCFS regulation or the approach being taken in the new proposed rule. Publications and other work available to the CARB staff since the commencement of the first LCFS rulemaking reveal experts who are both skeptical of the LCFS regulation and not aligned with stakeholders. They include Dr. Valerie Thomas, of the Georgia Institute of Technology, who was an external reviewer for the 2009 rulemaking process. Dr. Thomas noted in her 2009 review that "the values used to quantify the carbon intensity due to land use change for ethanol from corn and sugarcane are not yet sufficiently developed to be scientifically confirmed" and that "refinement and validation of those quantities [are] needed." (*See* Attachment B.) As Dr. Thomas also stated in 2009, "ARB could develop a more data driven and less model-dependent approach by observing and tracking changes in land use patterns that have been observed to date and that will be observed over the next few years . . . ."

LCFS FF45-23

Dr. Thomas's earlier external review is significant and raises two questions. The first is why Dr. Thomas did not participate in the current peer review. The second is why, in light of the success in identifying someone with Dr. Thomas' level of skepticism and independence in 2009, Cal/EPA or another appropriate body did not include anyone in the current external review process who expressed a similar, or any, level of skepticism about the scientific portions of the proposed new rule.

Growth Energy also notes that none of CARB's four current external reviewers appear to have attempted any systematic review of the CA-GREET model for sugarcane ethanol from Brazil, or biodiesel and renewable diesel. Given the importance assigned to those alternative fuels in the compliance scenarios developed for the new proposed rule by the CARB staff, those omissions are significant and make the current external scientific review substantially

LCFS FF45-24

noncompliant with section 57004 of the Health and Safety Code, because CARB has failed to obtain meaningful external review of all the relevant and important CA-GREET models. LCFS FF45-24 cont.

4. Selected List of Specific Questions CARB Staff Must Address

Although the following list of questions does not cover all the comments presented above concerning CARB's LCFS external review, and should not be taken to limit the scope of issues that CARB must address in its response to the 15-day comments, this list includes some of the questions concerning the LCFS peer review that the CARB staff should address. If CARB does not consider itself obliged to respond in full to any of the following questions, Growth Energy requests that for each such question, CARB explain separately why it is taking such a position.

- Did the materials provided or made available to the external peer reviewers include all the "best available economic … information" available to the CARB staff in developing the scientific portions of the proposed rule? (Cal. Health & Safety Code § 38561(e).) Did those materials include all the "best available … scientific information" available to the CARB staff in developing the scientific portions of the proposed rule? (*Id*.) If not, why not? LCFS FF45-25
    - Why were the external peer reviewers not advised of, or given materials concerning, fuel shuffling? LCFS FF45-26
    - Why were the external reviewers not provided with the ISU report co-authored by Dr. Babcock that casts doubt on the use of GTAP in regulatory settings, which was supplied to CARB in the 45-day comment process? LCFS FF45-27
    - What is CARB's definition of a "complete global land use database," as that term is used in the materials provided to the external peer reviewers? Does (or do) the database or databases referenced in the ISU report noted above meet the standard or criteria for a "complete global land use database?" If not, how is the 2004 GTAP database more "complete" than the database or databases referenced in the ISU report? LCFS FF45-28
- Does CARB consider Dr. Clarens to be adequately informed concerning the scientific portion of the proposed rule, notwithstanding the errors in his memorandum noted above? If so, why? Has CARB considered or will CARB consider asking Dr. Clarens to revise his evaluation and address the issues presented here, and if not, why not? LCFS FF45-29
    - What is CARB's understanding of Dr. Clarens' knowledge of the ILUC value assigned to corn ethanol in the proposed rule? Upon receipt of Dr. Clarens' report, did CARB staff attempt to provide Dr. Clarens with additional information? If not, why not? LCFS FF45-30

- What is CARB's understanding of the portion of Dr. Clarens' report excerpted on page 4 of the comments above? If CARB does not agree with Growth Energy's interpretation of that portion of Dr. Clarens' report, or with the identified errors in that portion of Dr. Clarens' report, why not? LCFS FF45-31

- Does CARB have confidence that Dr. Clarens had an adequate understanding of the scientific portions of the proposed rule that he claimed to evaluate, and if so why? LCFS FF45-32

- Does CARB consider Dr. Matthews' comments on the indirect land-use change portions of the scientific basis for the proposed rule to be relevant or useful in the external review of the proposed rule? If so, why? LCFS FF45-33

- Does CARB consider the CA-GREET results to which Dr. Matthews refers in the excerpt from his memorandum on page 5 of the above comments to be part of the scientific portion of the proposed regulation? If not, why did CARB include it in the report provided to the external reviewers? Which external reviews understood completely and reviewed those results? LCFS FF45-34

- Does CA-GREET use the MOVES model? If so, in what respects? If not, did the CARB staff take any action to advise Dr. Matthews of the error postulated on page 5 of the above comments with respect to MOVES? LCFS FF45-35

- Does CARB believe that the "scientific credibility" of the "method" that it used in the proposed rule is not affected by or related to estimates of the "overall potential benefits" of the LCFS regulation, as those terms are used in Dr. Matthews' memorandum? LCFS FF45-36

- Does CARB consider Mr. McCarl to be qualified to evaluate GTAP, notwithstanding the apparent errors in his understanding of GTAP noted on page 7 of the above comments? If so, why? LCFS FF45-37

    - Does GTAP attribute emissions to intensification, as the latter term is used in Dr. McCarl's draft memorandum?

    - Did CARB consider whether to invite Dr. McCarl to review and revise his memorandum? If not, why not?

- How did the CARB staff determine the number of peer reviewers required for each portion of the scientific basis of the proposed regulation? If the evaluations by Dr. Clarens, Dr. Matthews or Dr. McCarl are excluded to any extent from the external review, based on the issues presented here, will CARB seek additional external review? If so, under what specific circumstances, and if not, why not? LCFS FF45-38

Attachment A

Drake, Stuart

From: Adams, Stephen@ARB <Stephen.Adams@arb.ca.gov>
Sent: Wednesday, May 27, 2015 3:19 PM
To: Drake, Stuart
Cc: Elaine Meckenstock (Elaine.Meckenstock@doj.ca.gov); Brieger, William@ARB; tom darlington; Jim Lyons
Subject: RE: LCFS -- External Review Materials
Attachments: 01. CA-GREET_StaffReport.pdf; 02. OPGEE_StaffReport.pdf; 03. iLUC_StaffReport.pdf; CoverPage.pdf

Stuart,

I'm attaching three documents and a cover page that were provided to the LCFS peer reviewers but that were not posted to the peer review page when it was set up. I'm told these files contain all of the content you are asking about. Staff will be adding these documents to the web page as well.

Thank you,
Steve

From: Drake, Stuart [mailto:sdrake@kirkland.com]
Sent: Wednesday, May 27, 2015 11:15 AM
To: Adams, Stephen@ARB
Cc: Elaine Meckenstock (Elaine.Meckenstock@doj.ca.gov); Brieger, William@ARB; tom darlington; Jim Lyons
Subject: RE: LCFS -- External Review Materials

Thanks Steve.

Stuart Drake | Kirkland & Ellis LLP
655 15th Street, NW | Suite 1200
Washington, DC 20005
202-879-5094 Office | 202-450-0051 Mobile
202-654-9527 Direct Fax
stuart.drake@kirkland.com

From: Adams, Stephen@ARB [mailto:Stephen.Adams@arb.ca.gov]
Sent: Wednesday, May 27, 2015 2:12 PM
To: Drake, Stuart
Cc: Elaine Meckenstock (Elaine.Meckenstock@doj.ca.gov); Brieger, William@ARB; tom darlington; Jim Lyons
Subject: RE: LCFS -- External Review Materials

Stuart,

I wanted to make sure you're aware that separate peer reviews were conducted on biodiesel and renewable diesel as part of the multimedia evaluation on those two fuels. Those reviews are listed in the 15-day notice for the ADF regulation that went out Friday, and the peer review documents for those are at http://www.arb.ca.gov/fuels/diesel/altdiesel/biodocs.htm

Steve

From: Drake, Stuart [mailto:sdrake@kirkland.com]
Sent: Wednesday, May 27, 2015 10:59 AM
To: Adams, Stephen@ARB
Cc: Elaine Meckenstock (Elaine.Meckenstock@doj.ca.gov); Brieger, William@ARB; tom darlington; Jim Lyons
Subject: RE: LCFS -- External Review Materials

Thanks Steve, I appreciate it.

Stuart Drake | Kirkland & Ellis LLP
655 15th Street, NW | Suite 1200
Washington, DC 20005
202-879-5094 Office | 202-450-0051 Mobile
202-654-9527 Direct Fax
stuart.drake@kirkland.com

From: Adams, Stephen@ARB [mailto:Stephen.Adams@arb.ca.gov]
Sent: Wednesday, May 27, 2015 1:57 PM
To: Drake, Stuart
Cc: Elaine Meckenstock (Elaine.Meckenstock@doj.ca.gov); Brieger, William@ARB; tom darlington; Jim Lyons
Subject: RE: LCFS -- External Review Materials

Stuart,

I'm going to ask staff to take a look at your questions and the documents posted as part of the peer review reports. You can expect to hear back from me, or as you suggest I might have staff communicate directly with one of your colleagues if that seems the simpler way to proceed.

Steve

From: Drake, Stuart [mailto:sdrake@kirkland.com]
Sent: Wednesday, May 27, 2015 9:26 AM
To: Adams, Stephen@ARB
Cc: Elaine Meckenstock (Elaine.Meckenstock@doj.ca.gov); Brieger, William@ARB; tom darlington; Jim Lyons
Subject: LCFS -- External Review Materials

Steve --

Tom Darlington, Jim Lyons and I are having some trouble in readily locating some of the documents to which Dr. McCarl and Dr. Kumar, two of the LCFS external reviewers, refer in their April 29 and May 5 reports for the staff. On behalf of Growth Energy, I wondered if your Office could help us locate those documents, or if they are not currently on the external-review page on CARB's website, if your Office could let us know if there are any plans to post them. If it is more efficient for someone on the technical side to get in touch directly with Tom Darlington and/or Jim Lyons, that's fine too -- maybe we have just overlooked something. It is not possible to understand the external reviews without the ability to look at the same documents that the reviewers did.

Here is an excerpt from the first page Dr. McCarl's report:

"As I understand it the peer review is intended to develop external review opinions on whether the CI methodology used by the ARB staff and supporting parties in calculating carbon intensity values and use of greenhouse gas emission models yields a valid scientific basis for the conclusions in the air resources Board staff reports.

"I also believe that while I was sent three reports and a plain English version that I am only supposed to review those within my field of expertise which limits me to comment on

"Calculating Lifecycle Carbon Intensity Values of Transportation Fuels in California, March 2015 (Staff Report 1)

"Calculating Carbon Intensity Values from Indirect Land Change of Crop-Based Biofuels (Staff Report 3)

"Additionally I will comment on the attachment entitled *Plain English summary of staff's methodology in calculating fuel carbon intensities*."

Page 1 of Dr. Kumar's report refers to "Staff Report 2." That report appears to address carbon intensity values for crude oil.

The "Plain English" summary appears to be a 15-page document attached to Mr. Aguila's Jan. 21, 2015, memo to Dr. Bowes at the Water Board, which is posted on the external review page of the CARB website as part of Mr. Aguila's memo. Mr. Aguila's memo refers to the three Staff Reports but they do not seem to be attached to his memo, and in any event I don't understand how a memo dated January 2015 could have included a report that according to Dr. McCarl is dated March 2015. Are the three referenced Staff Reports also on the CARB website, and if so where? Are there multiple versions of the Staff Reports?

I also wanted to ask if there is a later version of Dr. McCarl's report. On the seventh page, there is a reference to "G tab," which we assume is supposed to be "GTAP."

Here is the url for the external review page:

http://www.arb.ca.gov/fuels/lcfs/peerreview/peerreview.htm

Anil Prabhu is listed as the technical contact person on the website.

Thanks in advance for your help, and my apologies if this is something easy to find that we have just missed. Give me a call if you would like to discuss.

-- Stuart

Stuart Drake | Kirkland & Ellis LLP
655 15th Street, NW | Suite 1200
Washington, DC 20005
202-879-5094 Office | 202-450-0051 Mobile
202-654-9527 Direct Fax
stuart.drake@kirkland.com

****
The information contained in this communication is confidential, may be attorney-client privileged, may constitute inside information, and is intended only for the use of the addressee. It is the property of Kirkland & Ellis LLP or Kirkland & Ellis International LLP. Unauthorized use, disclosure or copying of this communication or any part thereof is strictly prohibited and may be unlawful. If you have received this communication in error, please notify us immediately by return e-mail or by e-mail to postmaster@kirkland.com, and destroy this communication and all copies thereof, including all attachments.
****

****
The information contained in this communication is confidential, may be attorney-client privileged, may constitute inside information, and is intended only for the use of the addressee. It is the property of Kirkland & Ellis LLP or Kirkland & Ellis International LLP. Unauthorized use, disclosure or copying of this communication or any part thereof is strictly prohibited

Attachment B

Valerie Thomas, Ph.D.
Anderson Interface Associate Professor
School of Industrial and Systems Engineering
Georgia Institute of Technology
Atlanta, Georgia

Review of
Proposed Regulation to Implement the Low Carbon Fuel Standard
California Environmental Protection Agency
Air Resources Board

The Air Resources Board has made a great deal of progress in modeling and quantifying the greenhouse gas and other environmental impacts of fuels. This work provides a strong foundation for understanding the impacts of these fuels, and for further development of understanding as experience with alternative fuels increases.

The five issues identified by the ARB to be addressed by the peer reviewers are addressed below.

1. Greenhouse Gas Modeling

a. The description in the text of the greenhouse gas impacts of corn-derived and sugarcane-derive ethanol is solid, and could be emphasized more prominently: "Direct GHG emissions from the production and use of corn and sugarcane ethanol are less than the comparable emissions from gasoline. When land use change emissions are considered, however, the emissions-reduction benefit from corn and sugarcane ethanol is diminished." (p. IV-42)

b. The lookup table values for carbon intensity for the three gasoline fuels appear to be well justified.

c. The evaluation of carbon intensity for eleven different corn-derived ethanol is sound practice and provides a basis for encouraging low-carbon production of corn-derived ethanol.

LCFS FF45-39

d. The numerical values assigned to the GHG emissions from production of corn-derived and sugarcane-derived ethanol have some uncertainties that could be reduced through revised analysis and further reduced when more data become available.

i. The calculation of the direct GHG emissions from production of corn-derived and sugarcane-derive ethanol is by-and-large solid and consistent with a well-developed body of scientific research. The calculation of the coproduct credits does, in my view, somewhat overvalue these credits, resulting in an understimate of the direct GHG impacts of corn-derived ethanol of perhaps 10%.

Attachment "B"

2. Land Use Modeling

The calculation of the indirect, land-use-change GHG emissions from production of corn-derived and cane-derived ethanol has significant uncertainties.

a. That observed data have not be used to validate the GTAP model findings is a significant weakness. The changes in corn production resulting from the federal renewable fuel standard, and the changes in Brazilian sugar production resulting from increased ethanol production should be measurable, and should be measured to validate the model assumptions. The ARB model should be adjusted to reflect data.

b. The lack of a time dimension in GTAP results in an awkward match with the question at hand. Corn yields have been increasing largely linearly for some time now in the United States, yet the model appears to use 2008 corn yields to determine land impacts of corn-derived ethanol. The projected steady increase in use of corn for ethanol in the US over the next few years suggests that land use change will be somewhat less than projected here.

c. The greenhouse gas impact of land use change occurs mainly at the time of land clearing. This suggests that the effect of increased use of corn for ethanol will depend on whether and when total global corn production increases. An increase in use of corn for ethanol in a year in which corn demand decreases or stays constant will have a different greenhouse gas effect than in a year in which total corn demand increases. The increased use of corn for ethanol in one year can result in land clearing in a future year, depending on overall global total corn production and production of other crops. The ARB staff has put a great deal of effort in to thinking about the time dimension of this problem. Nevertheless, time-related issues are still addressed in piecemeal way that makes some unjustified assumptions. A more comprehensive approach to the changes in corn production over time would be simpler and could be more accurate. ARB could develop a more data driven and less model-dependent approach by observing and tracking changes in land use patterns that have been observed to date and that will be observed over the next few years as corn-derived and cane-derived ethanol production increases.

LCFS FF45-39 cont.

d. The development of the land use change analysis for Brazilian sugarcane-derived ethanol appears to be less developed than the analysis of US corn-derived ethanol. The Brazilian analysis should be revised using up-to-date yield values, if they were not used in this analysis, and should reflect data on land use changes in Brazil.

3. Economic Impacts

The LCFS staff report predicts that the LCFS will result in an overall savings in the State of California. The economic impacts of the LCFS will depend on future prices of petroleum and the future production costs of alternative fuels and vehicle technologies, which cannot be definitively predicted in advance. Nevertheless, the economic assessment appears reasonable, and the projection that the net economic impact will not be large and may even be slightly positive appears sound.

4. Environmental and Multimedia Impacts

The LCFS staff report covers many of the environmental impacts well. An important set of environmental impacts that are not mentioned are the increased impacts of nitrogen, phosphorus, and other agricultural inputs from increased corn production. As mentioned in the report, the increase in corn production is not likely to take place in California. Nevertheless, the impacts may be significant at the national and international scale. Hypoxia in the Gulf of Mexico is linked to increased corn production.[1] The use of nitrogen fertilizers and other agricultural inputs have a range of other environmental impacts that should be included in the environmental assessment.

5. Credit Trading

The credit trading framework and details appear reasonable. Note that the credit trading provisions may help to reduce the actual land-use-change impacts of corn-derived and sugarcane-derived ethanol: When corn or sugar prices are high, regulated parties may choose to use less corn-derived or sugar-derived ethanol, which would help to moderate corn and sugar demand and reduce pressure to increase plantings of corn and sugarcane.

LCFS FF45-39 cont.

The Big Picture

a. Are there any additional scientific issues to be addressed?

No.

b. Taken as a whole, is the scientific portion of the proposed rule based upon sound scientific knowledge, methods, and practices?

Taken as a whole, the scientific portion of the proposed rule is based upon sound scientific knowledge, methods and practices. Use of a non-zero positive value for the carbon intensity due to land use change for ethanol from corn and sugarcane is sound. The direct emission values for ethanol from corn and sugarcane, and the differences in direct carbon intensity values for different ethanol production processes are sound. However, the values used to quantify the carbon intensity due to land use change for ethanol from corn and sugarcane are not yet sufficiently developed to be scientifically confirmed; refinement and validation of those quantities is needed.

Detailed comments:

[1] US EPA SAB. Hypoxia in the Northern Gulf of Mexico. December 2007. EPA-SAB-08-003 http://epa.gov/msbasin/pdf/sab_report_2007.pdf

Table IV-1, page IV-3. This table appropriately separates the direct emissions from the land use effects, and appropriately shows fewer significant figures for land use effects than for direct emissions. The direct emissions, however, should not be shown to four significant figures because the estimates are not that accurate; these results should be expressed to at most two significant figures.

p. IV-12. Coproduct allocation. Coproduct credits for corn ethanol are allocated in GREET by assuming that the use of coproducts as animal feed results in decreased production of the displaced feed in exactly the amount that is displaced. This effectively assumes completely inelastic demand for the displaced product. This is not consistent with the land use change calculations, which do assume demand elasticities. In other words, the coproduct calculation appears to be overestimated, resulting in a somewhat lower calculation of the direct GHG impact than is probably likely, and indicating uncertainty in the direct emissions results for corn ethanol of at least several percent.

p. IV-17. Among the choices to meet demand for biofuel feedstock, one option not mentioned is to convert existing agricultural lands from non-food crops – such as cotton or tobacco, for example.

p. IV-20. The GTAP model is not time dependent, whereas the land use change from biofuels is time-dependent. In particular, yields of corn and other feedstocks can be expected to increase in time. Although there is extensive discussion of this issue, particularly in Appendix C6, the expected increase in yield of corn beyond 2008 does not appear to be incorporated into the model.

LCFS FF45-39 cont.

p. IV-24. Of the three time accounting methods described, the first one is by far the most sensible. The Net Present Value calculation is not appropriate here. Net present value calculations are used for money because of the potential to invest money and receive a return over time. That is not true for greenhouse gas emissions. The Fuel Warming Potential also is not appropriate; the greenhouse gases will remain in the atmosphere beyond the project time horizon, and presumably the policy interest is to reduce climate change impacts over a longer time horizon than this project time horizon. Presenting the net present value approach and the fuel warming approach gives the impression that these are valid approaches that could be used. I suggest that discussion of these approaches be dropped from the main body of this report, although retained in the Appendices. Development of these ideas in the peer-reviewed literature would provide a basis for inclusion in future ARB analyses.

p. IV-26. ARB staff appropriately uses the annualized method.

p. IV-29. The results of the GTAP model are for a situation in which 13.25 billion gallons of increased ethanol production is produced in the year 2008. Yield will increase in subsequent years, requiring less land for a given amount of ethanol. If the increases in corn production occur after 2008, the land use impact will be less.

p. IV-31. It should be possible to validate with data the projections of land use change shown in Table IV-10, and especially the projections of US land use change.

p. IV-33, Table. IV-12. It should be possible to validate with data he projections of land use change resulting from cane-derived ethanol production in Brazil. The projections seem to be entirely model-derived, with no reference to studies of actual land use change in Brazil. The results should be validated with data. Also, cane yield in Brazil has increased significantly over time. The cane yield used in the GTAP model is not mentioned, but if the 2001 baseline is used, then the modeled land use change would be larger than if the 2006-08 sugarcane yield were used. And, as discussed elsewhere for corn, sugarcane yields can be expected to continue to increase, suggesting that land use change impacts will decrease over time.

p. IV-34. "As an initial estimate, we assumed a 75 percent coproduct credit for soy meal." ARB staff appropriately flags the uncertainty of this estimate.

p. IV-39. Comparison of GTAP results with Observed Market Behavior. The effects of corn ethanol on land use either are, or are not, large enough to be observable. As this section states, there are many factors that influence corn production and corn exports. If the effects of ethanol production are large enough to be measurable and identifiable, then this effect should certainly be taken into account in the assessment of corn-derived ethanol. Observation of the effect and validation of the model results is critical to validation of the greenhouse gas calculation for corn-dervied and cane-derived ethanol. This section indicates that the GTAP model results cannot be validated, or have not yet been validated. Surely there is some aspect of the calculation that could be validated. For example, the changes in US forest and pasture land due to the federal RFS should be measurable.

LCFS FF45-39 cont.

p. IV-41-IV-42. This entire section expresses more certainty than warranted. Some judicious editing would prevent it from being misinterpreted. For example, in the bulleted list on p. IV-42, the word "about" should also be used in the last two bullets – these numbers are very uncertain.

p. IV-42. This statement is solid: "Direct GHG emissions from the production and use of corn and sugarcane ethanol are less than the comparable emissions from gasoline. When land use change emissions are considered, however, the emissions-reduction benefit from corn and sugarcane ethanol is diminished."

pp. IV-46. Increases in crop yield with time. The adjustments made to convert GTAP results from 2001 yields to 2006-08 yields, as described in Appendix C, do appear to be reasonable. However, the time profile of the land use change implied by the LCFS may warrant additional scaling of the GTAP results. In particular, if the increase in corn-derived ethanol is assumed to scale with the federal RFS, then the amount of corn used for ethanol will increase over time; if corn yields also increase over time then the land use impact of the corn-derived ethanol will decrease over time, although it will still be postive. However, if the amount of corn-derived ethanol used to fulfill the LCFS is

constant, as suggested by the scenarios presented in appendix E, then the land use change would all be concentrated in the very near future (or even recent past). The time scenario for corn-derived ethanol production (how much in which year, and the total change in demand in each year) will affect the actual land use change and the actual greenhouse gas impacts. The land use change impact will occur in the year that land use changes, which will not necessarily be the same as the year of the increased use of corn-derived ethanol.

p. IV-47. Uncertainties associated with time-accounting. As mentioned before, it would be feasible, and add clarity to the model, to do more explicit time-depedent modeling.

p. IV-48. The paragraph at the bottom of page IV-48 is solid. ARB should continue to refine its analysis and adjust the GHG emission values as the analysis develops, and data become available.

Appendices:
p. iii. The word "not" seems to be missing from lines 2.

p. C-5. Energy Economy Ratios. In Brazil, development of flex-fuel vehicle technologies with higher compression ratios has provided an opportunity to increase the efficiency of vehicles using ethanol fuels somewhat. ERB may not want to incorporate this potential into its LCFS EERs, but this potential may warrant at least a one-sentence mention.

LCFS FF45-39 cont.

p. C-27. A corn yield of 151.3 bushels per acre is mentioned here, but a corn yield of 160 bushels per acre is used in the derivation of the "110,000 acres of U. S. farmland" mentioned on p. IV-42 and derived on page C-41. The 160 bushels per acre may be taking into account future yield increases, as I have advocated above. The yield value assumptions, and the year to which each yield value is associated, should be clarified.

p. C-54. Co-product credit for DDGS. The decision of ARB to not adopt Wang's findings on this issue is solid. However, there is an additional co-product credit issue. In GREET, when a coproduct is used instead of the substitute product, the reduced use of the substitute is assumed to result in exactly that amount of decreased production of that product. This is surely an overestimate, resulting in a small underestimate of the direct GHG impacts of corn-derived ethanol.

p. C-54. "Staff will revisit this issue and make updates to the co-product credit, as appropriate." ARB's commitment to revising the analysis is important and will improve the assessment; increased production of biofuels will provide more data with which to refine the analysis.

Attachment C

MEETING

STATE OF CALIFORNIA

AIR RESOURCES BOARD

JOE SERNA, JR. BUILDING

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

BYRON SHER AUDITORIUM, SECOND FLOOR

1001 I STREET

SACRAMENTO, CALIFORNIA

THURSDAY, APRIL 23, 2009

9:04 A.M.

ORIGINAL COPY

JAMES F. PETERS, CSR, RPR
CERTIFIED SHORTHAND REPORTER
LICENSE NUMBER 10063

We've been working in such close collaboration that we scientists merge.

CHAIRPERSON NICHOLS: -- forgotten his last name.

STATIONARY SOURCE DIVISION CHIEF FLETCHER: But Mike has been working with us very closely since the inception of this project, and he has a few comments that he would like to make.

CHAIRPERSON NICHOLS: Thank you.

MR. O'HARE: Oh, I guess we got that to work.

(Thereupon an overhead presentation was Presented as follows.)

MR. O'HARE: So I'd like to make a few remarks on I guess you could call a bigger picture look at the land use change issue especially.

And the general burden of these remarks is to regard the land use change estimates that the staff has given you as being -- I don't want to use the word "conservative," but I would say biofuel favorable in the competition between fuels to satisfy the LCFS requirements. LCFS FF45-40

I do want to say at the beginning that it's not clear what "conservative" means in this context because it is a low carbon fuel standard. And if we make a mistake in one direction in estimating these numbers, we'll use too much of a biofuel that's actually higher carbon than

we thought and will therefore increase global warming. And if we use numbers that are too low, then we'll use too little of a biofuel that's lower carbon than we thought and will therefore increase global warming.

So the cost to the world of being wrong in both directions is fairly symmetrical. And there's no obvious conservative direction as there is, for example, in life and safety regulation.

Next slide please.

--o0o--

MR. O'HARE: I want to thank a large and growing group of collaborators, including one of your distinguished Board members, at this point, and also remember Alex who set us out on this path a couple of years ago. This has become quite a large group enterprise. And I think it's good for that reason.

LCFS FF45-40 cont.

Next slide please.

--o0o--

MR. O'HARE: So let me just quickly recall the history we'd been through and emphasize the policy is forcing the science quite rapidly.

The policy intentions of California and the nation and also other countries is pushing the science forward probably a lot faster than it would otherwise go. On the whole I think this is a good thing.

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

CALIFORNIA AIR RESOURCES BOARD

DECLARATION OF THOMAS L. DARLINGTON

I, Thomas L. Darlington, declare as follows:

1. I am an engineer with training and expertise in lifecycle emissions analysis, the use of models to estimate lifecycle emissions and to attribute emissions to the production, distribution and use of various fuels, and use of regulations to control mobile-source emissions. My areas of expertise also include land-use change ("LUC") modeling and the application of econometric models to attributional and consequential lifecycle emissions analysis. Following my graduation from the University of Michigan in 1979, I served for eight years as a Project Manager at the United States Environmental Protection Agency's Motor Vehicle Emissions and Fuels Laboratory in Ann Arbor, Michigan. Thereafter I worked at Detroit Diesel Corporation and General Motors Corporation, and as the Director of Mobile Source Programs at Systems Application International. I am the President of Air Improvement Resource ("AIR"), a company formed in 1994 to provide mobile source emission modeling to government and industry. A copy of my CV is attached to this Declaration as Attachment A.

2. I have participated on behalf of renewable fuels producers in the public consultation and rulemaking processes at the California Air Resources Board ("ARB" or "the Board") to consider, adopt and revise the low-carbon fuel standard ("LCFS") regulation since 2008. I testified at the Board's February 2015 hearing concerning proposed amendments to the LCFS regulation. I am fully familiar with the models released by CARB to establish and implement the LCFS regulation, including the versions of the Global Trade Analysis Project ("GTAP") modeling systems used by CARB or proposed for use by the CARB staff as part of the current and proposed LCFS regulation.

3. I make this Declaration based upon my personal knowledge, my training and expertise, and my familiarity with the subjects that I address here. This Declaration is divided into four parts: (1) Access to the Database Used by ARB Consultant David Rocke, (2) Proposed Modification 18 in the 15-Day Notice, (3) Differences between the December and June versions of CA-GREET and (4) Memoranda from ARB's External Scientific Reviewers.

A. Access to the Database Used by ARB Consultant David Rocke

4. ARB's LUC emission factor for corn starch ethanol in the revised LCFS regulation is 19.8 grams of carbon dioxide equivalent emissions per megajoule of energy ("g/MJ"). That is 12.2 g/MJ lower than the 30 g/MJ used in the current LCFS rule. The CARB staff has declined to consider and to propose a different and lower LUC emission factor for corn starch ethanol, in reliance on an analysis of crop price-yield values by David Rocke, an ARB consultant. ARB used Dr. Rocke's work for ARB in selecting price-yield values in its analysis of LUC values for all ethanol feedstocks; that analysis was in turn used in the proposed new LCFS regulation that is now under consideration by the Board. As soon as it learned of the project assigned to Dr. Rocke by

LCFS FF45-41

ARB, in the fall of 2014, AIR requested the data used by Dr. Rocke. As explained below, although ARB staff agreed to provide to the public the data used by Dr. Rocke, but the data were never provided by ARB to me or other members of the public; the lack of timely access to that data has prevented effective public participation in the current LCFS rulemaking. LCFS FF45-41 cont.

5. The ARB analysis applied in the proposed regulation in reliance on the data used by Dr. Rocke and on Dr. Rocke's analysis employs five price-yield values: 0.05, 0.10, 0.175, 0.25, and 0.35. The average of these 5 values is 0.19. Those values are used in ARB's version of the GTAP model, originally developed at Purdue University. The Purdue recommended value is 0.25. CARB's Expert Working Group for the LCFS regulation also recommended 0.25. ARB sponsored research indicated that there was little or no price-yield response (i.e., 0.0). AIR recommended that ARB should drop the lower price yield values (0.05 and 0.10) because the research supporting these lower values was developed over the very short term (1-3 years of price and yield data), and the GTAP model is a longer-term model (5-10 years). [1] ARB utilizes an 11.59 billion gallon per year shock of corn ethanol in its corn ethanol modeling, clearly illustrating that ARB is exercising the model with a medium-term shock, and not a short-term shock. Thus, ARB's use of short term price yield responses with the medium or longer term GTAP model is clearly inconsistent. LCFS FF45-42

6. In the Initial Statement of Reasons ("ISOR") for the new LCFS regulation, ARB references a recent analysis by Dr. Rocke in support of using lower price-yield responses. [2] The Rocke analysis utilized one set of data from a 2012 dissertation by Juan Francisco Rosas Perez. [3] That dissertation indicated that the price-yield response was in the region of 0.29, very close to the Purdue default value. Dr. Rocke obtained the data from the dissertation, conducted his own statistical analysis, and concluded that the data did not support the 0.29 price yield value. LCFS FF45-43

7. Because of the differences between these two analyses (Perez and Rocke), which stakeholders clearly must understand fully, AIR requested from ARB staff the data that Dr. Rocke used for his analysis. While staff said they were trying to get the data for AIR, the data was never supplied by staff. Therefore, AIR was unable to replicate Dr. Rocke's analysis of the Perez data. There is insufficient information in Dr. Rocke's available written work to reject the Perez analysis. (Dr. Rocke's rebuttal is only three pages in length.). In addition, this is only one of two sources (according to Rocke) that were used to support the 0.25 price-yield value, Rocke did not attempt to critique the other source. Thus, because ARB never supplied Rocke's database, AIR was not able to replicate Rocke's sketchy analysis, and Rocke only critiqued one source. To my knowledge no other person or organization has been able further to understand or replicate this portion of the analysis used in the current regulatory proposal. Based on the standards for transparency and public participation that I have observed in other regulatory proceedings, ARB should not rely on the Rocke analysis for its use of low price-yield values, and should therefore eliminate the lowest two values (0.05 and 0.10). The impacts of eliminating the lowest two price-yield values on corn LCFS FF45-44

[1] "Discussion of the Yield Price Elasticity of GTAP", Taheripour and Tyner, Purdue University, April 2014. (See Attachment B.)

[2] "Statistical issues Related to the Low-Carbon Fuel Standard", October 31, 2014. (See Attachment C.)

[3] "Essays on the Environmental Effects of Agricultural Production", Dissertation, Perez, Juan Francisco Rosas, Iowa State University. (Copyright material, not included in public filing.)

ethanol LUC emissions are shown in Table 1 below. Without both 0.05 and 0.10, the LUC value is 15.53 gCO2e/MJ instead of 19.84. CARB's choice of the higher emissions factor creates an inefficient bias against the use of corn starch ethanol, by overstating the LUC emissions attributed to the use of corn starch ethanol. LCFS FF45-44 cont.

Table 1. Impact of the Low Price-Yield Values		
Average of ARB Scenarios	Average price-yield	LUC (gCO2e/MJ)
All (ARB value)	0.19	19.84
w/o 0.05, 0.1 price-yield	0.26	15.53

B. Proposed Modification 18 in the 15-Day Notice

8. Proposed Modification 18 in the June 4, 2015, 15-day notice discusses recertification of the approximately 270 existing fuel pathways. Staff is proposing a system for prioritizing that work and eliminating potentially unrealistic deadlines in various parts of the existing proposal. Staff proposes to review and approve fuel pathway applications in batches based on fuel type, so that providers of the same fuel compete on equal terms, obtaining the new carbon intensity score at the same time. The proposed prioritization of fuel types would be: ethanol, followed by biodiesel, renewable diesel, compressed natural gas, liquefied natural gas, and finally all others. This prioritization makes sense, but the record submitting requirements of the recertification process are unnecessary burdensome for ethanol plants. LCFS FF45-45

9. The relevant sections of the recordkeeping requirements for recertification in the proposed regulation order are shown below. Plants are to submit

> *Invoices and receipts for all forms of energy consumed in the fuel production process, all fuel sales, all feedstock purchases, and all co-products sold. Invoices shall be submitted in electronic form. Each set of invoices shall be accompanied by a spreadsheet summarizing the invoices. Every invoice submitted shall appear as a record in the summary. Each record shall, at a minimum, specify in a separate column the period covered by the purchase, the quantity of energy purchased during that period, the invoice amount, and any special information that applies to that record (the special information column need not be populated for every record). For each form of energy consumed, the two-year total and average consumption shall be reported in the spreadsheet. These two-year totals and averages shall be used to calculate the per-million-Btu and per-megajoule energy consumption inputs used to calculate the life cycle CI of the fuel pathway.* LCFS FF45-46
>
> *a. Period Covered. The period covered shall be the most recent two-year period of relatively typical operation.*
>
> *b. Production Processes Covered. The invoices submitted under this provision shall cover the energy consumed in all unit operations devoted to feedstock handling and pre-processing; fuel production; co-product handling and processing; waste handling, processing, and treatment; the handling, processing and use of chemicals, enzymes, and organisms; the generation of process energy, including the generation, handling and*

processing of combustion fuels; and all plant monitoring and control systems. If the fuel produced or any by-products or co-products receive additional processing after they leave site, such as additional distiller's grains drying or fuel distillation, invoices covering the energy consumed for those processes must also be submitted. If the fuel production facility is co-located with one or more unrelated facilities, and energy consumption invoices are not separately available for the fuel production process, the applicant shall obtain a third-party energy audit sufficient to establish the long-term, typical energy consumption patterns of the fuel production facility.

3. In lieu of receipts or invoices for fuel sales, feedstock purchases, or co-product sales, the applicant may seek Executive Officer approval to submit audit reports prepared by independent, third-party auditors that document fuel sales, feedstock purchases, or co-product sales.

LCFS FF45-46 cont.

Ethanol production plants can have dozens of invoices for feedstock every week from many different suppliers. It would not be unusual for plants to have 3000-5000 invoices, DDG sales receipts, ethanol sales receipts, and other information requested by CARB. All of this information would require not only scanning but also significant redacting of key information to protect business relationships. I believe this is unnecessarily burdensome, nor do I believe CARB staff will be able to adequately review all of this information for 270 biofuel plants in the time required. Therefore, I request staff to revise these requirements. I recommend that the requirements be revised to require only summary information of key plant inputs and outputs (feedstock used, natural gas and electricity used, ethanol produced, DDG produced, etc.) on a monthly basis. This would be far more manageable by plants, and would not need as much redacting. The information could be verified by staff through on-site auditing if necessary.

I note that ARB allows applicants to seek Executive Officer approval to submit audit reports prepared by independent, third-party auditors that document fuel sales, feedstock purchases, or co-product sales. I recommend that ARB allow 3rd party audits to be performed using generally accepted auditing standards which would allow for a sampling approach, and would not need to involve every transaction unless there was a significant deficiency in the sampled data.

C. Differences between the December and June versions of CA-GREET

10. The June version of the CA-GREET model differs from the version of the CA-GREET model provide with the ISOR. CA-GREET includes a feature for selecting the presence of, and percentage of, mechanized harvesting of sugarcane. Users may select whether mechanized harvesting is used, and if so, in what percentage of feedstock used by a cane ethanol plant. In both the December (ISOR) and June versions of CA-GREET, when mechanized harvesting is selected, the model reduces emissions from cane straw burning. If 100% mechanized harvesting is selected, the model eliminates emissions from straw burning. Of course, a producer claiming that credit, referred to in the model as the "mechanized harvesting credit," must attest to and demonstrate the use of mechanized harvesting

LCFS FF45-47

11. Unlike the December version of CA-GREET, the new, June versions of CA-GREET awards a producer a mechanized harvesting credit even if a user does not specify, and is not thereby

LCFS FF45-48

requited to attest to, mechanized harvesting. Thus, even if a producer's percent of mechanized harvesting is 0%, the newly proposed regulation still awards a mechanized harvesting credit of 100%. Whether by design or error, a Brazilian sugarcane ethanol plant that had no mechanized harvesting would be assumed to have the same emissions as a plant with 100% mechanized harvesting.

LCFS FF45-48 cont.

D. Memoranda from ARB's external scientific reviewers.

12. In one of the memoranda attached to a May 2015 letter concerning the work of various external scientific reviewers retained by CARB, Dr. Clarens states as follows:

> *As written, the report states that the source must be directly consumed in the production process. But this is ambiguous in certain contexts such as those fuels that produce co-products. For example, if a corn feedstock were used to make ethanol and the stover were also used to make fuel (but was not consumed in the same production process) would that not trigger a switch from Tier 1 to Tier 2? It seems like it should but as written it might not. Clarifying this language is key for groups seeking to obtain co-product credit through the CA-LCFS.*

Despite my familiarity with the models to which Dr. Clarens is apparently referring, I am unable to determine whether Dr. Clarens believes stover is a coproduct of the corn feedstock or is a separate feedstock. Stover is not a coproduct of corn ethanol, clearly it is not. To the extent that Dr. Clarens recognizes that stover is a feedstock, I am unable to understand why or how he relates that fact to the impact of coproducts in relation to "trigger[ing] a switch from Tier 1 to Tier 2." In addition, I am unable to understand the point of confusion that Dr. Clarens perceives that would important to clarify for producers whose pathways include coproduct credits, even though I prepare pathway applications for some of those producers and am familiar with the newly proposed changes for registration and certification of ethanol pathways. I also note that Dr. Clarens appears not to know the LUC emissions factor that has been proposed for corn starch ethanol: he believes it to be 30 g/MJ, based on his memorandum. In my opinion, Dr. Clarens's memorandum demonstrates insufficient knowledge of the scientific portions of the proposed regulation to be given credibility in the scientific community as a reviewer of the LUC and CA-GREET portions of the proposed rule.

LCFS FF45-49

13. In the memorandum from Dr. Matthews that is attached to the May 5 letter, Dr. Matthews comments on the potential interaction between GHG emissions and emissions of volatile organic compounds and carbon monoxide. Those who work in the fields of GHG regulation and of criteria or related pollutant regulation consider such potential interactions to be minor, compared with the limitations on the effectiveness of GHG emissions regulations that do not address net emissions impact, or "leakage." The phenomenon of "fuel shuffling" -- in whch fuels that are not sold for use in California are still produced for sale elsewhere, regardless of the LCFS regulation -- is well recognized, but is not discussed in Dr. Matthews' memorandum.

LCFS FF45-50

14. In the draft memorandum from Dr. McCarl attached to the May 5 letter, Dr. McCarl states as follows:

LCFS FF45-51

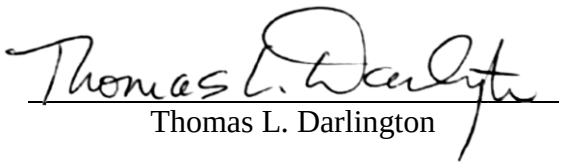
In GTAP I believe that there also are increases in emissions from intensification (more irrigation or fertilization) so that the characterization of it only in terms of indirect land use change is not accurate.

Dr. McCarl's belief about the contents of GTAP is not correct. There are no increases in emissions in GTAP attributed to intensification. Fertilization rates, for example are addressed in CA-GREET and not in GTAP, for purposes of ARB's lifecycle emissions analysis and standard-setting. I believe this error in Dr. McCarl's memorandum would be identified by anyone familiar with the relevant portions of the scientific basis of the proposed regulation. Although I believe Dr. McCarl to possess expertise in LUC modeling, the draft memorandum attributed to him does not demonstrate a level of familiarity with the scientific portions of the LCFS regulation on which he appears to be opining that can be considered to give the draft memorandum's opinion on those portions of the regulation credibility in the scientific community.

LCFS FF45-51 cont.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed this 18th day of June, 2015 in Holland, Michigan.



Thomas L. Darlington

Attachment A

Thomas L. Darlington
President, Air Improvement Resource Inc.

Profile

Thomas L. Darlington is President of Air Improvement Resource, a company formed in 1994 specializing in mobile source emission modeling. He is an internationally recognized expert in mobile source emissions modeling, lifecycle analysis, and land use modeling.

Professional Experience

1994-Present	President, Air Improvement Resource
1993-1994	Director, Mobile Source Programs, Systems Application International
1989-1994	Senior Engineer, General Motors Corporation, Environmental Activities
1988-1989	Senior Project Engineer, Detroit Diesel Corporation
1979-1988	Project Manager, U.S. EPA, Ann Arbor, Michigan

Recent Major Projects

- Developed Life Cycle reports and complete applications for 8 plants for the California Low Carbon Fuel Standard; six are currently registered, two plants are pending. Five plants were corn ethanol plants, one is sorghum and two are cellulose.
- Participated in and provided written comments on ARB's three 2014 iLUC workshops
- With Purdue and Don O'Connor, conducted study of iLUC emissions of rapeseed and other oilseeds in 2013 utilizing an updated version of GTAP
- Reviewed EPA's palm oil iLUC emissions in 2013
- Submitted comments on ARB's new GREET2.0 model
- Reviewed CARB's land use emissions for soybean biodiesel
- Reviewed the land use impacts of the RFS2 from EPA, including the notice of Proposed Rule, Regulatory Impact Analysis, and approximately one hundred documents in the rulemaking docket.
- Completed a land use study for Renewable Fuels Association and reviewed California Air Resource Board's Initial Statement of Reasons for the Low Carbon Fuel Standard
- Represented three stakeholders in the recent development of the ARB Predictive Model for reformulated gasoline in California (Alliance of Automobile Manufacturers, Renewable Fuels Association and Western States Petroleum Association)
- Represented two stakeholders in EPA's development of the MOVES on-highway emissions model (Alliance of Automobile Manufacturers and Engine Manufacturers Association)

Attachment "A"

- Developed the effects of ethanol permeation on on-highway and off-highway mobile sources in California and other states for the American Petroleum Institute
- Studied gasoline and diesel fuel options for Southeast Michigan (for SEMCOG, API and Alliance of Automobile Manufacturers)

Recent Publications

"Study of Transportation Fuel Life Cycle Analysis: Review of Economic Models Use to Assess Land Use Effects", CRC-E-88-3, July 2014.

"Land Use Change Greenhouse Gas Emissions of European Biofuel Policies Utilizing the Global Trade Analysis Project Model", Darlington, Kahlbaum, O'Connor, and Mueller, August 30, 2013.

"A Comparison of Corn Ethanol Lifecycle Analyses: California Low Carbon Fuels Standard (LCFS) Versus Renewable Fuels Standard (RFS2)", June 14, 2010. Renewable Fuels Association and Nebraska Corn Board. This study compared and contrasted the corn ethanol lifecycle analyses performed by both CARB (as a part of the LCFS) and the EPA (as a part of RFS2).

"Review of EPA's RFS2 Lifecycle Emissions Analysis for Corn Ethanol", September 25, 2009. Conducted for Renewable Fuels Association. This study reviewed EPA's land use GHG emissions assessment for corn ethanol, including the FASOM and FAPRI models and Winrock land-use types converted and emission factors by ecosystem type. The study made many recommendations for improving the land-use and emissions modeling.

"Review of CARB's Low Carbon Fuel Standard Proposal", April 15, 2009. Conducted for Renewable Fuels Association. This study reviewed CARB's analysis of land use emissions using GTAP6 and CARB's overall lifecycle emissions for corn ethanol. This study made many recommendations for improving the land use and lifecycle emissions of corn ethanol.

"Emission Benefits of a National Clean Gasoline", August 2008. Conducted for the Alliance of Automobile Manufacturers. This study evaluated the nationwide criteria pollutant emission reductions of a national clean gasoline standard.

"Land Use Effects of Corn-Based Ethanol", February 25, 2009. Conducted for Renewable Fuels Association. This study evaluates possible land use changes and GHG emissions associated with these land use changes as a result of the renewable fuel standard mandated 15 billion gallons of corn ethanol required by calendar year 2015. The study utilized projections of land use in the US and rest of world performed by Informa Economics, LLC, as well as newer estimates of the land use credits of co-products produced by ethanol plants to evaluate possible land use changes.

"On-Road NOx Emission Rates From 1994-2003 Heavy-Duty Trucks", SAE2008-01-1299, conducted for the Engine Manufacturers Association. This study examined

manufacturers consent decree emissions data to determine on-road NOx emission rates, and deterioration in emissions from heavy-duty vehicles. (Peer reviewed publication)

"Evaluation of California Greenhouse Gas Standards and Federal Energy Independence and Security Act - Part 2: CO2 and GHG Impacts", SAE2008-01-1853, conducted for the Alliance of Automobile Manufacturers. This paper evaluated the comparison of greenhouse gases from cars and light trucks in the US under both the Federal and California GHG policies. (Peer reviewed publication)

"Effectiveness of the California Light Duty Vehicle Regulations as Compared to Federal Regulations", June 15, 2007. Conducted with NERA Economic Consulting and Sierra Research for The Alliance of Automobile Manufacturers. This study compares the emission benefits of the California and Federal light duty vehicle regulations for HC, CO, NOx, PM, SOx, and Toxics taking into account the difference in emission standards, new vehicle costs and its effect on fleet turnover, new vehicle fuel economy and its effect on vehicle miles traveled, and other factors. Both the EPA MOBILE6 and ARB EMFAC on-road emissions models were used to estimate changes in emissions inventories.

"The Case for a Dual Tech 4 Model Within the California Predictive Model", May 20, 2007. Conducted with ICF International and Transportation Fuels Consulting for the Renewable Fuels Association (RFA). This study developed separate emissions vs fuel property models for lower and higher Tech 4 (1986-1995) vehicles, and showed that utilizing this alternative Predictive Model would result in a higher compliance margin for fuels containing higher volumes of ethanol. It was thought that this could lead to higher ethanol concentrations in the state, but even if the dual model is not used, it is a better representation of the 2015 inventory than the ARB single model.

"Updated Final Report, Effects of Gasoline Ethanol Blends on Permeation Emissions Contribution to VOC Inventory From On-Road and Off-Road Sources, Inclusion of E-65 Phase 3 Data and Other Updates", June 20, 2007. Conducted for the American Petroleum Institute. This report updates the earlier March 3, 2005 report for API utilizing data collected by CRC and others since of the time of the earlier report.

Final Report, Development of Technical Information for a Regional Fuels Strategy, February 28, 2006. Conducted for the Lake Air Directors Consortium (LADCO). This report provided guidance to the LADCO states (Midwestern states) concerning how to model different types of fuel control programs (in particular) using EPA mobile source models, and how to set up the baseline input files so that results are consistent between the different states.

"Emission Reductions from Changes to Gasoline and Diesel Specifications and Diesel Engine Retrofits in the Southeast Michigan Area", February 23, 2005. Conducted for the Southeast Michigan Council of Governments (SEMCOG), the Alliance of Automobile Manufacturers, and the American Petroleum Institute. This study examined the on-road and off-road emission benefits of many different possible gasoline and diesel fuel

specifications that the state could adopt to help meet the 8-hour ozone standards. This study formed the basis for the state's move to lower RVP summer gasoline.

"Examination of Temperature and RVP Effects on CO Emissions in EPA's Certification Database, Final Report", CRC Project No. E-74a, April 11, 2005. Conducted for the Coordinating Research Council. This study compared CO vs temperature results from the MOBILE6 model to the certification data, and recommended further testing, which is being conducted by the CRC at this time.

"Effects of Gasoline Ethanol Blends on Permeation Emissions Contribution to VOC Inventory From On-Road and Off-Road Sources" March 3, 2005. Conducted for the American Petroleum Institute (API). Using data from the CRC-E-65 program, and data collected by the California EPA and Federal EPA, this study estimated the impacts of ethanol use on increasing permeation VOC emissions from on-road vehicles, off-road equipment and vehicles, and from portable containers. Emission inventory estimates were made for a number of geographical areas including the state of California, and results showed that the permeation effect increases anthropogenic VOC inventories by 2-4%.

Review of EPA Report "A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions", February 11, 2003. Conducted for the American Petroleum Institute. This study critically examined the methods that EPA used to develop the impacts of biodiesel fuels on HC, CO, NOx, and PM emissions.

"Well-To Wheels Analysis of Advanced Fuel/Vehicle Systems – A North American Study of Energy Use, Greenhouse Gas Emissions, and Criteria Pollutant Emissions", May 2005. Conducted for General Motors Corporation, with Argonne National Labs. This study examined many different well to wheels pathways for various fuels, and their impacts on GHG and criteria pollutant emissions.

"Potential Delaware Air Emission Impacts of Switching From MTBE to Ethanol in the Reformulated Gasoline Program", May 26, 2005. Conducted for Lyondell Chemical Company. This study examined the HC, CO, and NOx impacts of switching from MTBE to ethanol.

"Potential Massachusetts Air Emission Impacts of Switching From MTBE to Ethanol in the Reformulated Gasoline Program" June 17, 2005. Conducted for Lyondell Chemical Company. This study is similar to the Delaware study above.

"Potential Maryland Air Emission Impacts of a Ban on MTBE in the Reformulated Gasoline Program", October 18, 2005. Conducted for Lyondell Chemical Company. This study is similar to the Delaware study above.

"MOBILE6.2C with Ethanol Permeation and Ethanol NOx Effects", February 8, 2005. Conducted for Health Canada. This study modified the MOBILE6.2C model for ethanol permeation VOC and ethanol NOx effects.

Education

B. Sc., (Materials and Metallurgical Engineering), University of Michigan, Ann Arbor, 1979
Post Graduate Courses (Business Administration), University of Michigan, Ann Arbor, 1982

Attachment B

Discussion of the Yield Price Elasticity in GTAP

Farzad Taheripour and Wallace E. Tyner
Purdue University

At the March 11, 2014 CARB meeting, there was considerable interest in the yield to price elasticity parameter in GTAP. There also seemed to be a good bit of confusion on what it does and does not do. The purpose of this note is to provide an explanation of the role of this parameter in GTAP, explain why it is there, and to explain other reasons why yields can change in GTAP.

First, the basic idea behind the parameter is that over the medium to long term (the time horizon of GTAP), one would expect the agricultural sector to respond to increases in net returns to crops with appropriate investments in improving yields of crops with growing returns. This investment is certainly not limited to on-farm investment. In fact, a major portion of it may occur off-farm. It could include investments by seed companies to produce higher yielding seeds, investments in chemical companies to produce better herbicides/pesticides, investments by farm equipment companies to produce more efficient machinery for cultivation and harvest, investments by farmers to improve drainage and other soil properties, and other productivity enhancing investments. In other words, this parameter attempts to capture responses throughout the agricultural sector to higher returns in given crops.

The yield to price elasticity does not measure changes over one crop year. In fact, any estimate done over one year would be totally inappropriate for GTAP and should be excluded from consideration in determining appropriate values for the parameter.

What is the precise definition of the yield to price elasticity (YDEL)? YDEL is the percentage change in intensive yield over the percentage changes in relative price of a crop over input prices. In other words it is the intensive yield change with respect to change in variable returns to a crop. If the YDEL value is 0.25, and the change in variable returns of a crop is 10%, then the change in intensive yield would be 2.5%. It is very important to emphasize that the parameter YDEL only governs changes in intensive yield due the changes in net return. Other factors can affect crop yields as well.

How else can yields change in GTAP? Yields are affected by changes on the intensive and extensive margins. As noted in Hertel et al. (2010), there are two important sources which affect the extensive margin of yields. The first source is due to shifting among crops. For example, shifting from corn-soybean rotation to corn-corn rotation could affect yield. The second source of change in extensive yield is due to land conversion from forest or pasture to cropland. In the first case, if there is a corn ethanol shock applied to the model, more corn will be demanded, and there likely will be both crop switching and land cover changes to accommodate the higher demand for corn. With crop switching, there will be more acres of corn and fewer acres of other lower yielding crops. Thus, when one calculates the weighted average yields after the shock, the average likely would be higher. For example, consider typical corn, soybean, and wheat yields of 4.5, 1.2, and 1.7 tons/ac respectively. If the post shock crop mix has more corn acreage, the post shock

weighted average yields can be higher even if YDEL were zero. That is simply because corn has a higher mass yield per acre.

Yields can also change when more or less productive acres come into corn from other uses. Crop switching can result in higher or lower productivity. However, land cover changes from pasture or forest typically tends to reduce yields because new land could be lower productivity. The productivity of converted land is affected by the ETA parameter.

Since GTAP is a CGE model, yields can also be influenced by a myriad of other changes such as changes in relative price of variable inputs. The bottom line is that while yields can be and are affected by many factors working in GTAP, the YDEL parameter is only designed to capture the incentive to invest over the medium term in crops with increasing returns.

It is not correct to divide the weighted average of percentage changes in crop yields by the weighted average of percent changes in crop prices as was done in the CARB presentation. This calculation incorporates area changes as well as yield changes. One must take into account percentage changes in variable costs of production as well. The calculated value from the CARB presentation of 0.39 for yield to price elasticity for US for the corn ethanol expansion is meaningless because it includes many factors. If we follow the CARB approach and calculate the same measure for Brazil due to the US corn ethanol shock, we get a yield to price elasticity of -0.16 for Brazil, which obviously does not make sense. Furthermore, CARB has ignored the fact that the yield to price ratio only cover the percentage change in intensive yield not total yield. In their calculations, percentage changes in total yield instead of intensive yield were used.

LCFS FF45-52

Attachment C

Statistical Issues Related to the Low-Carbon Fuel Standard
Submitted by
David M. Rocke, PhD
October 31, 2014
Under contract 13-405 (2014)

Analysis of Simulations for ILUC

Two separate simulation methodologies were employed by CARB to help determine factors to which Indirect Land Use Change (iLUC) is sensitive. The iLUC impact of biofuels relates to the unintended increase of carbon emissions due to land-use changes around the world induced by the expansion of croplands for production of biofuels such as ethanol in response to the increased global demand for these fuels. If more biofuels are needed, in general the price of the feedstock would rise compared to other uses of the land. This in turn may result in forests or other uncropped land being converted to agricultural use. Because natural lands, such as rainforests and grasslands, store carbon in their soil and in biomass as plants grow each year, clearance of wilderness for new farms translates to a net increase in greenhouse gas emissions. Due to this change in the carbon stock of the soil and the biomass, indirect land use change has consequences in the greenhouse-gas emissions balance of a biofuel.

Both sets of simulations are based on the Global Trade Analysis Project (GTAP) database and the Agro-ecological Zone Emission Factor (AEZ-EF) Model. One method was to use varying specific values of some parameters as sensitivity analysis. For example, this could consist of YDEL, the price elasticity of yield, ETL1, the elasticity of transformation between forest, cropland, and pasture, ETL2, the elasticity of transformation among crops, PAEL_US, the yield elasticity for cropland/pasture in the US, and PAEL_Brazil, yield elasticity for cropland/pasture in Brazil. The other simulation method used the Monte Carlo methodology in which values for a large number of parameters were chosen at random repeatedly.

In order to determine the most influential factors, we conducted a statistical analysis of the iLUC factor for corn ethanol in terms of the input variables in a simulation with 600 variables and 3,000 trials. This was done using stepwise regression, but since all the parameters were chosen independently in the Monte Carlo (except CDGC and CDGS, which were highly correlated), the coefficient estimates were almost orthogonal, so the results of a single analysis of the 600 variable model would have been very similar, except for CDGC and CDGS. Table 1 gives the results of this analysis. The most influential factors in terms of contribution to the sum of squares were YDEL, the price elasticity of yield, the ESBV parameters, the elasticity of substitution between primary input factors in production, ETA, the elasticity of effective hectares with respect to harvested area, and ETL1, the elasticity of transformation among crops.

Table 1. Statistical Analysis of Corn Ethanol ILUC Factor in a Monte Carlo Simulation

Response: ilucFactor

	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
ESBV.11.0.	1	68324	68324	4989.7281	< 2.2e-16	***
YDEL	1	65612	65612	4791.7008	< 2.2e-16	***
ETA	1	37960	37960	2772.2342	< 2.2e-16	***
ESBV.13.0.	1	17097	17097	1248.6237	< 2.2e-16	***
ETL1	1	13970	13970	1020.2320	< 2.2e-16	***
CDGC	1	13886	13886	1014.0667	< 2.2e-16	***
croplandPastureEmissionRatio	1	7214	7214	526.8437	< 2.2e-16	***
ESBV.12.0.	1	4978	4978	363.5544	< 2.2e-16	***
N2O_N_EF	1	2975	2975	217.2690	< 2.2e-16	***
PAEL.3.0.	1	2268	2268	165.6035	< 2.2e-16	***
pastureSoil_C.0.1.	1	2089	2089	152.5737	< 2.2e-16	***
croplandSoil_C	1	2034	2034	148.5450	< 2.2e-16	***
youngStandAglb	1	1471	1471	107.4001	< 2.2e-16	***
SUBP.0.18.	1	1356	1356	98.9945	< 2.2e-16	***
EFED	1	946	946	69.0674	< 2.2e-16	***
SUBP.0.1.	1	874	874	63.8461	1.934e-15	***
totalTree_C.0.4.	1	890	890	64.9935	1.094e-15	***
croplandLandUseFactor.5.0.	1	752	752	54.9003	1.661e-13	***
PAEL.1.0.	1	694	694	50.7027	1.354e-12	***
SUBP.0.2.	1	644	644	47.0584	8.416e-12	***
totalTree_C.0.1.	1	627	627	45.8145	1.572e-11	***
carbonNitrogenRatio	1	639	639	46.6822	1.016e-11	***
SUBP.0.3.	1	562	562	41.0261	1.751e-10	***
deadwoodByLatitude_C.3.1.	1	525	525	38.3264	6.844e-10	***
croplandLandUseFactor.10.0.	1	488	488	35.6556	2.646e-09	***
deadwoodByRegion_C.4.1.	1	515	515	37.5940	9.912e-10	***
deadwoodByRegion_C.1.1.	1	473	473	34.5168	4.715e-09	***
totalTree_C.0.2.	1	385	385	28.1390	1.215e-07	***
forestSoil_C.0.18.	1	383	383	27.9501	1.339e-07	***
forestSoil_C.0.4.	1	367	367	26.8051	2.407e-07	***
oldStandAglb	1	313	313	22.8335	1.856e-06	***
pastureSubsoilLossFraction	1	323	323	23.5576	1.277e-06	***
totalTree_C.0.18.	1	253	253	18.4775	1.777e-05	***
croplandLandUseFactor.6.0.	1	246	246	17.9905	2.291e-05	***
forestLitter_C.10.1.	1	218	218	15.9474	6.677e-05	***
pastureAgb.6.0.	1	211	211	15.4370	8.732e-05	***
understory_C	1	202	202	14.7871	0.0001230	***
GWP_N2O	1	177	177	12.9423	0.0003267	***
pastureSoil_C.0.19.	1	175	175	12.8020	0.0003520	***
ETL2	1	171	171	12.4815	0.0004175	***
EPSR	1	170	170	12.3870	0.0004391	***
foregoneGrowthRate	1	152	152	11.1033	0.0008727	***
croplandLandUseFactor.4.0.	1	149	149	10.8470	0.0010016	**
ESBM.4.0.	1	143	143	10.4288	0.0012547	**
ESBM.2.0.	1	124	124	9.0317	0.0026764	**
ESBV.25.0.	1	119	119	8.7089	0.0031924	**
pastureSoil_C.0.12.	1	115	115	8.4070	0.0037663	**
pastureSoil_C.0.3.	1	117	117	8.5596	0.0034642	**
ESBV.30.0.	1	105	105	7.6970	0.0055672	**
forestLitter_C.15.1.	1	108	108	7.8711	0.0050571	**
ELEN.9.0.	1	102	102	7.4502	0.0063818	**

ELEN.26.0.	1	103	103	7.5010	0.0062047 **
cropCarbonAnnualizationFactor	1	87	87	6.3746	0.0116303 *
ELEG.19.0.	1	88	88	6.4184	0.0113473 *
pastureSubsoil_C.0.1.	1	86	86	6.2890	0.0122040 *
forestLitter_C.13.1.	1	86	86	6.2485	0.0124856 *
ELNC.16.0.	1	83	83	6.0512	0.0139554 *
ESBM.46.0.	1	76	76	5.5190	0.0188785 *
forestLitter_C.9.1.	1	72	72	5.2607	0.0218848 *
SUBP.0.13.	1	76	76	5.5662	0.0183778 *
pastureSoil_C.0.8.	1	72	72	5.2931	0.0214824 *
ELEN.2.0.	1	71	71	5.1593	0.0231958 *
totalTree_C.0.6.	1	65	65	4.7814	0.0288496 *
ESBV.2.0.	1	68	68	4.9825	0.0256817 *
ELEG.3.0.	1	65	65	4.7447	0.0294704 *
ELKE.10.0.	1	68	68	4.9421	0.0262881 *
deforestedFraction.11.0.	1	64	64	4.6579	0.0309946 *
ELNE.7.0.	1	63	63	4.6191	0.0317009 *
croplandLandUseFactor.15.0.	1	64	64	4.6402	0.0313146 *
forestRootShootRatio	1	63	63	4.5786	0.0324578 *
deadwoodByRegion_C.18.1.	1	59	59	4.2837	0.0385692 *
deforestedFraction.8.0.	1	59	59	4.2987	0.0382306 *
ELKE.37.0.	1	57	57	4.1496	0.0417355 *
pastureSubsoil_C.0.3.	1	57	57	4.1742	0.0411345 *
ELEN.29.0.	1	57	57	4.1843	0.0408909 *
pastureSoil_C.0.18.	1	58	58	4.2081	0.0403236 *
deforestedFraction.13.0.	1	55	55	4.0201	0.0450553 *
hwpFraction.9.0.	1	52	52	3.7859	0.0517839 .
forestLandUseFactor.11.0.	1	52	52	3.7882	0.0517122 .
forestSoil_C.0.13.	1	52	52	3.7649	0.0524376 .
ELNE.22.0.	1	48	48	3.4933	0.0617215 .
totalTree_C.0.12.	1	51	51	3.7565	0.0527010 .
ESBM.41.0.	1	49	49	3.5807	0.0585568 .
ELHL	1	48	48	3.5264	0.0605018 .
croplandLandUseFactor.3.0.	1	47	47	3.4426	0.0636396 .
forestLitter_C.17.1.	1	46	46	3.3286	0.0681885 .
ELNC.13.0.	1	45	45	3.2580	0.0711825 .
ELNE.4.0.	1	43	43	3.1227	0.0773172 .
ESBV.1.0.	1	44	44	3.1827	0.0745296 .
ELNC.19.0.	1	43	43	3.1486	0.0760975 .
forestSoil_C.0.11.	1	42	42	3.0762	0.0795527 .
SUBP.0.4.	1	44	44	3.1855	0.0743993 .
ELEG.2.0.	1	42	42	3.0802	0.0793588 .
PAEL.11.0.	1	41	41	3.0253	0.0820827 .
ELNC.5.0.	1	41	41	2.9984	0.0834557 .
forestBurningEF	1	41	41	2.9782	0.0844994 .
ELKE.15.0.	1	42	42	3.0370	0.0814919 .
pastureSubsoil_C.0.8.	1	39	39	2.8725	0.0902161 .
ESBM.16.0.	1	39	39	2.8535	0.0912852 .
croplandLandUseFactor.1.0.	1	42	42	3.0817	0.0792853 .
ELKE.1.0.	1	39	39	2.8257	0.0928772 .
deforestedFraction.7.0.	1	37	37	2.7211	0.0991387 .
ELVL	1	37	37	2.7172	0.0993831 .
forestSubsoil_C.0.8.	1	39	39	2.8846	0.0895377 .
forestSubsoil_C.0.18.	1	37	37	2.7202	0.0991942 .
ELNE.24.0.	1	39	39	2.8418	0.0919521 .
ELEN.4.0.	1	40	40	2.9344	0.0868207 .
ELNE.6.0.	1	37	37	2.7386	0.0980619 .

```
forestSoilLossFraction           1     35      35    2.5360 0.1113837
forestLandUseFactor.3.0.         1     36      36    2.6196 0.1056590
ELEG.7.0.                        1     33      33    2.3757 0.1233479
ELKE.36.0.                       1     32      32    2.3144 0.1282875
ESBM.33.0.                       1     36      36    2.6437 0.1040686
ELNC.26.0.                       1     35      35    2.5444 0.1107993
ELEN.6.0.                        1     36      36    2.5966 0.1072009
ELNE.34.0.                       1     32      32    2.3068 0.1289195
PAEL.6.0.                        1     32      32    2.3672 0.1240167
ESBV.28.0.                       1     32      32    2.3410 0.1261183
pastureAgb.10.0.                 1     37      37    2.6804 0.1017002
ELNE.16.0.                       1     33      33    2.3810 0.1229333
forestSubsoil_C.0.14.            1     31      31    2.2673 0.1322385
pastureSoil_C.0.16.              1     33      33    2.3782 0.1231485
ELHB                             1     33      33    2.3743 0.1234546
ELNC.1.0.                        1     33      33    2.3922 0.1220537
ELKE.18.0.                       1     35      35    2.5512 0.1103183
ELNC.17.0.                       1     30      30    2.1732 0.1405476
ESBV.19.0.                       1     31      31    2.2578 0.1330512
ELEN.31.0.                       1     33      33    2.4252 0.1195113
pastureAgb.12.0.                 1     30      30    2.1670 0.1411076
ELKE.34.0.                       1     33      33    2.4155 0.1202515
ELNE.33.0.                       1     32      32    2.3370 0.1264439
ELNE.32.0.                       1     32      32    2.3271 0.1272524
ESBM.22.0.                       1     32      32    2.3090 0.1287354
ELKE.41.0.                       1     30      30    2.2042 0.1377488
SUBP.0.5.                        1     34      34    2.4534 0.1173836
ELNC.2.0.                        1     31      31    2.2766 0.1314507
ELNE.14.0.                       1     28      28    2.0659 0.1507380
ELEN.7.0.                        1     28      28    2.0718 0.1501589
forestSubsoil_C.0.11.            1     31      31    2.2497 0.1337495
ELNE.18.0.                       1     31      31    2.2353 0.1350028
ELNE.17.0.                       1     27      27    1.9797 0.1595262
ELNC.14.0.                       1     29      29    2.1052 0.1469068
deforestedFraction.1.0.          1     29      29    2.0978 0.1476215
ELEG.11.0.                       1     28      28    2.0785 0.1494954
ESBM.21.0.                       1     28      28    2.0808 0.1492744
Residuals                     2854  39080      14
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Price Elasticity of Yield (YDEL)

In view of the importance of YDEL in the analysis, and in view of the conflicting results in the literature on its likely size, the next part of the project undertaken was to analyze one of the data sets upon which these estimates have been based. The data were used in a 2012 dissertation of Juan Francisco Rosas Pérez (also given as Juan Francisco Rosas in a 2014 paper by Rosas, Hayes, and Lence, apparently taken from the dissertation). In these works, the price elasticity of yield was estimated from data on corn (maize) in Iowa for 1960–2004, and was said to be in the range of 0.29. The data set was publicly available so it was used for a re-analysis. The analysis used by Rosas Pérez, was complex, and can be criticized for insufficiently handling autocorrelation in the series. Therefore, a simpler analysis was conducted that should have similar results to the more complex analysis if the latter is not flawed.

The data set used was the one supplied with the Rosas Pérez dissertation, though there is no good data dictionary and the meaning of some of the statistics was less than clear. The most clearly relevant variables were a corn price index series (here called corn.price) and a corn supply index series (corn.supply) and their natural logarithms (lcorn.price and lcorn.supply). There do not seem to be good data on land devoted to corn, or perhaps land at all, since the variable Z4 = Q Land is equal to 1 for all years, so this analysis was aimed at the price elasticity of supply not the price elasticity of yield; this would tend to overestimate the effect of price on supply given that land substitution is often an easier response to greater potential profit from a crop than is attempting to increase yield.

The quantity of interest then would be the ratio of the percentage change in supply to the percentage change in price. Roughly, the percentage change is equal to the actual change on the natural log scale. For example (110 – 100)/100 = 0.10 while log(110) – log(100) = 0.0953, so we will proceed to relate the change on the log scale of supply to the change on the log scale of price.

Without participating in debates about the proper functional form of multi-equation models of the agricultural economy, we can go back to statistical basics using the following principles:

1. All other things being equal, the price elasticity of supply can be estimated by regressing log(supply) on log(price).
2. In regressions with autocorrelated time series, it is important to account for the self-effects of the series being predicted before asking if another series has an effect. This is sometimes called Granger causality analysis.

In fact, both series are autocorrelated in a plausibly autoregressive way, with the ACF function declining slowly and the PACF function dropping of more quickly (see Figures 1 and 2 for the supply series later in the document). As can be seen from the output in Table 2, there is no significant relationship of supply to current or past prices after

accounting for last year's supply. In fact, the estimated coefficients are not even positive.

While there may exist alternative explanations of these results with respect to omitted factors, it is hard to find such modeling aspects that provide effects in the direction of reducing the apparent response of supply to price and that themselves could explain a large elasticity that is so hidden. The best interpretation of these results is that

1. The price elasticity of yield implied by the Iowa corn data is likely close to 0 and very unlikely to be as large as 0.10 or 0.20.
2. The results obtained by Rosas Pérez showing an apparently higher elasticity is likely caused by mishandling the autocorrelation in the time series.

As documented in Berry (2011), Berry and Schlenker (2011), and Roberts and Schlenker (2013), much of the literature providing purported estimates of the price elasticity of yield is deeply methodologically flawed. In addition to the problems of endogeneity and autocorrelation that are badly handled, there are other important issues. In Goodwin, Michele Marra, Piggott, and Mueller (2012), for example, 15 years of data are multiplied into 405 data points by considering 27 different districts. But there are still only 15 price values and it is hard to believe that the strong relationships of weather, price, and technology within a given year can be handled by econometric tricks. The analyses, such as those in Roberts and Schlenker (2013), that are methodologically sound all show small to zero price elasticities of yield.

Table 2. Regression Analysis for Price Elasticity of Supply for Iowa Corn

```
> anova(lm(lcorn.supply~lcorn.supply1+lcorn.price+lcorn.price1))

Analysis of Variance Table

Response: lcorn.supply
              Df  Sum Sq Mean Sq F value    Pr(>F)
lcorn.supply1  1 1.58085 1.58085 30.5328 2.191e-06 ***
lcorn.price    1 0.00558 0.00558  0.1078    0.7444
lcorn.price1   1 0.01618 0.01618  0.3125    0.5793
Residuals     40 2.07103 0.05178
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

> anova(lm(lcorn.supply~lcorn.supply1+lcorn.price+lcorn.price1
           +lcorn.price2))

Analysis of Variance Table

Response: lcorn.supply
              Df  Sum Sq Mean Sq F value    Pr(>F)
lcorn.supply1  1 1.39173 1.39173 26.6904 7.889e-06 ***
lcorn.price    1 0.00466 0.00466  0.0894    0.7666
```

```
lcorn.price1   1 0.01436 0.01436  0.2755    0.6027
lcorn.price2   1 0.07523 0.07523  1.4428    0.2371
Residuals     38 1.98145 0.05214
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm(lcorn.supply~lcorn.supply1+lcorn.price+lcorn.price1))

Call:
lm(formula = lcorn.supply ~ lcorn.supply1 + lcorn.price +
lcorn.price1)

Residuals:
     Min       1Q   Median       3Q      Max
-0.64342 -0.11119  0.01966  0.14210  0.52123

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)    0.71117    0.24967   2.848  0.00691 **
lcorn.supply1  0.62929    0.13427   4.687 3.19e-05 ***
lcorn.price   -0.02265    0.23289  -0.097  0.92301
lcorn.price1  -0.12364    0.22116  -0.559  0.57925
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.2275 on 40 degrees of freedom
  (1 observation deleted due to missingness)
Multiple R-squared:  0.4362,    Adjusted R-squared:  0.394
F-statistic: 10.32 on 3 and 40 DF,  p-value: 3.676e-05
```

Figure 1. Autocorrelation of Corn Supply in Iowa

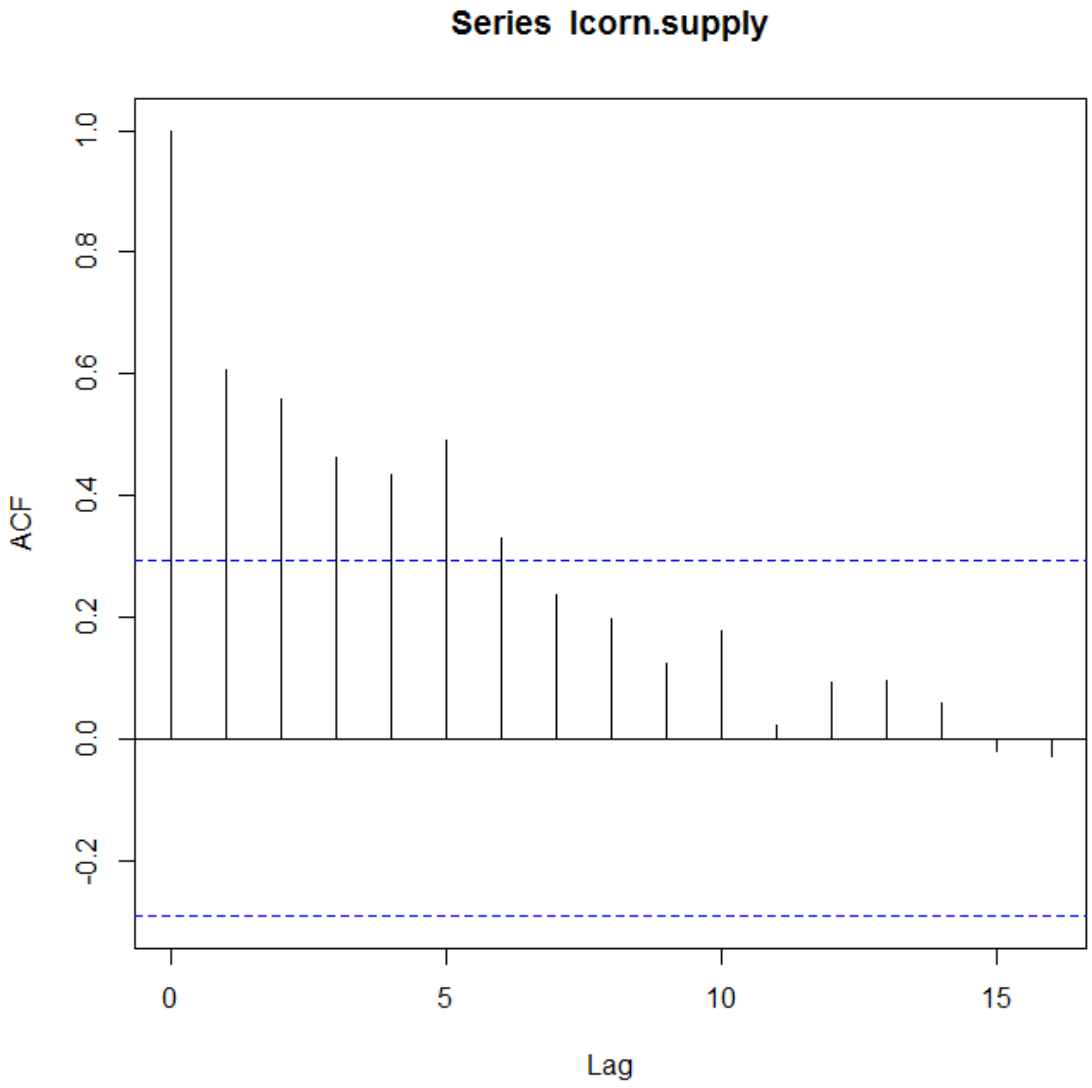
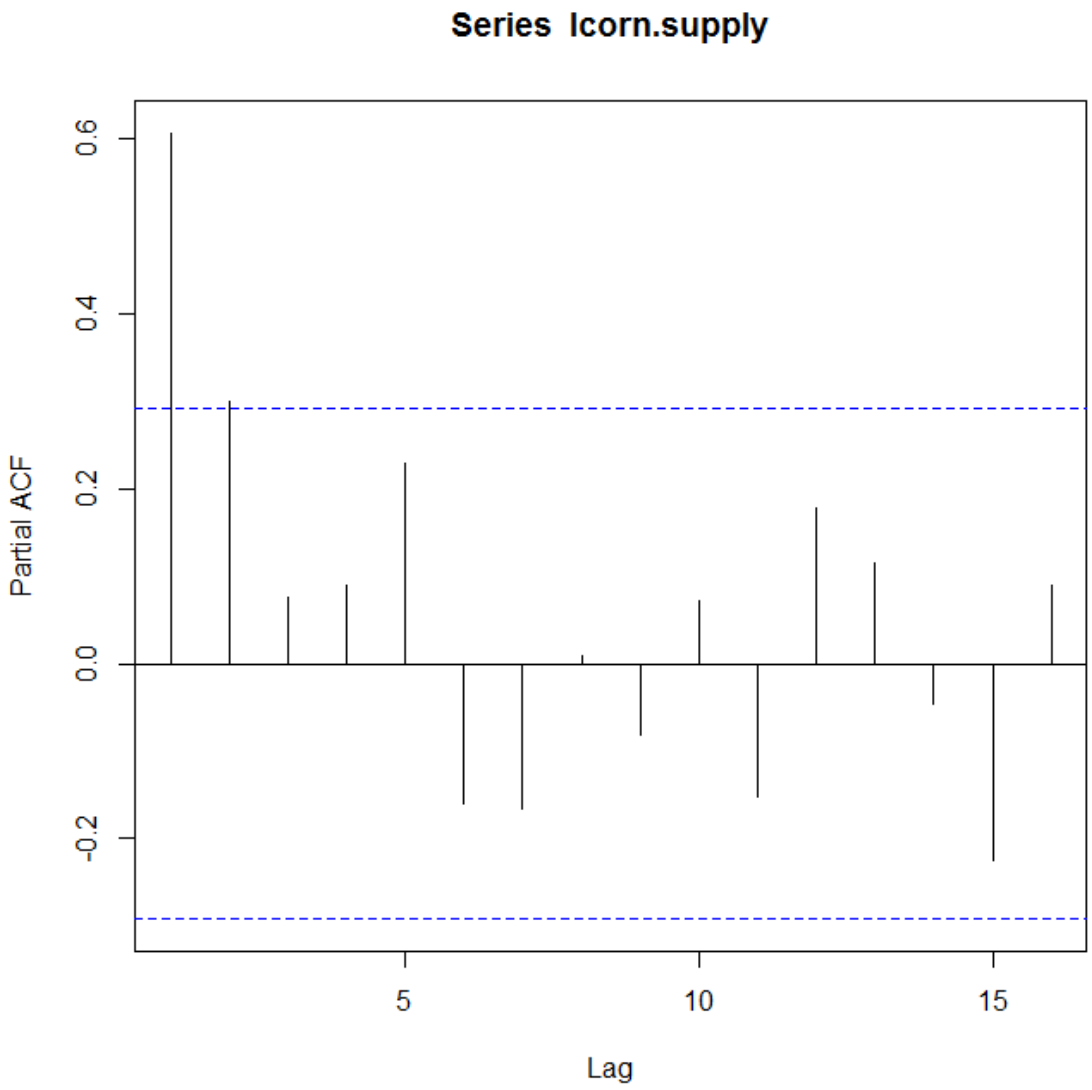


Figure 2. Partial Autocorrelation of Corn Supply in Iowa



Bibliography

Berry, Steven T. (2011) “Biofuels Policy and the Empirical Inputs to GTAP Models,” manuscript.

Berry, Steven and Wolfram Schlenker (2011) “Technical Report for the ICCT: Empirical Evidence on Crop Yield Elasticities,” manuscript.

Goodwin, Barry K., Michele Marra, Nicholas Piggott and Steen Mueller (2012) “Is Yield Endogenous to Price? An Empirical Evaluation of Inter- and Intra-Seasonal Corn Yield Response,” manuscript.

Pérez, Juan Francisco Rosas, (2012) *Essays on the Environmental Effects of Agricultural Production*, Diss. Iowa State University.

Roberts, Michael J. and Wolfram Schlenker (2013) “Identifying Supply and Demand Elasticities of Agricultural Commodities: Implications for the US Ethanol Mandate,” *American Economic Review*, 103, 2265–2295.

Rosas, Juan Francisco, Dermot J. Hayes, and Sergio H. Lence (2014) “Response of Crop Yields to Output Prices: A Bayesian Approach to Complement the Duality Theory Econometrics,” manuscript.

STATE OF CALIFORNIA

BEFORE THE AIR RESOURCES BOARD

Declaration of James M. Lyons

I, James Michael Lyons, declare as follows:

1. I make this Declaration based upon my own personal knowledge and my familiarity with the matters recited herein. It is based on my experience of nearly 30 years as a regulator, consultant, and professional in the field of emissions and air pollution control. A copy of my résumé can be found in Attachment A.

2. I am a Senior Partner of Sierra Research, Inc., an environmental consulting firm located at 1801 J Street, Sacramento, California owned by Trinity Consultants, Inc. Sierra specializes in research and regulatory matters pertaining to air pollution control, and does work for both governmental and private industry clients. I have been employed at Sierra Research since 1991. I received a B.S. degree in Chemistry from the University of California, Irvine, and a M.S. Degree in Chemical Engineering from the University of California, Los Angeles. Before joining Sierra in 1991, I was employed by the State of California at the Mobile Source Division of the California Air Resources Board (CARB).

3. During my career, I have worked on many projects related to the following areas: 1) the assessment of emissions from on- and non-road mobile sources, 2) assessment of the impacts of changes in fuel composition and alternative fuels on engine emissions including emissions of green-house gases, 3) analyses of the unintended consequences of regulatory actions, and 4) the feasibility of compliance with air quality regulations.

4. I have testified as an expert under state and federal court rules in cases involving CARB regulations for gasoline, Stage II vapor recovery systems and their design, factors affecting emissions from diesel vehicles, evaporative emission control system design and function, as well as combustion chamber system design. While at Sierra I have acted as a consultant on automobile air pollution control matters for CARB and for the United States Environmental Protection Agency. I am a member of the American Chemical Society and the Society of Automotive Engineers and have co-authored nine peer-reviewed monographs concerned with automotive emissions, including greenhouse gases and their control. In addition, over the course of my career, I have conducted peer-reviews of numerous papers related to a wide variety of issues associated with pollutant emissions and air quality.

5. This Declaration summarizes the results of my review of the CARB Notice of Public Availability of Modified Text and Availability of Additional Documents for the Proposed Re-Adoption of the Low Carbon Fuel Standard Regulation on the Commercialization of Alternative Diesel Fuels (the LCFS Regulation) dated June 4,

2015. I have performed this review as an independent expert for Growth Energy. If called upon to do so, I would testify in accord with the facts and opinions presented here.

6. Based on my review of the changes proposed to the LCFS regulation by CARB, the elimination of the multimedia evaluation provisions from the LCFS through the deletion of Section 95490 and related deletions in Sections 95481(a)(59) and 95488(c)(4)(G)6.d. creates the potential for significant adverse environmental impacts to occur as the result of the introduction of new lower carbon intensity fuels. I have participated in every aspect of the development of the LCFS regulation in which a member of the public was allowed by CARB to participate. This change to the proposed regulation could not reasonably have been anticipated, based on the notice of proposed rulemaking and the supporting materials made available in December 2014. LCFS FF45-53

7. The discussion of the need for the multimedia evaluation provisions that CARB staff is now proposing to delete is summarized in both the current Initial Statement of Reasons (ISOR) for re-adoption of the LCFS regulation as well as the ISOR prepared in 2009 for the original LCFS regulation. The language relevant to the multimedia evaluation provisions in both the current and 2009 ISOR is virtually identical. With respect to why the multimedia evaluation provisions were needed in the LCFS, both the ISOR for the re-adoption of the LCFS regulation[1] and the 2009 ISOR[2] state that:

> *The LCFS regulation incorporates this principle as a pre-sale prohibition applied to fuels that are subject to an ARB specification that is modified or adopted after adoption of the LCFS regulation. In such cases, regulated parties would be prohibited from selling the affected fuels in California to comply with the LCFS requirements until a multimedia evaluation is approved for those fuels pursuant to H&S §43830.8.*

LCFS FF45-54

Elimination of the multimedia evaluation provisions from the LCFS regulation as now proposed by CARB staff would permit fuel suppliers to sell new fuels in California in order to try to comply with the LCFS without ensuring that adverse environmental impacts associated with their use have been identified and properly mitigated. Such new fuels could include gasoline-butanol blends, alternative diesel fuels other than biodiesel and renewable diesel, and renewable natural gas fuels that fail to comply with CARB's existing natural gas fuel specifications. In addition, these potential impacts of the LCFS regulation were not considered in the Environmental Analysis prepared for the LCFS and ADF regulations.

8. There are several ways in which new fuels which could lead to adverse environmental impacts could be sold in California before the approval of a multimedia LCFS FF45-55

1. [1] Page III-64

[2] Page V-32

evaluation pursuant to H&S §43830.8. The first of these is if the California Division of Measurement Standards (CDMS) rather than CARB adopts fuel specifications allowing the use of the new fuel. In the past, new fuels have been allowed in California through specifications enacted by CDMS that have not been required to undergo multimedia evaluation pursuant to H&S §43830.8. Biodiesel is one such fuel that has created adverse environmental impacts. Based on CARB staff estimates, in 2014, biodiesel use for compliance with the LCFS regulation allowed by CARB[3] without an approved multimedia evaluation pursuant to H&S §43830.8 resulted in increased NOx emissions of 1.2 tons per day statewide.[4] Increased NOx emissions due to the use of biodiesel for purposes of LCFS compliance have occurred since the inception of the LCFS program as a result of CARB's failure to adopt fuel specifications and complete the multimedia evaluation required pursuant to H&S §43830.8 despite having committing to do so as early as 2009.[5] Elimination of the requirements for approval of a multimedia evaluation before allowing new fuels to be sold for purposes of LCFS approval would allow other new fuels to be sold in California that, like biodiesel, create adverse environmental impacts before those impacts have been identified through the multimedia evaluation process. These potential environmental impacts created by the LCFS as a result the elimination of the LCFS multimedia evaluation requirements were not considered in the Environmental Assessment.

LCFS FF45-55 cont.

9. That the increases in NOx emissions resulting from biodiesel use in California without an approved multimedia evaluation were significant can be seen through a comparison of the criteria used to assess air quality impacts in areas of California outside the South Coast and San Joaquin Air Basins and the increases in NOx emissions estimated to result from biodiesel use. Using the Sacramento Metropolitan Air Quality Management District as an example,[6] the significance threshold for NOx emissions projects subject to CEQA is 65 pounds per day or 0.0325 tons per day. The 0.0325 tons per day threshold can be compared to both the 1.2 ton per day increase in NOx emissions due to biodiesel use estimated by CARB staff for 2014 statewide. Clearly, elimination of the requirements for multimedia evaluation for new fuels sold for LCFS compliance could lead to similar, and therefore significant, unmitigated, increases in NOx emissions or significant and unmitigated increases in emissions of other pollutants.

LCFS FF45-56

10. Another way in which new fuels could create potential adverse environmental impacts if the multimedia evaluation requirements are deleted is through the

LCFS FF45-57

[3] See *http://www.arb.ca.gov/fuels/diesel/altdiesel/20111003biodiesel%20guidance.pdf*

[4] See Table 1 of *http://www.arb.ca.gov/regact/2015/adf2015/signedadfnotice.pdf*

[5] See page V-33 of *http://www.arb.ca.gov/regact/2009/lcfs09/lcfsisor1.pdf*

[6] See *http://airquality.org/ceqa/ceqaguideupdate.shtml*

Developmental Engine Fuel Variance Program operated by CDMS.[7] Again, the multimedia evaluation requirements of H&S §43830.8 that apply to fuels for which CARB adopts specifications would not apply in this case and adverse environmental impacts can occur. Allowing new fuels that are part of this program to be sold for purposes of LCFS compliance without having an approved multimedia evaluation would increase the likelihood that fuel producers would seek to use this program and the likelihood that new fuel that leads to unmitigated adverse environmental impacts would be used in California. These potential environmental impacts that the LCFS regulation could create as a result of the proposed elimination of the multimedia evaluation requirements were not considered in the Environmental Assessment.

LCFS FF45-57 cont.

11. In addition, the Alternative Diesel Fuel regulation proposed by CARB staff creates another way by which new fuels with potential adverse environmental impacts could be sold in California for purposes of LCFS compliance should the multimedia evaluation requirements be eliminated. Currently, fuels involved in Stage 1 or Stage 2 of the LCFS regulation are not required to have completed a multimedia evaluation and therefore could not be sold for purposes of LCFS compliance until they reach Stage 3, at which point completion of a multimedia evaluation and adoption of fuel specifications by CARB are required. Elimination of the current multimedia evaluation requirements from the LCFS regulation as now proposed by CARB staff, would allow fuels in Stage 1 and Stage 2 to be sold for purposes of LCFS compliance before the potential adverse environmental consequences have been assessed or mitigated. Again, these potential environmental impacts due to the LCFS were not considered in the Environmental Assessment.

LCFS FF45-58

12. In summary, retention of the current LCFS requirements that new fuels have received an approved multimedia evaluation pursuant to H&S §43830.8 before being allowed to be sold for purposes of LCFS compliance is the only way to ensure that the LCFS is not responsible for use of these new fuels creating potential adverse environmental impacts.

LCFS FF45-59

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed this 19th day of June, 2015 at Sacramento, California.

JAMES M. LYONS

[7] See *http://www.cdfa.ca.gov/dms/programs/petroleum/DevelopmentalFuels/RelevantLawsInstructionsChecklist.pdf*

This page intentionally left blank.

Comment Letter 45_FF_LCFS_GE Responses

LCFS FF45-2 The commenter asks ARB to eliminate the lowest two values for its average price-yield for corn ethanol. The ARB's approach in the current rulemaking is to develop appropriate methodologies for estimating CI fuels values based on the best information and data available. Evaluation of all available studies indicates that the appropriate range of values for price should be from 0.05 to 0.35. In performing the analysis ARB used the values within this range and assigned equal values to every value in the estimation methodology. A detailed discussion of the ARB analysis is shown in Chapter III of the ISOR.

There is no rationale to revise this analysis by selectively changing the range of values and excluding the values of 0.05 and 0.10 from the analysis. Such an approach would generate incorrect iLUC values and it might bias the results in favor of some fuels versus some others. ARB's approach in this rulemaking is fuel neutral and by performing an appropriate analysis for CI values, it provides the option to fuel users to select the most appropriate and more beneficial fuel from a GHG emissions perspective.

LCFS FF45-4 The commenter believes that removing section 95490 from the proposal is not within the scope of the original notice, dated December 16, 2014. ARB disagrees. The original notice indicated that the proposal constituted the enactment of a new regulation, and further indicated that the new regulation was different in several respects from an LCFS Regulation adopted in 2009. Reducing the scope of the proposal as compared to the initial notice does two things. First, staff is proposing *less* than the initial proposal. A slimmer proposed regulation is by definition within the borders of the larger initial proposal that was attached to the initial notice. Second, staff is proposing a change that would – as promised in the initial notice – result in a new regulation that differs from the LCFS Regulation adopted in 2009. Accordingly, the removal of section 95490 (and internal cross references) is within the scope of the initial proposal. Pursuant to Government Code section 11346.8, the public need be given 15 days notice of such a change. That notice was given.

ARB also notes that Health & Safety Code section 43830.8 requires a multimedia evaluation (MME) whenever the Board establishes a motor vehicle fuel specification. Proposed section 95490 required a "multimedia evaluation," defined to have "the same meaning as in Health & Safety Code section 43830.8(b) and (c)." (initially

proposed as Cal. Code Regs., tit. 17, section 95481(a)(60).) Removing the redundant requirement that was initially proposed as section 95490 has no effect.

LCFS FF45-5

The commenter, citing Health & Safety Code section 43830.8, notes that regulation of new fuels should not result in emissions increases. ARB agrees. In that regard, section 43830.8 safeguards the environment by requiring a multimedia evaluation when a new fuel specification is established. ARB disagrees with the comment to the extent it implies that 43830.8 no longer safeguards the environment absent a restatement of 43830.8's requirements in the initially-proposed regulation section 95490. The statute remains in effect and unchanged. Restating its requirements in proposed section 95490 added no additional environmental safeguard. The restatement of 43830.8's requirements in the initially proposed regulation and in the original regulation adopted in 2009 was intended simply to remind fuel providers of those multimedia requirements being applicable if and when ARB establishes a new fuel specification. However, since the original regulation has been in effect for over five years, we believe the restatement served its purpose and removing it will have no effect on 43830.8 or the LCFS proposal.

The commenter notes that biodiesel has been used for several years without the benefit of a multimedia evaluation. That evaluation was not required until 2015, in connection with ARB adopting a fuel specification for biodiesel. We note that the existing LCFS, which contains a multimedia evaluation provision identical to proposed section 95490, did not trigger the evaluation during the several years the commenter notes because ARB had not established a new fuel specification for biodiesel. (Cal. Code Regs., tit. 17, section 95487.) That chronology simply demonstrates that the regulatory requirement in the prior LCFS added no environmental safeguard beyond the statutory requirement. The previous MME provision in section 95487, like the initially-proposed section 95490, contains numerous exemptions, including one for biomass-based diesel subject to Division of Measurement Standards rules. In sum, removing section 95490 leaves the regulation of new fuels in the same position regardless whether the LCFS contained section 95490, and in the same position as under former section 95487. As noted above, the 15-day change to which the comment is directed has no substantive effect.

LCFS FF45-6 The commenter believes that eliminating section 95490 from the proposal is not within the scope of the notice. ARB disagrees. Please also see response to **LCFS FF45-4**.

The commenter also mistakenly states that by omitting section 95490 from the proposal, "many new fuels will be exempt from the MME requirement." As noted in response to comment **LCFS FF45-5**, the decision not to pursue adoption of proposed section 95490, like the repeal of prior section 95487, is without effect, due to statutory requirements regarding MMEs. (See Cal. Health & Saf. Code section 43830.8.)

LCFS FF45-53 The commenter attaches the declaration of James M. Lyons, who declares that the proposed 15-day change to eliminate the redundant proposed section 95490 "could not reasonably have been anticipated" based on the initial notice. ARB disagrees for the reasons set forth in response to comment **LCFS FF45-5**.

LCFS FF45-54 The commenter claims that without the MME required by proposed section 95490 that (1) new fuels might be used in California (presumably other than all fuels subject to a fuel specification, and reformulated gasoline, diesel, ethanol blends, CNG, LPG, Hydrogen, biomass-based diesel, and electricity – all of which were proposed to be exempted from section 95490's requirements) and (2) those fuels might cause adverse environmental impacts absent the MME that 95490 required in the event ARB adopted a fuel specification. ARB disagrees and notes, again, that the initially-proposed section 95490 was redundant and Health & Safety Code section 43830.8 still applies.

Please see response to comments **LCFS FF45-5**.

LCFS FF45-55 The commenter claims that the Division of Measurement Standards (not part of ARB) *might* allow new fuels to be used, and those fuels *might* have an unstated potential adverse impact that would remain unmitigated before ARB had a chance to comply with the lengthy MME process required by the initially-proposed section 95490 (and, we note, by statute). ARB disagrees for the reasons set forth in responses to comments **LCFS FF45-5** and **LCFS FF45-54**.

LCFS FF45-56 The commenter believes that eliminating the duplicate MME requirement in section 95490 will preclude MME's for new fuels. ARB staff disagrees. See responses to comments **LCFS FF45-5**, **LCFS FF45-54**, **LCFS FF45-55**.

LCFS FF45-57 The commenter believes that eliminating the duplicate MME requirement in section 95490 will preclude MME's for new fuels. ARB staff disagrees for the reasons set forth in response to **LCFS FF45-5**, **LCFS FF45-54**, **LCFS FF45-55**, and **LCFS FF45-56**.

LCFS FF45-58 The commenter expresses concerns that hypothetical new alternatives to diesel might be allowed to be sold in small quantities after demonstrating their safety to ARB under the ADF, but before completing the lengthy MME process required by statute. In the process of re-adopting the LCFS and adopting the ADF, ARB carefully considered potential environmental impacts that might result from the incentives in the LCFS, and evaluated the potential impacts of foreseeable LCFS compliance responses (described in detail in the Draft EA). The ADF and myriad other applicable laws, including ARB's power to regulate fuels and air quality, can be brought to bear in the event specific adverse impacts - too speculative to predict and assess now - emerge in the future. It should be noted that existing regulations (13 CCR §2259) already provide for ARB to conduct limited testing of new fuels and fuel additives prior to the establishment of a new fuel specification. This concept was central to the three-tier gradual testing ramp up to commercialization in the ADF proposal. See also responses to comments **LCFS FF45-5**, **LCFS FF45-54**, **LCFS FF45-55**, and **LCFS FF45-56**.

LCFS FF45-59 This comment summarizes several prior comments, responded to above in responses to **LCFS FF45-5** and **LCFS FF45-54** through **LCFS FF45-58**.

Comment letter code: 8_SF_LCFS_GE

Commenter: Joshua Willter

Affiliation: Growth Energy

The following letter was submitted to the LCFS Docket during the Second 15-day comment period. The comment letter is 421 pages long. Only pages 1 – 7 and 142 – 144 contain environmental comments and are reproduced here.

This page intentionally left blank.

8_SF_LCFS_GE

Growth Energy's Comments on June 23, 2015, 15-Day Notice for the Proposed Revisions to the LCFS Regulation

Growth Energy submits the following comments on the California Air Resources Board's ("CARB") June 23, 2015 Notice of Public Availability of Modified Text and Availability of Additional Documents (the "Second 15-Day Notice") for CARB's proposed revisions to the Low Carbon Fuel Standard (the "LCFS regulation").

The Second 15-Day Notice represents the second time CARB staff has performed substantive modifications to the proposed LCFS regulation since it initially circulated an Initial Statement of Reasons (the "ISOR") and an Environmental Analysis ("EA") for public review on December 30, 2014. The first 15-day notice was circulated for public review on June 4, 2015 (the "First 15-Day Notice").

Due to various concerns regarding the LCFS regulation, Growth Energy submitted comments on the ISOR and the EA during the first comment period, as well as the comment period for the First 15-Day Notice, under the California Environmental Quality Act, the California Administrative Procedures Act, and the Health & Safety Code. In addition to the issues raised previously, Growth Energy submits the following comments on the Second 15-Day Notice. Submitted with these comments are the declarations of James C. Lyons and Thomas L. Darlington, which are enclosed as Attachments "A" and "B," respectively.

A. CARB's LUC Value for Cane Ethanol of 11.8 gCO_2e/MJ Is Not Supported By Substantial Evidence, and Could Increase Greenhouse Gas Emissions

CARB's proposed revisions to the LCFS regulation contemplate a land use change ("LUC") value for cane ethanol of 11.8 gCO_2e/MJ, which is a significant departure from the 46 gCO_2e/MJ value stated in the original LCFS regulation. As explained in the Declaration of Thomas L. Darlington, which is provided as Attachment B, the substantial drop in LUC emissions for cane ethanol relates to CARB's estimate of the "perennial reversion GHG emissions" associated with cane. (Darlington ¶ 4.) "These emissions describe the carbon stored in a field when cane is planted after forest is removed for cane." (*Id.*)

Although CARB has produced a report describing the emissions released when various types of land are converted from one use to another, the report contains "no documentation or description for the perennial reversion emissions for various perennials, including cane" ethanol. (Decl. Darlington ¶ 5 [citing *Agro-Ecological Zone Emission Factor Model (v52)*, Plevin, Gibbs, Duffy, *et al.*, December 11, 2014.].) Appendix I of the ISOR likewise does not contain this information. (*Id.*) Because this information has not been provided, and is nowhere available in the public record, experts in the field are unable to "review how the cane LUC emissions were developed." (*Id.*)

Growth Energy's expert, Thomas L. Darlington, has made several attempts to receive this information from CARB, to no avail. Among other things, Mr. Darlington has emailed CARB on several occasions to determine how ARB estimated these emissions. Yet, no

LCFS SF8-1

substantive information regarding how CARB developed its estimate of the "perennial reversion GHG emissions" was provided. Thus, CARB has either failed to include documents in the rulemaking filed under Section 11347.3(b) of the Government Code, or CARB's LUC for cane ethanol is not based on any evidence, data, or study, and is thus arbitrary and capricious.

CARB's failure to support the 11.8 gCO_2e/MJ LUC value for cane ethanol also raises significant questions about the adequacy of CARB's environmental findings. Growth Energy considers the use of indirect LUC factors in the LCFS regulation to be generally unsound. Nevertheless, CARB has decided to include LUC factors as a component of the Carbon Intensity ("CI") Value placed on a fuel by CARB. If CARB inaccurately calculates the LUC (and thus the CI Value) of a fuel—such as sugarcane ethanol—as being too low, it will make more difficult the task of achieving reductions in greenhouse gas emissions, which is the purpose of the LCFS regulation. By reducing the CI value assigned to sugarcane ethanol below a level that is scientifically supportable relative to other renewable fuels, CARB is incentivizing the use of fuels that do not provide the maximum GHG reductions in a cost-effective manner. The LCFS regulation will create incorrect "market signals" contrary to the intended effect of the overall LCFS program.[1]

LCFS SF8-1 cont.

To avoid these potential adverse consequences, and to develop LUC Values (and thereby CI Values) that are based on scientific data, CARB should produce the evidence, data, or study upon which its estimate of the "perennial reversion GHG emissions" for cane was based, (assuming such information exists), and recirculate the revised LCFS regulation for public comment.

B. CARB Staff Failed to Disclose Material Information Regarding the Proposed LCFS Regulation to the California Environmental Policy Council

Prior to the June 23, 2015, public hearing by the California Environmental Policy Council ("CEPC") on the LCFS regulation, Growth Energy and Western States Petroleum Association ("WSPA") submitted written comments on the multimedia evaluation ("MME") prepared for the LCFS regulation. Those written comments are included as Exhibits "F" and "G" to the Lyons Declaration, which is enclosed with these comments as Attachment B.[2] The comments specifically reference flaws in both CARB's proposed MME and the peer review process: (1) the failure ***of the MME*** to assess the environmental impacts of di-tertiary butyl peroxide (DTBP) at higher concentrations than the presently; (2) incorporation ***in the MME*** of an obsolete and incomplete analysis of air quality impacts associated with biodiesel that has been superseded by an analysis CARB staff performed for the ADF rulemaking; and (3) CARB staff's failure to provide ***the MME's peer reviewers*** with all of the relevant scientific information and data available to CARB staff related to air quality impacts associated with biodiesel. The

LCFS SF8-2

[1] See CARB, "Staff Report: Initial Statement of Reasons, Proposed Regulation to Implement the Low Carbon Fuel Standard," Vol. I at VI-20 (March 5, 2006), available at http://www.arb.ca.gov/fuels/lcfs/030409lcfs_isor_vol1.pdf.

[2] The comments stated in Exhibits "F" and "G" to the Lyons Declaration are incorporated into this letter as if set forth fully herein.

comment letter submitted by Growth Energy also referenced a proposed alternative to CARB staff's proposed ADF regulation that would ensure no NOx increases would occur.

Although the comments submitted by Growth Energy and WSPA relate directly to the MME, CARB staff did not summarize those comments to the CEPC. Rather, CARB staff at the June 23, 2015 hearing represented to the CEPC that Growth Energy's and WSPA's comments were "not particularly relevant." After CARB's Assistant Chief Counsel subsequently corrected CARB staff's statements, and conceded that the comments "did pertain to the Multi-Media Evaluation," CARB staff then asserted the comments "did nothing to alter the CARB findings being presented to the CEPC." (Decl. Lyons ¶ 6.) Although CARB staff was asked at several points by CEPC Chair Matthew Rodriquez about the comments, CARB staff preempted a serious discussion of the concerned raised by Growth Energy and WSPA by the CEPC.

LCFS SF8-2 cont.

As a result of these flaws, CARB did not fully discharge its duty under Section 43830.8 of the Health and Safety Code. Among other things, Section 43830.8 requires a "multimedia evaluation" to be based on (i) "the best available scientific data," (ii) "written comments submitted by any interested person," and (iii) "information collected by the state board in preparation for rulemaking." As explained in the comments of Growth Energy and WSPA, CARB complied with none of these requirements, and instead chose to ignore the best available scientific data, concealed arguments submitted in written comments, and declined to disclose more recent information collected by the state board itself. Because CARB failed to comply with its procedural mandate under Section 43830.8, CARB cannot adopt the LCFS regulation at this time.

ATTACHMENT A

Declaration of James M. Lyons

STATE OF CALIFORNIA

BEFORE THE AIR RESOURCES BOARD

Declaration of James M. Lyons

I, James Michael Lyons, declare as follows:

1. I make this Declaration based upon my own personal knowledge and my familiarity with the matters recited herein. It is based on my experience of nearly 30 years as a regulator, consultant, and professional in the field of emissions and air pollution control. A copy of my résumé can be found in Exhibit "A."

2. I am a Senior Partner of Sierra Research, Inc., an environmental consulting firm located at 1801 J Street, Sacramento, California owned by Trinity Consultants, Inc. Sierra specializes in research and regulatory matters pertaining to air pollution control, and does work for both governmental and private industry clients. I have been employed at Sierra Research since 1991. I received a B.S. degree in Chemistry from the University of California, Irvine, and a M.S. Degree in Chemical Engineering from the University of California, Los Angeles. Before joining Sierra in 1991, I was employed by the State of California at the Mobile Source Division of the California Air Resources Board (CARB).

3. During my career, I have worked on many projects related to the following areas: (1) the assessment of emissions from on- and non-road mobile sources, (2) the assessment of the impacts of changes in fuel composition and alternative fuels on engine emissions including emissions of green-house gases, (3) analyses of the unintended consequences of regulatory actions, and (4) the feasibility of compliance with air quality regulations.

4. I have testified as an expert under state and federal court rules in cases involving CARB regulations for gasoline, Stage II vapor recovery systems and their design, factors affecting emissions from diesel vehicles, evaporative emission control system design and function, as well as combustion chamber system design. While at Sierra I have acted as a consultant on automobile air pollution control matters for CARB and for the United States Environmental Protection Agency. I am a member of the American Chemical Society and the Society of Automotive Engineers and have co-authored nine peer-reviewed monographs concerned with automotive emissions, including greenhouse gases and their control. In addition, over the course of my career, I have conducted peer-reviews of numerous papers related to a wide variety of issues associated with pollutant emissions and air quality.

5. This Declaration identifies significant omissions by CARB staff in providing relevant information to the California Environmental Policy Council (CEPC) during the Council's Public Meeting of June 23, 2015. These omissions include (1) the failure of

LCFS SF8-3

CARB staff to accurately summarize written comments related to the Multi-Media Evaluation (MME) of biodiesel[1] submitted to the CEPC, and (2) the failure of CARB staff to make the CEPC aware during the meeting of alternatives that would be more environmentally protective than the proposed Alternative Diesel Fuel regulation and therefore the Low Carbon Fuel Standard (LCFS) regulation. A complete electronic video recording of the June 23, 2015 CEPC meeting, which I received from CEPC, has been submitted along with this Declaration and is referred to here as Exhibit "B." In addition, the briefing presentation,[2] staff presentation,[3] and draft resolution[4] that was ultimately approved by the CEPC on June 23, can be found in Exhibits "C," "D," and "E," respectively, to this Declaration.

LCFS SF8-3 cont.

6. Both Growth Energy[5] and the Western States Petroleum Association (WSPA)[6] submitted written comments to the CEPC (see Exhibits "F" and "G," respectively, to this Declaration). The sole summary of the written comments submitted by Growth Energy can be found on page 90 of the staff presentation contained in Exhibit "D." As can be seen, there is no substantive summary of either the Growth Energy or WSPA comments. During a discussion of these comments[7] involving CEPC Chair, Matthew Rodriquez, and CARB staff member Jim Aguila, both sets of comments were deemed to be "not particularly relevant." However, later in the proceeding,[8] Stephen Adams, Assistant Chief Counsel of CARB, acknowledged that at least portions of the Growth Energy and WSPA comments "did pertain to the Multi-Media Evaluation" and provided two limited examples from the comments to illustrate that point. Mr. Rodriquez then returned to the issue of the relevance of the Growth Energy and WSPA comments[9] and, in response to his question, was told by CARB that they did nothing to alter the CARB findings being presented to the CEPC.

LCFS SF8-4

[1] See http://www.arb.ca.gov/fuels/diesel/altdiesel/20150521BD_StaffReport.pdf

[2] See http://www.calepa.ca.gov/cepc/2015/CouncilBrief.pdf

[3] See http://www.calepa.ca.gov/cepc/2015/Presentation.pdf

[4] See http://www.calepa.ca.gov/cepc/2015/Resolution.pdf

[5] See http://www.calepa.ca.gov/cepc/2015/KinseyHelsey.pdf

[6] See http://www.calepa.ca.gov/cepc/2015/BoydWSPA.pdf

[7] This discussion takes place between about 1:44 and 1:46 of the runtime of the recording submitted as Exhibit "B."

[8] This discussion takes place between about 1:53 to 1:55 of the runtime of the recording submitted as Exhibit "B."

[9] This discussion takes place between about 1:57 and 1:58 of the runtime of the recording submitted as Exhibit "B."

7. As documented through the video recording of the June 23, 2015 CEPC public meeting, the CEPC was relying on CARB staff to summarize both the substance and import of the written comments received from Growth Energy and WSPA. As indicated by Mr. Adams, these comments did pertain to the biodiesel MME and, based on my expertise, should be considered by any entity claiming to have reached a conclusion "based on the best available scientific information and public comments received," as is stated in the CEPC resolution. More specifically, issues raised in the Growth Energy and WSPA comments and directly germane to the environmental impacts of biodiesel, but not presented to the CEPC by CARB, include the following:

- Failure of the MME to comprehensively assess the environmental impacts of the use of di-tertiary butyl peroxide (DTBP) at much higher concentrations than it is currently used; LCFS SF8-5
- Incorporation in the MME of an obsolete and incomplete analysis of the air quality impacts associated with the use of biodiesel, which was superseded by the analysis CARB staff actually performed for the ADF rulemaking; LCFS SF8-6
- Failure of CARB staff to provide the peer reviewers of the biodiesel MME with all of the relevant scientific information and data that were available to CARB staff and related to the air quality impacts associated with biodiesel; and that LCFS SF8-7
- Growth Energy has proposed an alternative to the staff's proposed ADF regulation that would ensure that increases in NOx emissions would not occur in California due to the use of biodiesel. LCFS SF8-8

12. In summary, in my opinion, the flaws in the biodiesel MME identified in the written comments supplied by Growth Energy and WSPA to the CEPC render it unsuitable to support a finding that there will be no significant adverse environmental impact from the use of biodiesel in California. Given that the CEPC has relied on the biodiesel MME, its findings regarding the environmental impact of biodiesel use in California are similarly flawed. LCFS SF8-9

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed this 8th day of July, 2015 at Sacramento, California.

JAMES M. LYONS

Exhibit F to Declaration of James M. Lyons

WANGER JONES HELSLEY PC
ATTORNEYS

OLIVER W. WANGER
TIMOTHY JONES*
MICHAEL S. HELSLEY
PATRICK D. TOOLE
SCOTT D. LAIRD
JOHN P. KINSEY
KURT F. VOTE
TROY T. EWELL
PETER M. JONES**
JAY A. CHRISTOFFERSON**
MARISA L. BALCH
JENA M. HARLOS***
JOSIAH M. PRENDERGAST
MICAELA L. NEAL
CAMERON M. PEYTON
DYLAN J. CROSBY

* Also admitted in Washington
** Of Counsel
*** Also admitted in Wisconsin

265 E. RIVER PARK CIRCLE, SUITE 310
FRESNO, CALIFORNIA 93720

MAILING ADDRESS
POST OFFICE BOX 28340
FRESNO, CALIFORNIA 93729

TELEPHONE
(559) 233-4800

FAX
(559) 233-9330

OFFICE ADMINISTRATOR
LYNN M. HOFFMAN

Writer's E-Mail Address:
jkinsey@wjhattorneys.com

Website:
www.wjhattorneys.com

June 22, 2015

VIA EMAIL & UNITED STATES MAIL

Secretary Matthew Rodriquez, Chair
Environmental Policy Council
1011 I Street
P.O. Box 2815
Sacramento, California 95812

Re: Comments of Growth Energy on Multimedia Evaluations of Biodiesel and Renewable Diesel

Dear Mr. Rodriquez:

I am writing on behalf of Growth Energy to provide comments on the Multimedia Evaluation of Biodiesel (the "MME"), which Growth Energy understands will be discussed at the California Environmental Policy Council's June 23, 2015, public hearing.

First, as explained in the declarations submitted by James M. Lyons on February 17, 2015, June 8, 2015, and June 19, 2015, concerning the Alternative Diesel Fuel regulation (the "ADF regulation"), and Low Carbon Fuel Standard (the "LCFS regulation"), the air quality analysis prepared by CARB staff is fatally flawed. (See, e.g., February 17, 2015, Decl. Lyons ¶¶ 12-15; *id.*, Attachment F; June 8, 2015, Decl. Lyons ¶¶ 6-12.) LCFS SF8-10

Mr. Lyons' declarations also explain that the air quality analysis prepared by CARB staff in its Environmental Assessment for the ADF regulation and the LCFS regulation is different from that contained in the MME in several material respects. (See June 8, 2015, Decl. Lyons ¶¶ 13-15.) LCFS SF8-11

Further, CARB did not provide several important documents, including analyses raising questions regarding the air quality analysis underlying the ADF regulation, to either the persons working on the MME, or the MME peer reviewers. Without these documents, the preparers of the MME, and the MME peer reviewers, are provided only a one-sided view of the regulations, LCFS SF8-12

and insufficient information to fully analyze the potential air quality impacts of the regulations. The documents CARB failed to disclose include, but are not limited to, (1) *NOx Emission Impacts of Biodiesel Blends*, Robert Crawford, Rincon Ranch Consulting (February 10, 2015); and (2) February 17, 2015, Declaration of James M. Lyons, with attachments, both of which are enclosed.

LCFS SF8-12 cont.

Due to the above issues, the Environmental Policy Council should not approve the MME at this time, and should instead require CARB to revise its air quality analysis to correct the existing flaws. The Environmental Policy Council should also require CARB to make all relevant analyses – not just those supporting CARB's position – available to both the preparers of the MME and the MME peer reviewers, prior to the Environmental Policy Council's consideration of the MME.

LCFS SF8-13

Respectfully submitted,

John P. Kinsey

Enclosures:

1. Declaration of James M. Lyons (June 19, 2015)

2. Declaration of James M. Lyons (June 8, 2015)

3. Declaration of James M. Lyons (February 17, 2015)

4. *NOx Emission Impacts of Biodiesel Blends*, Robert Crawford, Rincon Ranch Consulting (February 10, 2015)

5. *NOx Emissions Impact of Soy- and Animal-based Biodiesel Fuels: A Re-Analysis*, Robert Crawford, Rincon Ranch Consulting (December 10, 2013)

6. California Air Resources Board, Initial Statement of Reasons, ADF Regulation , Main Text (January 2, 2015)

7. California Air Resources Board, Initial Statement of Reasons, ADF Regulation, Appendix B [Technical Supporting Information] (January 2, 2015)

Comment Letter 8_SF_LCFS_GE Responses

LCFS SF8-1 The comment states that ARB's land use change value (LUC Value) for cane ethanol of 11.8 gCO2e/MJ is not supported by substantial evidence, and could increase greenhouse gas emissions.

The commenter's suggestion that "the substantial drop in LUC emissions for cane ethanol relates to CARB's estimate of the 'perennial reversion of GHG emissions' associated with cane," is incorrect. As described in Appendix I (ISOR), Attachment 2-44:

> "The most substantial change relates to an error in earlier versions of the model in which a weighted average of soil carbon loss was computed for annual crops, sugarcane, and oil palm. Upon closer examination of the results for oil palm biodiesel, it became apparent that this method was incorrect: the increase in oil palm area was several times larger than the net change in cropland, resulting in a "weight" of 1400%, and other weights being negative. The new approach uses the total change in each type of crop separately, computing the emissions for each transition, and summing them, avoiding the use of a weighted average."

The commenter also describes "perennial reversion GHG emissions" as carbon stored in a field when cane is planted after a forest is removed for cane. That description is incorrect. As considered in the AEZ-EF model (described in Appendix I, Attachment 2), "reversion" refers to the reversion of cropland to forest or pasture. Just as carbon loss from soil is calculated when forestland is converted to cropland, reversion emissions refer to carbon sequestered when cropland (or pastureland) is converted back to forestland. ARB staff used reasonable assumptions (clearly detailed in the AEZ-EF report) which include:

- Reversion emissions to forest, pasture, or cropland-pasture are calculated by negating (multiplying by -1) the emissions from the converting any of forest, pasture, or cropland-pasture to perennial crops.

- In the AEZ-EF model, "perennial" crops include only sugarcane and oil palm.

- For conversion of land-cover to perennial crops, staff assumed there is no change in soil carbon (C) (Although initial conversion would result in emissions, the lack of subsequent tillage is assumed to result in restoration of soil C.)

- The biomass in perennial crops that replace the biomass in the prior land-cover category is handled differently for the two perennials modeled.

- As described in section 3.3 (p.15) of the report, sugarcane biomass is treated the same as other crops. That is, total biomass is computed from region-and-AEZ-specific crop yield using harvest index, root:shoot ratio, water fraction, and carbon fraction.

In summary, carbon emissions for all crops used in the analysis have been developed using data and research from various studies and reports. All literature references have been detailed in the AEZ-EF report (Appendix I, Attachment 2). Any assumptions made have also been detailed in this report. ARB staff therefore does not agree with the commenter that the analysis for cane ethanol is not based on evidence, data, or study and is thus arbitrary.

The commenter also does not support the consideration of iLUC emissions in the regulation. ARB staff disagrees with that position, and is providing support below for the inclusion of iLUC estimates for biofuels:

- The existence of indirect Land Use Change (iLUC) effect and corresponding emissions related to biofuel expansion has been demonstrated by scientific and academic research.

- The Environmental Protection Agency (EPA) has included iLUC emissions in their lifecycle analysis of biofuels for their Renewable Fuel Standard (RFS).

- A peer review conducted in 2009 noted on the need to include iLUC emissions to fully account for the effects of additional feedstock demand for biofuel production.

- The Board, in 2009, recognizing the need to account for all effects in the evaluation of GHG emissions from transportation

fuels, approved the inclusion of iLUC emissions in the evaluation of crop-based biofuels.

- Following the Board's directive in 2009, staff convened experts in land use science, economics, agriculture, carbon emissions, etc. to review and recommend modifications to iLUC values. This group, called the Expert Working Group, acknowledged the need to include iLUC emissions in the lifecycle analysis of crop-based biofuels.

- Studies and reports beyond 2009 have also supported the existence of such effects from crop-based biofuels.

The analysis conducted in 2009 used available data and understanding of land use science to develop the best estimate of iLUC emissions. The current analysis has refined the 2009 iLUC analysis to account for the latest data and updated land use change science. At this time, all of the iLUC values being proposed to the Board are a result of staff using the latest science and best data to estimate iLUC values for all 6 biofuels. A recent peer review of the current iLUC analysis supported the inclusion of iLUC emissions and also concluded that the approach used by staff was scientifically sound. ARB staff therefore does not agree with commenter that the iLUC value for sugarcane ethanol has been under estimated, and believes these iLUC values are supported by substantial evidence.

LCFS SF8-2

The comment states that ARB staff failed to disclose written comments regarding the proposed LCFS regulation to the California Environmental Policy Council (CEPC). The comment further states that Growth Energy and Western States Petroleum Association (WSPA) submitted written comments prior to the public hearing but staff did not summarize the comments to the CEPC.

As an initial matter, the comment erroneously states that the June 23, 2015, meeting of the CEPC was conducted on the LCFS regulation. The June 23rd meeting was held in support of the proposed Alternative Diesel Fuel (ADF) Regulation, and not the LCFS. Under California Health and Safety Code (HSC) section 43830.8(a), ARB may not adopt a regulation that establishes new fuel specifications unless that regulation and the multimedia evaluation are reviewed by the CEPC. Therefore, the Multimedia Working Group (MMWG) staff reports, entitled *Staff Report:*

Multimedia Evaluation of Biodiesel[1] (Biodiesel Staff Report) and *Staff Report: Multimedia Evaluation of Renewable Diesel*[2] (Renewable Diesel Staff Report); the proposed ADF; and public comments were submitted to the CEPC for review.

The Notice of Public Meeting[3] (Notice) provided interested parties an opportunity to comment on the multimedia evaluation staff reports and the proposed ADF regulation. The Notice stated the following:

> The CEPC will receive public comments on the multimedia evaluation staff reports and the proposed ADF regulation. Written comments directed to the CEPC should be sent by U.S. mail or by email to the addresses listed below. Written comments must be **received by noon on June 22, 2015** to be fully considered by the CEPC. Please include in the subject line of any written communication or email: **Comments for June 23, 2015 CEPC Meeting**. Please submit written comments to the address below:
>
> Secretary Matthew Rodriquez, Chair
> Environmental Policy Council
> 1001 I Street, P.O. Box 2815
> Sacramento, California 95812
> Email: cepc@calepa.ca.gov

In addition, any person could comment at the public meeting at 9 a.m. June 23, 2015. As noted above, CEPC required that *written* comments be received no later than noon on June 22, 2015 – the day before the CEPC meeting – to allow for full consideration of those comments. Persons who wanted to speak at the public meeting were requested to fill out a speaker's card, available at the back of the hearing room, before the meeting. Representatives from CalEPA presided at the meeting, scheduled to adjourn by noon. The Chair could, at his discretion, limit the length of public oral comments at the meeting.

[1] Multimedia Working Group. *Staff Report: Multimedia Evaluation of Biodiesel*. May 2015. http://calepa.ca.gov/CEPC/2015/BiodieselRpt.pdf

[2] Multimedia Working Group. *Staff Report: Multimedia Evaluation of Renewable Diesel*. May 2015. http://calepa.ca.gov/CEPC/2015/RenDieselRpt.pdf

[3] California Environmental Protection Agency. *California Environmental Policy Council Notice of Public Meeting.* http://calepa.ca.gov/CEPC/2015/June23.pdf

All written comments received by the deadline were sent to the CEPC members and their delegates on June 22, 2015 for their consideration. As stated in the Notice, the CEPC requires written comments to be received by the specified date and time in order to allow full consideration of the comments. Public comments were also posted to the CEPC webpage[4] and a direct link was provided on June 22, 2015. Therefore, contrary to the comment, staff did not fail to disclose material information or submit public comments to the CEPC. Also, although not legally required under HSC section 43830.8, a very brief summary of public comments was included as part of staff's presentation[5] to the CEPC. Parties submitting written comments to the CEPC could have appeared at the hearing to summarize their own comments, but did not do so.

LCFS SF8-5 The comment states that the biodiesel multimedia evaluation failed to fully assess the environmental impacts of di-tertiary butyl peroxide (DTBP) and that this issue was not presented to the CEPC. Please see responses **ADF F1-4** and **ADF F1-6**.

LCFS SF8-6 The comment states that the air quality impact analysis incorporated in the biodiesel multimedia evaluation was incomplete, obsolete, and superseded by ARB's analysis for the ADF regulation. Please see response **ADF F5-8**.

LCFS SF8-7 The comment states that ARB staff failed to provide peer reviewers with all relevant scientific information and data related to air quality impacts. Please see response **ADF F5-8**.

LCFS SF8-8 The comment states that Growth Energy had proposed an alternative to the proposed ADF regulation that would ensure no NOx emissions increases. All written comments were sent to the CEPC for full consideration on June 22, 2015. Based on the CEPC's review of the biodiesel multimedia evaluation and the proposed ADF regulation, the CEPC determined that the use of biodiesel will not pose a significant adverse impact of public health or the environment. Therefore, there was no need for the CEPC to consider alternative measures as part of the multimedia evaluation. Analysis of alternative regulatory proposals may be considered

[4] California Environmental Policy Council webpage: http://calepa.ca.gov/CEPC/default.htm

[5] Multimedia Working Group. *Staff Presentation to the CEPC*. Public Comments, Slide 90. June 23, 2015. http://calepa.ca.gov/CEPC/2015/Presentation.pdf

under the ADF rulemaking. Please also see response **LCFS SF8-2**.

LCFS SF8-9 The comment states that the flaws in the biodiesel multimedia evaluation identified in the Growth Energy and WSPA comments render it unsuitable to support the CEPC's finding of no significant adverse impact. The biodiesel multimedia evaluation and the CEPC's review of the evaluation were completed in accordance with HSC section 43830.8.[6] Please also see responses to comments **LCFS SF8-5** through **LCFS SF8-8**.

LCFS SF8-10 The comment states that the air quality analysis in the Multimedia Evaluation of Biodiesel is fatally flawed. The commenter does not specify how they believe the analysis is flawed but references three previous comment letters the commenter had submitted. See response to comments **LCFS 46-235** through **LCFS 46-238**, **LCFS FF45-53** through **LCFS 45-59**, **ADF 17-18** through **ADF 17-23**, and **ADF F5-15** through **ADF F5-22**.

LCFS SF8-11 The comment states that the air quality analysis prepared by ARB staff in its Environmental Assessment for the ADF and LCFS regulations is different from the multimedia evaluation in several material respects. Please see response **ADF F5-8** and **ADF F5-9**.

LCFS SF8-12 The comment states that ARB did not provide several important documents to those working on the multimedia evaluation and the peer reviewers. Please see responses **ADF F5-8**, **ADF F5-9** and **ADF F5-14**.

LCFS SF8-15 The comment states that the multimedia evaluation of biodiesel blends is not complete because it did not consider the use of DTBP at the concentrations required in the proposed ADF regulation. Please see responses **ADF F1-4** and **ADF F1-6**.

LCFS SF8-16 The comment states that the multimedia evaluation of biodiesel blends is not complete because it did not consider water demands in biofuel production for the LCFS. Please see response **ADF F5-9**.

LCFS SF8-17 The comment states that the SWRCB and DTSC review of biodiesel blends containing DTBP were not performed as part of

[6] California Air Pollution Control Laws. Health and Safety Code, Division 26, Part 5, Chapter 4, Section 43830.8.

the multimedia evaluation. Please see responses **ADF F1-4** and **ADF F1-6**.

LCFS SF8-19 The comment requests that the CEPC recommend the MMWG fully re-examine the use of DTBP to ensure all potential impacts associated with its use are reviewed and evaluated. Please see responses **ADF F1-4** and **ADF F1-6**.

LCFS SF8-20 The comment states that the MMWG did not sufficiently evaluate potential impacts to water in the U.S. and California. Please see response **ADF F-9**.

This page intentionally left blank.

Comment letter code: 2_TF_LCFS_GE

Commenter: Joshua Willter

Affiliation: Growth Energy

The following letter was submitted to the LCFS Docket during the Third 15-day comment period.

This page intentionally left blank.

2_TF_LCFS
_GE

Growth Energy's Comments on July 31, 2015, 15-Day Notice for the Proposed Revisions to the LCFS Regulation

Growth Energy submits the following comments on the California Air Resources Board's ("CARB") July 31, 2015, Notice of Public Availability of Modified Text and Availability of Additional Documents (the "Third 15-Day Notice") for CARB's proposed revisions to the Low Carbon Fuel Standard (the "LCFS regulation").

The Third 15-Day Notice represents the third time CARB staff has performed substantive modifications to the proposed LCFS regulation since it initially circulated an Initial Statement of Reasons (the "ISOR") and an Environmental Analysis ("EA") for public review on December 30, 2014. CARB circulated the first 15-day notice for public review on June 4, 2015 (the "First 15-Day Notice"). CARB circulated the second 15-day notice for public review on June 23, 2015 (the "Second 15-Day Notice").

In light of all the remaining and important open issues, uncertainties, inconsistencies, and procedural errors that have marked this regulatory process, Growth Energy believes that the Board cannot take final action on the now thrice-amended regulatory proposal without publication of a new rulemaking notice that allows 45 days for public comment, leading to a new public hearing. In addition, Growth Energy submits the following comments on the Third 15-Day Notice. Submitted with these comments are the declarations of James M. Lyons and Thomas L. Darlington, which are enclosed as Attachments "A" and "B," respectively. LCFS TF2-1

A. CARB's Assumptions Regarding the Usage of Renewable Natural Gas in Heavy-Duty Vehicles Are Not Supported by Substantial Evidence

1. CARB's Analysis of Renewable Natural Gas is Internally Inconsistent with CARB's Method of Analysis for Electric Vehicles

As part of its recent 15-day notice, CARB added a spreadsheet entitled "Estimate of Electricity Use by ZEVs" to the rulemaking file. The spreadsheet reveals the assumptions made by CARB staff in estimating the amount of electricity that would be used by light-duty battery electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEVs). This analysis was used to develop "illustrative compliance scenarios and evaluat[e] potential compliance curves" included in Appendix B of the ISOR (and updates). The assumptions include the values for the number of EVs and PHEVs in operation, vehicle miles traveled, and fuel efficiency, which are generally consistent with the conclusions published by CARB staff in connection with the Zero Emission Vehicle (ZEV) regulation, which requires automobile manufacturers to produce EVs and PEHVs and offer them for sale in California. (Decl. Lyons ¶ 6.) This information is necessary to understand how CARB staff "arrived at its conclusions regarding the use of LCFS TF2-2

electricity as a transportation fuel in the light-duty vehicle fleet, which . . . is critical to assessing the veracity of the illustrative compliance scenarios, the environmental analysis of the proposed LCFS regulation and the estimated cost of the regulation." (*Id.* ¶ 8.) CARB has not explained why this information was not included in the original 45-day notice, nor why it waited until now to make the information available for public comment. The 15 days allowed for public review and comment are insufficient, although Growth Energy has attempted to prepare limited, time-constrained comments in Attachment "A." Among other problems, the record does not include any comparable information for the use of renewable natural gas in heavy-duty vehicles. In fact, CARB staff has advised that it "never performed an analysis similar to that disclosed for ZEVs for natural gas usage by heavy-duty vehicles under the LCFS." (Decl. Lyons ¶ 9.) This is surprising and raises serious concerns regarding the validity of the LCFS illustrative compliance scenario and, consequently, the environmental and economic analysis that were based upon that scenario. (See *id.*) "Further, it is impossible for any stakeholder or reviewing body such as the Office of Administrative Law to understand how the staff arrived at its conclusions regarding the use of electricity as a transportation fuel in the light-duty vehicle fleet, which again is critical to assessing the veracity of the illustrative compliance scenarios, the environmental analysis of the proposed LCFS regulation, and the estimated cost of the regulation." (*Id.*)

LCFS TF2-2 cont.

LCFS TF2-3

Because CARB's methods of analysis for EVs/PHEVs and natural gas are internally inconsistent, CARB's conclusions regarding natural gas usage are not supported by substantial evidence. (See, e.g., *Friends of Oroville v. City of Oroville* (2013) 219 Cal.App.4th 832, 844 [concluding that "speculative and contradictory conclusions do not close the evidentiary sufficiency gap involving the City's finding that the Project's GHG emissions will have a less than significant environmental impact after mitigation."]; see also *Vineyard Area Citizens for Responsible Growth, Inc, v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 439 ["Factual inconsistencies and lack of clarity in the FEIR leave the reader – and the decision makers – without substantial evidence for concluding that sufficient water is, in fact, likely to be available for the Sunrise Douglas project at full build-out."].)

LCFS TF2-4

Accordingly, before CARB considers the revised LCFS regulation for approval, it should first disclose the assumptions and analysis used to estimate the use of natural gas in heavy-duty vehicles. Under its certified program, the Board must then permit full public comment and conduct a public hearing. (17 Cal. Code Regs., §§ 60000-60007.)

2. CARB Has Failed to Meet its Information Disclosure Requirements With Respect to the Use of Natural Gas in Heavy Duty Trucks

"CARB's projected increase in natural gas use in heavy-duty vehicles relative to 2014 levels is 2.6 times in 2020 and 4.4 times in 2025." (Decl. Lyons, Exhibit B-1.) To meet these increases, there would need to be "a massive increase in natural gas as a fuel for heavy-

LCFS TF2-5

duty vehicles, which directly implies a similar massive increase in the number of heavy-duty natural gas vehicles in operation in California." (*Id.,* Exhibit B-3.) Notably, however, CARB's analysis includes no estimate of "number of vehicles required" to meet the projected increase in natural gas as a fuel for heavy-duty vehicles, nor is there any evidence in the record "to support that it is reasonably foreseeable that the required number of vehicles will be in operation in California" to correspond to this demand. (*Id.,* Exhibit B-3.)

CARB's failure in this regard has resulted in a flawed and unreliable analysis. First, by (i) failing to estimate the number of vehicles required to meet CARB's projected increase in natural gas, and (ii) failing to include any evidence that it is "reasonably foreseeable" such increase would occur, CARB has failed to meet its information disclosure obligations under CEQA. Specifically, CEQA requires that an environmental analysis "provide sufficient information to enable the "'public [to] discern . . . the 'analytic route . . . from evidence to action . . . .'" (*City of Maywood v. Los Angeles Unif. Sch. Dist.* (2012) 208 Cal.App.4th 362, 393 [quoting *Calif. Oak Found. v. Regents of Univ. of Calif.* (2010) 188 Cal.App.4th 227, 262].) Because CARB staff did not prepare any detailed estimate of natural gas use by heavy-duty vehicles, and CARB's conclusions regarding natural gas usage are "unsupported by empirical or experimental data, scientific authorities, or explanatory information of any kind," the public and the decision makers have been left without any "basis for a comparison of the problems involved with the proposed project and the difficulties involved in the alternatives." (*Citizens to Preserve the Ojai v. County of Ventura* (1985) 176 Cal.App.3d 421, 429.) LCFS TF2-5 cont.

CARB's failure to provide evidence supporting any increase in heavy-duty gas vehicles in California is particularly puzzling here, as any such increase is contrary to the evidence. Analysis by Sierra Research shows "there will be no significant increase in either the heavy-duty natural gas vehicle population or natural gas use by such vehicles unless CARB requires the purchase and use of such vehicles." (Decl. Lyons, Exhibit B-3.) LCFS TF2-6

Specifically, there "are no existing CARB regulations like the ZEV mandate that require dramatic increases in the sale of heavy-duty natural gas vehicles." (*Id.*) "[I]ncreases in the California heavy-duty natural vehicle population will" therefore "be driven by market forces," and "[i]f CARB believes that the market will drive those increases, staff needs to explain why and allow the public to comment on that explanation." (*Id.,* Exhibit B-4.)

Moreover, any projected increase in the entry of a significant number of heavy-duty natural gas vehicles into the market is contradicted by CARB's own data, which show "substantial barriers to increases in heavy-duty natural gas populations." (*Id.,* Exhibit B-4.) These barriers include: (1) Shorter range between refueling; (2) Increased weight; (3) 10 to 15% lower fuel economy; (4) Higher purchase costs which range from $30,000 to $80,000 per vehicle; (5) Higher maintenance costs of 1-2 cents per mile; and (6) a limited number of LCFS TF2-7

publically accessible refueling stations. (*Id.*) There is simply no evidence CARB took these factors into account when it estimated future natural gas use by heavy-duty vehicles. LCFS TF2-7 cont.

If the entry of heavy-duty natural gas vehicles into the market does not materialize, there will also be potentially significant environmental effects, as regulated parties would have to look to other fuels to comply with the LCFS regulation. If heavy-duty users turn to biodiesel, for example, the LCFS regulation has the potential to increase NOx emissions statewide, including "significant increases in NOx emissions in the South Coast and San Joaquin Valley air basins which are already in extreme non-attainment of the federal ozone NAAQS and moderate non-attainment of the federal fine particulate NAAQS." (Decl. Lyons ¶ 13.) LCFS TF2-8

In any event, CARB's analysis relies upon "unsupported speculation that contradicts economic logic and CARB staff assessments of heavy-duty natural gas vehicles outside of the LCFS rulemaking process." (Decl. Lyons ¶ 13.) Because there is no evidence to suggest a significant increase in heavy-duty gas vehicles is "reasonably foreseeable," and in fact the evidence points to the exact opposite conclusion, CARB's analysis does not "provide sufficient information to enable "'public [to] discern . . . the 'analytic route . . . from evidence to action . . . .'" (See *City of Maywood*, *supra*, 208 Cal.App.4th at 393.) As a result, CARB's environmental analysis should be revised to address whether a significant increase in heavy-duty gas vehicles is truly reasonably foreseeable. LCFS TF2-9

3. CARB Must Revise its Economic Impact Analysis to Account for the Need for California's Heavy-Duty Gas Vehicle Population to More than Quadruple By 2025

Because there is no analysis in the ISOR (or elsewhere) regarding the number of vehicles required to meet CARB's projected increase in natural gas, Sierra Research performed this analysis. According to Sierra Research, to meet CARB's projected increase, the number of California Heavy-Duty Natural Gas Vehicles would need to more than ***quadruple*** in just ten years. California heavy-duty vehicle users would need to spend approximately $2.4 billion to meet CARB's fuel forecast in order to use natural gas instead of diesel vehicles, in addition to increased maintenance costs of between $22 and $44 million per year. (Decl. Lyons, Exhibit B-4.) LCFS TF2-10

These costs were not included by CARB in its economic analysis for the LCFS regulation, as required under the Government Code, including Sections 11346.3 and 11346.5. (Decl. Lyons, Exhibit B-4.) Because CARB's economic analysis does not take into consideration over $2.4 billion in additional costs associated with the need for California businesses to purchase heavy-duty natural gas vehicles to meet CARB's projections of natural gas usage, CARB's economic impact assessments are not adequately supported by "facts, evidence, documents, testimony or other evidence." (Govt. Code, § 11346.5(a)(8).) If CARB does not agree with our cost estimate, it should explain why, and provide a different estimate

along with the basis for its different estimate. If CARB does not believe that these costs must be considered in the current rulemaking, it must explain why.

LCFS TF2-10 cont.

4. CARB Failed to Address the Potential Environmental Impacts Associated with the Potential Inability to Meet CARB's 2025 Natural Gas Targets

As explained above, CARB's estimates for natural gas usage by heavy-duty vehicles is exceptionally optimistic, and unlikely to be realized. Nevertheless, there is no indication in CARB's environmental document that CARB analyzed the potential impacts associated with the inability to meet those optimistic targets.

LCFS TF2-11

Specifically, if there is no demand in California for the $2.4 billion in heavy-duty natural gas vehicles contemplated under the revised LCFS regulation, this will have a substantial impact on CARB's estimation of credits and deficits generated by the proposed LCFS regulation. For example, if demand for natural gas remains at 2014 levels – *i.e.*, 110 million diesel gallon equivalents – during the years 2015 through 2025, natural gas credits will be reduced significantly, while diesel deficits will increase. (Decl. Lyons, Exhibit C-1.) This would result in deficits of -3.85 MMTs in 2025 for the May 22 natural gas compliance scenario alone, along with net total deficits for the LCFS program generally. (*Id.*, Exhibit C-1, C-2.)

LCFS TF2-12

Accordingly, CARB must significantly reevaluate the number of credits and deficits that will likely result from the implementation of the LCFS regulation, (Decl. Lyons, Exhibit C-1), and evaluate the potential environmental effects associated with the potential credit imbalance caused by the proposed LCFS regulation. Thereafter, CARB should recirculate both the environmental analysis and the revised LCFS regulation for public review.

B. CARB's Indirect Land Use Change Factor for Corn Ethanol Is Based on Incomplete Data and Faulty Analysis, and Lacks Evidentiary Support

CARB's proposed revisions to the LCFS regulation contemplate a land use change ("LUC") value for corn ethanol of 19.8 gCO_2e/MJ. This value is based, in large part, on the Global Trade Analysis Project Model (the "GTAP Model"). The price-yield elasticity[1] of a particular biofuel "is an important parameter used in the GTAP [M]odel to estimate the

LCFS TF2-13

[1] "[P]rice-yield elasticity is a measure of the change in yield with a change in price of a commodity." (Decl. Darlington ¶ 4.) For example, "[a] price-yield elasticity of 0.25 . . . means that if corn prices increase by 1%, corn yield would be expected to increase by 0.25%." (*Id.*) "The increase in yield is brought about by producers using seed types that are resistant to drought and disease, more intensive planting, possibly more fertilizer, irrigation, and other methods." (*Id.*)

magnitude of land use changes" that CARB contends is associated with that biofuel. (Decl. Darlington ¶ 4.)

To calculate the corn ethanol LUC value, CARB staff used the average of five price-yield values [0.05, 0.10, 0.175, 0.25, and 0.35], which is 0.185. (*Id.* ¶ 6.) To select these five values, CARB used (1) input from the expert working group (EWG) on elasticities, (2) its own review of various price-yield studies, and (3) a report by David Rocke reviewing some price-yield studies. The data Rocke relied upon to critique one of the studies, the Perez study, was not provided by ARB for review until August 1, 2015. (Decl. Darlington ¶ 7.) As with the late addition of the ZEV spreadsheet to rulemaking file, CARB's failure to comply with the Government Code's requirements is unexplained, prejudicial, and impossible to correct merely by allowing a brief period for review with no opportunity for the public to address at a hearing by the Board.

LCFS TF2-13 cont.

As is now plainly apparent, in light of the late addition of the Rocke data to the rulemaking file, the 0.185 price-yield value is not supported by the evidence. CARB's own Elasticity Values Expert Working Group (EWG) recommended a mid-point value of 0.25.[2] The only report relied upon by CARB to support a lower price-yield value was prepared by David Rocke of UC Davis. The Rocke analysis is based on only one set of data – a 2012 dissertation by Juan Francisco Rosas Perez, who concluded that price-yield response was approximately 0.29. Despite claiming to use that data set, the Rocke study ignored the Perez data, and somehow concluded the price yield should be lower. (*Id.* ¶¶ 16-18.) Until approximately August 1, 2015, the rulemaking file did not contain an explanation as to how the Rocke study reached this conclusion or performed his statistical analysis. (*Id.* ¶ 7.) Once the information was finally made available to the public, it became readily apparent the lower price-yield values were deeply flawed and unsupported by the evidence. Specifically, although the Perez study found a price-yield value of 0.29, Rocke used the same data as Perez to reach an entirely different result, *i.e.*, that "price elasticities of yield" are "small to zero." (Decl. Darlington ¶ 18.) This conclusion is contrary to the evidence, misinterpret the Perez study, and is based on modeling practices that are inconsistent with the methods CARB has used for other rulemakings.

LCFS TF2-14

First, in performing his "simple" analysis, Rocke only used "a small part of the Perez data." (Decl. Darlington ¶ 23.) Because Rocke's analysis only uses a small portion of the Perez data, and CARB relied upon the Rocke analysis to depart from the 0.25 price yield value recommended by its own EWG, CARB's use of a price-yield value of 0.185 is unsupported by the evidence. Without public access to the data on which he relied, the public was completely mislead about the nature of Dr. Rocke's analysis and its unreliability.

LCFS TF2-15

[2] *Final Recommendations from the Elasticity Values Subgroup*, ARB LCFs Expert Workgroup, *available at* http://www.arb.ca.gov/fuels/lcfs/workgroups/ewg/010511-final-rpt-elasticity.pdf

Rocke's conclusions also misinterpret the Perez study, and are thus wholly unreliable. The entire point of the Perez study was to show how "a wide range of related parameters" affect the price yield values. (Decl. Darlington ¶ 20.) Rocke, however, simply took a small subset of the parameters, and determined based on the incomplete data there was no price yield elasticity. (*Id.* ¶ 16-19.) Nothing in the open record from Dr. Rocke or any other source explains why he took that approach. LCFS TF2-16

Rocke's method of modeling is also inconsistent with the methods CARB has used for other rulemakings. (Decl. Darlington ¶ 19.) Rocke's simple modeling focuses only on one parameter, which has a higher likelihood of resulting in conclusions suggesting a certain parameter is statistically insignificant. (*Id.*) Reliable and scientifically defensive modeling practices include a full range of inputs that could influence vehicle emissions; for example, CARB's Predictive Model for gasoline estimates emissions from cars and trucks in response to a number of gasoline inputs, including sulfur, benzene, T50, T90, aromatics, olefins, volatility, and total oxygen. (*Id.* ¶ 19 n.14.) Rather than relying upon Rocke's conclusions based on incomplete data, CARB should instead rely upon the conclusions of its own EWG, and studies that are internally consistent with the methodologies it uses in other contexts. LCFS TF2-17

Among other steps that CARB must take now, Dr. Rocke's analysis, including the data on which he relied, must receive the external scientific review mandated by Section 57004 of the Health and Safety Code. One, though by no means the only, indication of the need for external review is the fact CARB's own EWG examined the same issue, yet reached a vastly different result. If CARB does not agree, it should explain its reasons for disagreement in full, and address the following issues: LCFS TF2-18

- Whether CARB believes Rocke's very limited analysis of price and supply data alone constitutes an adequate analysis of the Perez data, when CARB's own typical methods of analyzing data are much more robust than those employed by Rocke.

- Why CARB deviated from the EWG recommendation of 0.25 for a central value or average value for YPE.

- What exactly was wrong with how Perez handled autocorrelation in his analysis.

(See *id.* ¶ 25.)

CARB's improper reliance on the Rocke data has significant real-world consequences. Using a factually-supported price-yield value, such as the 0.25 recommended by CARB's EWG, the LUC for corn ethanol would be 17.3 gCO_2/MJ, compared to the 19.8 gCO_2/MJ using the proposed inputs. (Decl. Darlington ¶ 32.) Although Growth Energy considers the use of indirect LUC factors in the LCFS regulation to be generally unsound, CARB has included LUC factors as a component of the Carbon Intensity ("CI") Value placed on a fuel LCFS TF2-19

by CARB. If CARB inaccurately calculates the LUC (and thus the CI Value) of a fuel – such as corn ethanol – as being too high, it will prevent achievement of reductions in greenhouse gas emissions in the most cost-effective manner possible, which is the purpose of the LCFS regulation and a mandatory duty under the 2006 Global Warming Solutions Act. By reducing the CI value assigned to corn ethanol above a level that is scientifically supportable relative to other renewable fuels, CARB is incentivizing the use of fuels that do not provide the maximum GHG reductions in a cost-effective manner. The LCFS regulation will create incorrect "market signals" contrary to the intended effect of the overall LCFS program.[3] (*Cf. id.* ¶ 33.)

LCFS TF2-19 continued

To avoid these potential adverse consequences, and to develop LUC Values (and thereby CI Values) that are based on scientific data and the facts, the GTAP should use a price-yield value that is no less than 0.25, the amount recommended by CARB's EWG. If CARB does not take this action, it should explain why in a new rulemaking notice and permit testimony at a public hearing.

C. Because the 15-Day Review Period Provides Insufficient Time for Commenting Parties to Evaluate the New Evidence and Modifications to the Revised LCFS Regulation, CARB Should Recirculate the EA

Finally, it bears further emphasis that fifteen calendar days provides insufficient time for the public to review CARB's modifications to the proposed LCFS regulation.

LCFS TF2-20

The 15-Day Notice not only includes substantial modifications to the proposed LCFS regulation, but extensive new information regarding CARB's analyses. This information includes, for example, detailed information underlying CARB's analysis of EVs/PHEVs and information regarding the Rocke analysis. This information appears to have been available since the original 45-day comment period, and Growth Energy's representatives have requested that information on many occasions since that time. The statement in the 15-day notice that CARB is seeking public comment on the additional materials in "the interests of fairness and transparency" is ironic, and misleading. It has taken the pressure of litigation against CARB under the Public Records Act – in which CARB has raised its duties under the rulemaking-file provisions of the Government Code as a type of defense – to force CARB to put the new materials in the rulemaking file. CARB initially resisted that Public Records Act request with dilatory motions practice, until the Court with jurisdiction in that case became fully engaged in the issues. No private party should have to bear the expense of attempting to require a public agency to comply with its information disclosure obligations under the Government Code during the rulemaking process, yet this is exactly what CARB forced Growth Energy to do here.

LCFS TF2-21

[3] See CARB, "Staff Report: Initial Statement of Reasons, Proposed Regulation to Implement the Low Carbon Fuel Standard," Vol. I at VI-20 (March 5, 2006), available at http://www.arb.ca.gov/fuels/lcfs/030409lcfs_isor_vol1.pdf.

Rather than providing all interested parties, including Growth Energy, with an adequate opportunity to review these highly relevant documents – which, as explained above, show fundamental flaws in CARB's analysis – CARB instead placed the documents into the rulemaking file concurrently with its third 15-day notice. Fifteen days is simply insufficient for technical experts with relevant knowledge of the subject matter of the proposed LCFS regulation; certainly, a member of the public with no technical or legal background could not meaningfully be asked to provide comments on CARB's modifications and new evidence within this short timeframe. LCFS TF2-22

In light of the foregoing, and the significant new information provided by CARB with respect to its analysis of the revised LCFS regulation, CARB should recirculate both the proposed LCFS regulation and a revised EA for 45-day review. LCFS TF2-23

STATE OF CALIFORNIA

BEFORE THE AIR RESOURCES BOARD

Declaration of James M. Lyons

I, James Michael Lyons, declare as follows:

1. I make this Declaration based upon my own personal knowledge and my familiarity with the matters recited herein. It is based on my experience of nearly 30 years as a regulator, consultant, and professional in the field of emissions and air pollution control. A copy of my résumé can be found in Exhibit A.

2. I am a Senior Partner of Sierra Research, Inc., an environmental consulting firm located at 1801 J Street, Sacramento, California owned by Trinity Consultants, Inc. Sierra specializes in research and regulatory matters pertaining to air pollution control, and does work for both governmental and private industry clients. I have been employed at Sierra Research since 1991. I received a B.S. degree in Chemistry from the University of California, Irvine, and a M.S. Degree in Chemical Engineering from the University of California, Los Angeles. Before joining Sierra in 1991, I was employed by the State of California at the Mobile Source Division of the California Air Resources Board (CARB).

3. During my career, I have worked on many projects related to the following areas: 1) the assessment of emissions from on- and non-road mobile sources, 2) assessment of the impacts of changes in fuel composition and alternative fuels on engine emissions, including emissions of green-house gases, 3) analyses of the unintended consequences of regulatory actions, and 4) the feasibility of compliance with air quality regulations.

4. I have testified as an expert under state and federal court rules in cases involving CARB regulations for gasoline, Stage II vapor recovery systems and their design, factors affecting emissions from diesel vehicles, evaporative emission control system design and function, as well as combustion chamber system design. While at Sierra I have acted as a consultant on automobile air pollution control matters for CARB and for the United States Environmental Protection Agency. I am a member of the American Chemical Society and the Society of Automotive Engineers and have co-authored nine peer-reviewed monographs concerned with automotive emissions, including greenhouse gases and their control. In addition, over the course of my career, I have conducted peer-reviews of numerous papers related to a wide variety of issues associated with pollutant emissions and air quality.

5. This Declaration summarizes the results of my review of the CARB Notice of Public Availability of Modified Text and Availability of Additional Documents for the Proposed Re-Adoption of the Low Carbon Fuel Standard Regulation (the LCFS Regulation) dated July 31, 2015. I have performed this review as an independent expert

for Growth Energy. If called upon to do so, I would testify in accord with the facts and opinions presented here.

6. According to CARB staff, the illustrative compliance scenario published in the ISOR and last updated as part of the May 15-day notice has been used for a number of purposes. These include preparation of the environmental analysis[1] and assessment of economic impacts.[2] In response to a lawsuit under the Public Records Act and discussions between counsel for CARB and Growth Energy, CARB has recently added a spreadsheet entitled "Estimate of Electricity Use by ZEVs" to the rulemaking file. This spreadsheet reveals the assumptions made by CARB staff in estimating the amount of electricity that would be used by light-duty battery electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEVs) for the purposes of developing illustrative compliance scenarios and evaluating potential compliance curves as documented in Appendix B of the Initial Statement of Reasons (ISOR) and subsequent updates. These assumptions include the number of EVs and PHEVs in operation, as well as the annual number of miles traveled and the fuel efficiency of the vehicles. In general, the assumptions reflect the regulatory requirements of the Zero Emission Vehicle (ZEV) regulation,[3] which requires automobile manufacturers to produce EVs and PEHVs and offer them for sale in California.

LCFS TF2-24

7. Once it became clear that CARB was using ZEV vehicle population estimates to estimate the amount of electricity expected to be used as a fuel for light-duty vehicles in developing the LCFS illustrative compliance scenario, Growth Energy renewed earlier requests for similar data used by CARB to estimate of the amount of natural gas that will be used in heavy-duty vehicles under the LCFS. I understand that, since the publication of the July 31 public notice, counsel for CARB has advised counsel for Growth Energy that no heavy-duty natural gas vehicle population estimates were used to prepare the LCFS illustrative compliance scenario. I further understand that CARB staff never performed as analysis similar to that disclosed for ZEVs to estimate natural gas use in heavy-duty vehicles under the LCFS. This is surprising, and raises serious concerns regarding the validity of the LCFS illustrative compliance scenario, and therefore the environmental and economic analyses that were performed based on it.

8. If, unlike the situation with ZEVs, CARB has failed to perform any technical analysis to estimate the amount of natural gas that would be used in heavy-duty vehicles which have been assumed in the illustrative compliance scenario and evaluation of potential compliance curves, the compliance scenario and all conclusions drawn from it cannot be relied upon. Further, it is impossible for any stakeholder or reviewing body

LCFS TF2-25

[1] See page V-1 of the LCFS ISOR.

[2] See page VII-15 of the LCFS ISOR.

[3] See for example the ZEV population forecasts in Table 3.6 of www.arb.ca.gov/regact/2012/zev2012/zevisor.pdf.

such as the Office of Administrative Law to understand how the staff arrived at its conclusions regarding the use of electricity as a transportation fuel in the light-duty vehicle fleet, which again is critical to assessing the veracity of the illustrative compliance scenarios, the environmental analysis of the proposed LCFS regulation, and the estimated cost of the regulation. LCFS TF2-25 continued

9. Although it is not possible to understand how CARB staff arrived at its estimates of natural gas use in heavy-duty vehicles based on the available information, it is possible to estimate what CARB's assumptions would have been if staff performed the analysis required to provide a technical basis that would justify the forecast use of natural gas in heavy-duty vehicles. Once these estimates are established, it is then possible to assess their implications with respect to the veracity of the illustrative compliance scenarios, the environmental analysis of the proposed LCFS regulation, and the estimated cost of the regulation. LCFS TF2-26

10. I have estimated the increase in the number of heavy-duty natural gas vehicles that would be required to come into operation in California in order to consume the volume of natural gas forecast by CARB staff. I have also performed an analysis to determine if that required increase in vehicle population is reasonably foreseeable. Both analyses are documented in Exhibit B to this declaration. As demonstrated by these analyses, the required increase in the number of heavy-duty natural gas vehicles is large, and the available data and information contradict CARB's unsupported assumptions regarding large increases in the use of natural gas in heavy-duty vehicles.

11. Exhibit B also identifies substantial costs that would be incurred as a result of CARB's natural gas usage assumptions that were not considered in the assessment of the economic impacts of the LCFS regulation. To the extent that CARB staff continues to rely on its current illustrative compliance scenario, which incorporates flawed assumptions regarding natural gas use in heavy-duty vehicles, these costs must be included in the economic impact assessment. LCFS TF2-27

12. The correction of CARB's use of flawed assumptions regarding increased natural gas use in heavy-duty vehicles would significantly impact the results of the illustrative compliance scenario. As shown in Exhibit C, using corrected assumptions that limit natural gas use in heavy-duty vehicles to 2014 volumes and increase the use of diesel fuel, total LCFS credit balances under the compliance scenario become negative for the years 2021 to 2025, indicating that compliance with the LCFS regulation will not be feasible based on the remaining assumptions. LCFS TF2-28

13. CARB staff might try to develop illustrative compliance scenarios based on other assumptions. These other assumptions would likely include greater use of biodiesel in heavy-duty vehicles. As I have shown previously,[4] increased use of biodiesel in LCFS TF2-29

[4] See Appendix I of Growth Energy's February 17, 2015 comments on the Alternative Diesel Fuel and LCFS regulations.

heavy-duty diesel vehicles under the proposed LCFS and Alternative Diesel Fuel regulations will lead to increased NOx emissions, including significant increases in NOx emissions in the South Coast and San Joaquin Valley air basins which are already in extreme non-attainment of the federal ozone NAAQS, and moderate non-attainment of the federal fine particulate NAAQS. However, given CARB's reliance on the original illustrative compliance scenario in performing the environmental analysis and assessment of economic impacts, revisions to those analyses would also have to be performed if CARB revises the illustrative compliance scenario. In any case, at present CARB is relying on unsupported speculation that contradicts economic logic and CARB staff assessments of heavy-duty natural gas vehicles outside of the LCFS rulemaking process.

LCFS TF2-29
continued

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed this 17th day of August, 2015 at Sacramento, California.

JAMES M. LYONS

Exhibit A to Declaration of James M. Lyons

sierra research
A Trinity Consultants Company
1801 J Street
Sacramento, CA 95811
Tel: (916) 444-6666
Fax: (916) 444-8373
Ann Arbor, MI
Tel: (734) 761-6666
Fax: (734) 761-6755

Résumé

James Michael Lyons

Education

1985, M.S., Chemical Engineering, University of California, Los Angeles

1983, B.S., Cum Laude, Chemistry, University of California, Irvine

Professional Experience

4/91 to present — Senior Engineer/Partner/Senior Partner
Sierra Research

Primary responsibilities include oversight and execution of complex analyses of the emission benefits, costs, and cost-effectiveness of mobile source air pollution control measures. Mr. Lyons has developed particular expertise with respect to the assessment of control measures involving fuel reformulation, fuel additives, and alternative fuels, as well as accelerated vehicle/engine retirement programs, the deployment of advanced emission control systems for on- and non-road gasoline- and Diesel-powered engines, on-vehicle evaporative and refueling emission control systems, and Stage I and Stage II service station vapor recovery systems. Additional duties include assessments of the activities of federal, state, and local regulatory agencies with respect to motor vehicle emissions and reports to clients regarding those activities. Mr. Lyons has extensive litigation experience related to air quality regulations, product liability, and intellectual property issues.

7/89 to 4/91 — Senior Air Pollution Specialist
California Air Resources Board

Supervised a staff of four professionals responsible for identifying and controlling emissions of toxic air contaminants from mobile sources and determining the effects of compositional changes to gasoline and diesel fuel on emissions of regulated and unregulated pollutants. Other responsibilities included development of new test procedures and emission standards for evaporative and running loss emissions of hydrocarbons from vehicles; overseeing the development of the state plan to control toxic emissions from motor vehicles; and reducing emissions of CFCs from motor vehicles.

4/89 to 7/89 Air Pollution Research Specialist
California Air Resources Board

Responsibilities included identification of motor vehicle research needs; writing requests for proposals; preparation of technical papers and reports; as well as monitoring and overseeing research programs.

9/85 to 4/89 Associate Engineer/Engineer
California Air Resources Board

Duties included analysis of vehicle emissions data for trends and determining the effectiveness of various types of emissions control systems for both regulated and toxic emissions; determining the impact of gasoline and diesel powered vehicles on ambient levels of toxic air contaminants; participation in the development of regulations for "gray market" vehicles; and preparation of technical papers and reports.

Professional Affiliations

American Chemical Society
Society of Automotive Engineers

Selected Publications (Author or Co-Author)

"Development of Vehicle Attribute Forecasts for 2013 IEPR," Sierra Research Report No. SR2014-01-01, prepared for the California Energy Commission, January 2014.

"Assessment of the Emission Benefits of U.S. EPA's Proposed Tier 3 Motor Vehicle Emission and Fuel Standards," Sierra Research Report No. SR2013-06-01, prepared for the American Petroleum Institute, June 2013.

"Development of Inventory and Speciation Inputs for Ethanol Blends," Sierra Research Report No. SR2012-05-01, prepared for the Coordinating Research Council, Inc. (CRC), May 2012.

"Review of CARB Staff Analysis of 'Illustrative' Low Carbon Fuel Standard (LCFS) Compliance Scenarios," Sierra Research Report No. SR2012-02-01, prepared for the Western States Petroleum Association, February 20, 2012.

"Review of CARB On-Road Heavy-Duty Diesel Emissions Inventory," Sierra Research Report No. SR2010-11-01, prepared for The Ad Hoc Working Group, November 2010.

"Identification and Review of State/Federal Legislative and Regulatory Changes Required for the Introduction of New Transportation Fuels," Sierra Research Report No. SR2010-08-01, prepared for the American Petroleum Institute, August 2010.

"Technical Review of EPA Renewable Fuel Standard Program (RFS2) Regulatory Impact Analysis for Non-GHG Pollutants," Sierra Research Report No. SR2010-05-01, prepared for the American Petroleum Institute, May 2010.

"Effects of Gas Composition on Emissions from Heavy-Duty Natural Gas Engines," Sierra Research Report No. SR2010-02-01, prepared for the Southern California Gas Company, February 2010.

"Effects of Gas Composition on Emissions from a Light-Duty Natural Gas Vehicle," Sierra Research Report No. SR2009-11-01, prepared for the Southern California Gas Company, November 2009.

"Technical Review of 2009 EPA Draft Regulatory Impact Analysis for Non-GHG Pollutants Due to Changes to the Renewable Fuel Standard," Sierra Research Report No. SR2009-09-01, prepared for the American Petroleum Institute, September 2009.

"Effects of Vapor Pressure, Oxygen Content, and Temperature on CO Exhaust Emissions," Sierra Research Report No. 2009-05-03, prepared for the Coordinating Research Council, May 2009.

"Technical Review of 2007 EPA Regulatory Impact Analysis Methodology for the Renewable Fuels Standard," Sierra Research Report No. 2008-09-02, prepared for the American Petroleum Institute, September 2008.

"Impacts of MMT Use in Unleaded Gasoline on Engines, Emission Control Systems, and Emissions," Sierra Research Report No. 2008-08-01, prepared for McMillan Binch Mendelsohn LLP, Canadian Vehicle Manufacturers' Association, and Association of International Automobile Manufacturers of Canada, August 2008.

"Attachment to Comments Regarding the NHTSA Proposal for Average Fuel Economy Standards Passenger Cars and Light Trucks Model Years 2011-2015, Docket No. NHTSA-2008-0089," Sierra Research Report No. SR2008-06-01, prepared for the Alliance of Automobile Manufacturers, June 2008.

"Evaluation of California Greenhouse Gas Standards and Federal Energy Independence and Security Act – Part 1: Impacts on New Vehicle Fuel Economy," SAE Paper No. 2008-01-1852, Society of Automotive Engineers, 2008.

"Basic Analysis of the Cost and Long-Term Impact of the Energy Independence and Security Act Fuel Economy Standards," Sierra Research Report No. SR 2008-04-01, April 2008.

"The Benefits of Reducing Fuel Consumption and Greenhouse Gas Emissions from Light-Duty Vehicles," SAE Paper No. 2008-01-0684, Society of Automotive Engineers, 2008.

"Assessment of the Need for Long-Term Reduction in Consumer Product Emissions in South Coast Air Basin," Sierra Research Report No. 2007-09-03, prepared for the Consumer Specialty Products Association, September 2007.

"Summary of Federal and California Subsidies for Alternative Fuels," Sierra Research Report No. SR2007-04-02, prepared for the Western States Petroleum Association, April 2007.

"Analysis of IRTA Report on Water-Based Automotive Products," Sierra Research Report No. SR2006-08-02, prepared for the Consumer Specialty Projects Association and Automotive Specialty Products Alliance, August 2006.

"Evaluation of Pennsylvania's Implementation of California's Greenhouse Gas Regulations on Criteria Pollutants and Precursor Emissions," Sierra Research Report No. SR2006-04-01, prepared for Alliance of Automobile Manufacturers, April 12, 2006.

"Evaluation of New Jersey's Adoption of California's Greenhouse Gas Regulations on Criteria Pollutants and Precursor Emissions," Sierra Research Report No. SR2005-09-03, prepared for the Alliance of Automobile Manufacturers, September 30, 2005.

"Evaluation of Vermont's Adoption of California's Greenhouse Gas Regulations on Criteria Pollutants and Precursor Emissions," Sierra Research Report No. SR2005-09-02, prepared for the Alliance of Automobile Manufacturers, September 19, 2005.

"Assessment of the Cost-Effectiveness of Compliance Strategies for Selected Eight-Hour Ozone NAAQS Nonattainment Areas," Sierra Research Report No. SR2005-08-04, prepared for the American Petroleum Institute, August 30, 2005.

"Evaluation of Connecticut's Adoption of California's Greenhouse Gas Regulations on Criteria Pollutants and Precursor Emissions," Sierra Research Report No. SR2005-08-03, prepared for the Alliance of Automobile Manufacturers, August 26, 2005.

"Evaluation of New York's Adoption of California's Greenhouse Gas Regulations On Criteria Pollutants and Precursor Emissions," Sierra Research Report No. SR2005-07-04, prepared for the Alliance of Automobile Manufacturers, July 14, 2005.

"Review of MOVES2004," Sierra Research Report No. SR2005-07-01, prepared for the Alliance of Automobile Manufacturers, July 11, 2005.

"Review of Mobile Source Air Toxics (MSAT) Emissions from On-Highway Vehicles: Literature Review, Database, Development, and Recommendations for Future Studies," Sierra Research Report No. SR2005-03-01, prepared for the American Petroleum Institute, March 4, 2005.

"The Contribution of Diesel Engines to Emissions of ROG, NOx, and PM2.5 in California: Past, Present, and Future," Sierra Research Report No. SR2005-02-01, prepared for Diesel Technology Forum, February 2005.

"Fuel Effects on Highway Mobile Source Air Toxics (MSAT) Emissions," Sierra Research Report No. SR2004-12-01, prepared for the American Petroleum Institute, December 23, 2004.

"Review of the August 2004 Proposed CARB Regulations to Control Greenhouse Gas Emissions from Motor Vehicles: Cost Effectiveness for the Vehicle Owner or Operator – Appendix C to the Comments of The Alliance of Automobile Manufacturers," Sierra Research Report No. SR2004-09-04, prepared for the Alliance of Automobile Manufacturers, September 2004.

"Emission and Economic Impacts of an Electric Forklift Mandate," Sierra Research Report No. SR2003-12-01, prepared for National Propane Gas Association, December 12, 2003.

"Reducing California's Energy Dependence," Sierra Research Report No. SR2003-11-03, prepared for Alliance of Automobile Manufacturers, November 25, 2003.

"Evaluation of Fuel Effects on Nonroad Mobile Source Air Toxics (MSAT) Emissions: Literature Review, Database Development, and Recommendations for Future Studies," Sierra Research Report No. SR2003-10-01, prepared for American Petroleum Institute, October 3, 2003.

"Review of Current and Future CO Emissions from On-Road Vehicles in Selected Western Areas," Sierra Research Report No. SR03-01-01, prepared for the Western States Petroleum Association, January 2003.

"Review of CO Compliance Status in Selected Western Areas," Sierra Research Report No. SR02-09-04, prepared for the Western States Petroleum Association, September 2002.

"Impacts Associated With the Use of MMT as an Octane Enhancing Additive in Gasoline – A Critical Review", Sierra Research Report No. SR02-07-01, prepared for Canadian Vehicle Manufacturers Association and Association of International Automobile Manufacturers of Canada, July 24, 2002.

"Critical Review of 'Safety Oversight for Mexico-Domiciled Commercial Motor Carriers, Final Programmatic Environmental Assessment', Prepared by John A Volpe Transportation Systems Center, January 2002," Sierra Research Report No. SR02-04-01, April 16, 2002.

"Critical Review of the Method Used by the South Coast Air Quality Management District to Establish the Emissions Equivalency of Heavy-Duty Diesel- and Alternatively Fueled Engines", Sierra Research Report No. SR01-12-03, prepared for Western States Petroleum Association, December 21, 2001.

"Review of U.S. EPA's Diesel Fuel Impact Model", Sierra Research Report No. SR01-10-01, prepared for American Trucking Associations, Inc., October 25, 2001.

"Operation of a Pilot Program for Voluntary Accelerated Retirement of Light-Duty Vehicles in the South Coast Air Basin," Sierra Research Report No. SR01-05-02, prepared for California Air Resources Board, May 2001.

"Comparison of Emission Characteristics of Advanced Heavy-Duty Diesel and CNG Engines," Sierra Report No. SR01-05-01, prepared for Western States Petroleum Association, May 2001.

"Analysis of Southwest Research Institute Test Data on Inboard and Sterndrive Marine Engines," Sierra Report No. SR01-01-01, prepared for National Marine Manufacturers Association, January 2001.

"Institutional Support Programs for Alternative Fuels and Alternative Fuel Vehicles in Arizona: 2000 Update," Sierra Report No. SR00-12-04, prepared for Western States Petroleum Association, December 2000.

"Real-Time Evaporative Emissions Measurement: Mid-Morning Commute and Partial Diurnal Events," SAE Paper No. 2000-01-2959, October 2000.

"Evaporative Emissions from Late-Model In-Use Vehicles," SAE Paper No. 2000-01-2958, October 2000.

"A Comparative Analysis of the Feasibility and Cost of Compliance with Potential Future Emission Standards for Heavy-Duty Vehicles Using Diesel or Natural Gas," Sierra Research Report No. SR00-02-02, prepared for Californians For a Sound Fuel Strategy, February 2000.

"Critical Review of the Report Entitled 'Economic Impacts of On Board Diagnostic Regulations (OBD II)' Prepared by Spectrum Economics," Sierra Research Report No. SR00-01-02, prepared for the Alliance of Automobile Manufacturers, January 2000.

"Potential Evaporative Emission Impacts Associated with the Introduction of Ethanol-Gasoline Blends in California," Sierra Research Report No. SR00-01-01, prepared for the American Methanol Institute, January 2000.

"Evaporative Emissions from Late-Model In-Use Vehicles," Sierra Research Report No. SR99-10-03, prepared for the Coordinating Research Council, October 1999.

"Investigation of Sulfur Sensitivity and Reversibility in Late-Model Vehicles," SAE Paper No. 1999-01-3676, August 1999.

"Future Diesel-Fueled Engine Emission Control Technologies and Their Implications for Diesel Fuel Properties," Sierra Research Report No. SR99-08-01, prepared for the American Petroleum Institute, August 1999.

"Analysis of Compliance Feasibility under Proposed Tier 2 Emission Standards for Passenger Cars and Light Trucks," Sierra Research Report No. SR99-07-02, July 1999.

"Comparison of the Properties of Jet A and Diesel Fuel," Sierra Research Report No. SR99-02-01, prepared for Pillsbury Madison and Sutro, February 1999.

"Investigation of Sulfur Sensitivity and Reversibility in Late-Model Vehicles," Sierra Research Report No. SR98-12-02, prepared for the American Petroleum Institute, December 1998.

"Analysis of New Motor Vehicle Issues in the Canadian Government's Foundation Paper on Climate Change – Transportation Sector," Sierra Research Report No. SR98-12-01, prepared for the Canadian Vehicle Manufacturers Association, December 1998.

"Investigation of the Relative Emission Sensitivities of LEV Vehicles to Gasoline Sulfur Content - Emission Control System Design and Cost Differences," Sierra Research Report No. SR98-06-01, prepared for the American Petroleum Institute, June 1998.

"Costs, Benefits, and Cost-Effectiveness of CARB's Proposed Tier 2 Regulations for Handheld Equipment Engines and a PPEMA Alternative Regulatory Proposal," Sierra Research Report No. SR98-03-03, prepared for the Portable Power Equipment Manufacturers Association, March 1998.

"Analysis of Diesel Fuel Quality Issues in Maricopa County, Arizona," Sierra Research Report No. SR97-12-03, prepared for the Western States Petroleum Association, December 1997.

"Potential Impact of Sulfur in Gasoline on Motor Vehicle Pollution Control and Monitoring Technologies," prepared for Environment Canada, July 1997.

"Analysis of Mid- and Long-Term Ozone Control Measures for Maricopa County," Sierra Research Report No. SR96-09-02, prepared for the Western States Petroleum Association, September 9, 1996.

"Technical and Policy Issues Associated with the Evaluation of Selected Mobile Source Emission Control Measures in Nevada," Sierra Research Report No. SR96-03-01, prepared for the Western States Petroleum Association, March 1996.

"Cost-Effectiveness of Stage II Vapor Recovery Systems in the Lower Fraser Valley," Sierra Research Report No. SR95-10-05, prepared for the Province of British Columbia Ministry of Environment Lands and Parks and the Greater Vancouver Regional District, October 1995.

"Cost of Stage II Vapor Recovery Systems in the Lower Fraser Valley," Sierra Research Report No. SR95-10-04, prepared for the Province of British Columbia Ministry of Environment Lands and Parks and the Greater Vancouver Regional District, October 1995.

"A Comparative Characterization of Gasoline Dispensing Facilities With and Without Vapor Recovery Systems," Sierra Research Report No. SR95-10-01, prepared for the Province of British Columbia Ministry of Environment Lands and Parks, October 1995.

"Potential Air Quality Impacts from Changes in Gasoline Composition in Arizona," Sierra Research Report No. SR95-04-01, prepared for Mobil Corporation, April 1995.

"Vehicle Scrappage: An Alternative to More Stringent New Vehicle Standards in California," Sierra Research Report No. SR95-03-02, prepared for Texaco, Inc., March 1995.

"Evaluation of CARB SIP Mobile Source Measures," Sierra Research Report No. SR94-11-02, prepared for Western States Petroleum Association, November 1994.

"Reformulated Gasoline Study," prepared by Turner, Mason & Company, DRI/McGraw-Hill, Inc., and Sierra Research, Inc., for the New York State Energy Research and Development Authority, Energy Authority Report No. 94-18, October 1994.

"Phase II Feasibility Study: Heavy-Duty Vehicle Emissions Inspection Program in the Lower Fraser Valley," Sierra Research Report No. SR94-09-02, prepared for the Greater Vancouver Regional District, September 1994.

"Cost-Effectiveness of Mobile Source Emission Controls from Accelerated Scrappage to Zero Emission Vehicles," Paper No. 94-TP53.05, presented at the 87th Annual Meeting of the Air and Waste Management Association, Cincinnati, OH, June 1994.

"Investigation of MOBILE5a Emission Factors, Assessment of I/M Program and LEV Program Emission Benefits," Sierra Research Report No. SR94-06-05, prepared for American Petroleum Institute, June 1994.

"Cost-Effectiveness of the California Low Emission Vehicle Standards," SAE Paper No. 940471, 1994.

"Meeting ZEV Emission Limits Without ZEVs," Sierra Research Report No. SR94-05-06, prepared for Western States Petroleum Association, May 1994.

"Evaluating the Benefits of Air Pollution Control - Method Development and Application to Refueling and Evaporative Emissions Control," Sierra Research Report No. SR94-03-01, prepared for the American Automobile Manufacturers Association, March 1994.

"The Cost-Effectiveness of Further Regulating Mobile Source Emissions," Sierra Research Report No. SR94-02-04, prepared for the American Automobile Manufacturers Association, February 1994.

"Searles Valley Air Quality Study (SVAQS) Final Report," Sierra Research Report No. SR94-02-01, prepared for North American Chemical Company, February 1994.

"A Comparative Study of the Effectiveness of Stage II Refueling Controls and Onboard Refueling Vapor Recovery," Sierra Research Report No. SR93-10-01, prepared for the American Automobile Manufacturers Association, October 1993.

"Evaluation of the Impact of the Proposed Pole Line Road Overcrossing on Ambient Levels of Selected Pollutants at the Calgene Facilities," Sierra Research Report No. SR93-09-01, prepared for the City of Davis, September 1993.

"Leveling the Playing Field for Hybrid Electric Vehicles: Proposed Modifications to CARB's LEV Regulations," Sierra Research Report No. SR93-06-01, prepared for the Hybrid Vehicle Coalition, June 1993.

"Size Distributions of Trace Metals in the Los Angeles Atmosphere," *Atmospheric Environment*, Vol. 27B, No. 2, pp. 237-249, 1993.

"Preliminary Feasibility Study for a Heavy-Duty Vehicle Emissions Inspection Program in the Lower Fraser Valley Area," Sierra Research Report No. 92-10-01, prepared for the Greater Vancouver Regional District, October 1992.

"Development of Mechanic Qualification Requirements for a Centralized I/M Program," SAE Paper No. 911670, 1991.

"Cost-Effectiveness Analysis of CARB's Proposed Phase 2 Gasoline Regulations," Sierra Research Report No. SR91-11-01, prepared for the Western States Petroleum Association, November 1991.

"Origins and Control of Particulate Air Toxics: Beyond Gas Cleaning," in Proceedings of the Twelfth Conference on Cooperative Advances in Chemical Science and Technology, Washington, D.C., October 1990.

"The Effect of Gasoline Aromatics on Exhaust Emissions: A Cooperative Test Program," SAE Paper No. 902073, 1990.

"Estimation of the Impact of Motor Vehicles on Ambient Asbestos Levels in the South Coast Air Basin," Paper No. 89-34B.7, presented at the 82nd Annual Meeting of the Air and Waste Management Association, Anaheim, CA, June 1989.

"Benzene/Aromatic Measurements and Exhaust Emissions from Gasoline Vehicles," Paper No. 89-34B.4, presented at the 82nd Annual Meeting of the Air and Waste Management Association, Anaheim, CA, June 1989.

"The Impact of Diesel Vehicles on Air Pollution," presented at the 12th North American Motor Vehicle Emissions Control Conference, Louisville, KY, April 1988.

"Exhaust Benzene Emissions from Three-Way Catalyst-Equipped Light-Duty Vehicles," Paper No. 87-1.3, presented at the 80th Annual Meeting of the Air Pollution Control Association, New York, NY, June 1987.

"Trends in Emissions Control Technologies for 1983-1987 Model-Year California-Certified Light-Duty Vehicles," SAE Paper No. 872164, 1987.

Exhibit B to Declaration of James M. Lyons

Exhibit B

Estimation of the Heavy-Duty Natural Gas Vehicle Requirements Implied by CARB's LCFS Illustrative Compliance Scenario

LCFS TF2-30

As described in detail in the ISOR and Appendix B to the ISOR, in developing proposed revisions to the Low Carbon Fuel Standard (LCFS) regulation, CARB staff has prepared an "illustrative compliance scenario" which, for purposes of its Environmental Assessment, must be "reasonably foreseeable."[1] However, CARB staff has failed to publish many of the assumptions and data that underlie that scenario, making it impossible to understand the technical basis, if any, which supports CARB's claim that the scenario is in fact reasonably foreseeable. In particular, CARB staff has failed to provide any technical basis that supports the large increase in natural gas use by heavy-duty vehicles assumed in the compliance scenario. As documented below, an analysis that estimates the implications of CARB's assumptions regarding natural gas use in heavy-duty vehicles indicates that the CARB assumptions are not in fact reasonably foreseeable. Given this, CARB's environmental analysis and its assessment of the economic impacts of the proposed LCFS regulation are flawed and cannot be used to comply with the California Environmental Quality Act (CEQA) or the rulemaking requirements of the Administrative Procedures Act (APA).

CARB Staff Assumptions Regarding Natural Gas Use in Heavy-Duty Vehicles

CARB staff has published several versions of the compliance scenario during the course of the LCFS rulemaking process. The most recent version is dated May 22, 2015 and is titled "Analysis of Compliance Curve Reflecting the Impact of May 2015 Proposed 15-Day Changes." The CARB assumptions regarding conventional and renewable natural gas to be used in heavy-duty vehicles as a function of time are presented in Table 1 in diesel equivalent gallons. As shown, CARB assumes a dramatic increase in total natural gas use over time, with that gas being derived from "renewable" sources that include landfills and waste digesters. More specifically, CARB's projected increase in natural gas use in heavy-duty vehicles, relative to 2014 levels, is 2.6 times greater in 2020 and 4.4 times greater in 2025.

Required Heavy-Duty Natural Gas Vehicle Populations

Using CARB staff's assumptions regarding natural gas use in heavy-duty vehicles, it is possible to estimate the required number of heavy-duty vehicles as a function of time. This process begins with determining the current population of heavy-duty natural gas vehicles in California. Data regarding that population (exclusive of conversions) in 2013 have been published by the

[1] See pages ES-18 and 19 of the LCFS ISOR.

National Renewable Energy Laboratory.[2] These data can then be used with EMFAC2014 annual mileage accumulation rates and an average natural gas fuel economy value of 5.6 miles per diesel equivalent value for the 2013 fleet[3] to estimate natural gas use. These data and the resulting estimate of natural gas consumption by heavy-duty vehicles in 2013 are presented in Table 2. As shown, the estimated volume of 102 million diesel equivalent gallons for the 2013 fleet is in reasonable agreement with the 2014 CARB assumed value of 110 million.

Assuming that both the relative distribution of heavy-duty natural gas vehicles in the fleet and their fuel economy remain constant, the growth in vehicle population required to satisfy CARB's forecast demand is directly proportional to the growth in that demand. The resulting populations for 2015 to 2025 are shown in Table 3. It should be noted that while the assumption of constant fuel economy is likely to be incorrect, the expected increase in fleet fuel economy would only serve to increase the number of natural gas vehicles required to consume the fuel volumes assumed by CARB for future years.

Table 1
CARB Assumptions Regarding Natural Gas Use In Heavy-Duty Vehicles
(million diesel equivalent gallons)

Year	Conventional	Renewable	Total
2014	86	23	110
2015	70	55	125
2016	75	70	145
2017	75	90	165
2018	75	130	205
2019	75	170	245
2020	55	230	285
2021	35	290	325
2022	35	330	365
2023	35	370	405
2024	35	410	445
2025	35	450	485

[2] See www1.eere.energy.gov/cleancities/pdfs/ngvtf14oct_schroeder.pdf
[3] See www.energy.ca.gov/2013_energypolicy/documents/2013-06-26_workshop/presentations/07_Medium_Heavy_Vehicles_Bob_RAS_22Jun2013.pdf

Table 2 2013 Heavy-Duty Natural Gas Fleet Data and Estimated Fuel Consumption			
Type	Population	Annual Miles	NG Use (million diesel equivalent gallons)
Class 4-6	1,009	18,228	3
Class 7	2,148	20,215	8
Class 8	9,791	52,023	91
Total	12,947	-	102

Table 3 Estimated California Heavy-Duty Natural Gas Vehicle Population Required to Consume Natural Gas Volumes Forecast by CARB (vehicles)				
Year	Class 8	Class 7	Class 4-6	Total
2013	9,791	2,148	1,009	12,947
2015	11,156	2,447	1,149	14,753
2016	12,941	2,839	1,333	17,113
2017	14,726	3,230	1,517	19,474
2018	18,296	4,013	1,885	24,194
2019	21,866	4,796	2,253	28,915
2020	25,436	5,579	2,620	33,636
2021	29,006	6,362	2,988	38,357
2022	32,576	7,146	3,356	43,078
2023	36,147	7,929	3,724	47,799
2024	39,717	8,712	4,091	52,520
2025	43,287	9,495	4,459	57,241
Increase from 2013 to 2025	33,496	7,347	3,451	44,294

Assessment of Required Heavy-Duty Natural Gas Vehicle Populations

As documented above, the CARB illustrative scenario assumes a massive increase in natural gas as a fuel for heavy-duty vehicles, which directly implies a similar massive increase in the number of heavy-duty natural gas vehicles in operation in California. Although, CARB staff might be able to show that it is possible to divert the forecast volume of natural gas intended for other purposes to use as a transportation fuel, staff has apparently not estimated the number of vehicles required nor published any data or analysis to support that it is reasonably foreseeable that the required number of vehicles will be in operation in California. Rather, as is demonstrated below, what is reasonably foreseeable is that there will be no significant increase in either the heavy-duty natural gas vehicle population or natural gas use by such vehicles unless CARB requires the purchase and use of such vehicles.

LCFS TF2-31

It should be noted that while there are several existing CARB regulations that have resulted in the deployment of natural gas vehicles, such as Solid Waste Collection Vehicle rule and the Fleet Rule for Transit Agencies, those regulatory programs are mature and will not lead to further increases in heavy-duty natural gas vehicle use. There are simply no existing CARB regulations like the ZEV mandate that require dramatic increases in the sale of heavy-duty natural gas vehicles. Given this, increases in the California heavy-duty natural vehicle population would have to be driven by market. If CARB believes that the market will drive those increases, staff needs to explain why and allow the public to comment on that explanation. Indeed, CARB's own recent assessment of heavy-duty natural gas vehicle technology[4] compares heavy-duty natural gas vehicles with diesel vehicles and notes that natural gas vehicles suffer from a number of disadvantages including the following:

LCFS TF2-32

1. Shorter range between refueling;
2. Increased weight;
3. 10 to 15% lower fuel economy;
4. Higher purchase costs which range from $30,000 to $80,000 per vehicle;
5. Higher maintenance costs of 1-2 cents per mile; and
6. A limited number of publically accessible refueling stations.

All of these factors serve as substantial barriers to increases in heavy-duty natural gas populations. For example, multiplying the $55,000 mid-point of the range in increased vehicle costs by the estimated 44,924 additional natural gas vehicles that would be required in 2025 to meet CARB's fuel forecast, indicates that an additional $2.4 billion dollars would have to be spent by California heavy-duty vehicle users in order to use natural gas instead of diesel vehicles. Similarly, the increased maintenance costs associated with the additional natural gas vehicles would amount to between $22 and $44 million in 2025 alone. There are also substantial costs associated with installation of natural gas refueling facilities.[5] It should be noted that these costs were not included by CARB staff in its economic analysis of the LCFS regulation.

The two primary advantages associated with natural gas vehicles that have been identified by CARB staff are (1) lower tailpipe emissions of particulate matter and oxides of nitrogen, and (2) lower fuel price. Given that less expensive diesel vehicles will be available, the lower emission levels associated with natural gas vehicles are unlikely to influence the purchasing decisions of vehicle operators. In addition, given the recent changes in the oil prices, the price difference between natural gas and diesel fuel has dropped dramatically as shown in Figure 1, which was obtained from a U.S. Department of Energy website.[6] It should be noted that the price differential shown in Figure 1 does not reflect the 10 to 15% lower fuel economy cited by CARB as a disadvantage of natural gas vehicles, which would further reduce the price differential. Further, current EIA forecasts for diesel fuel prices indicate that lower prices will persist for a considerable period of time.[7] Given this, the advantage associated with lower prices for natural gas does not appear to be a substantial factor.

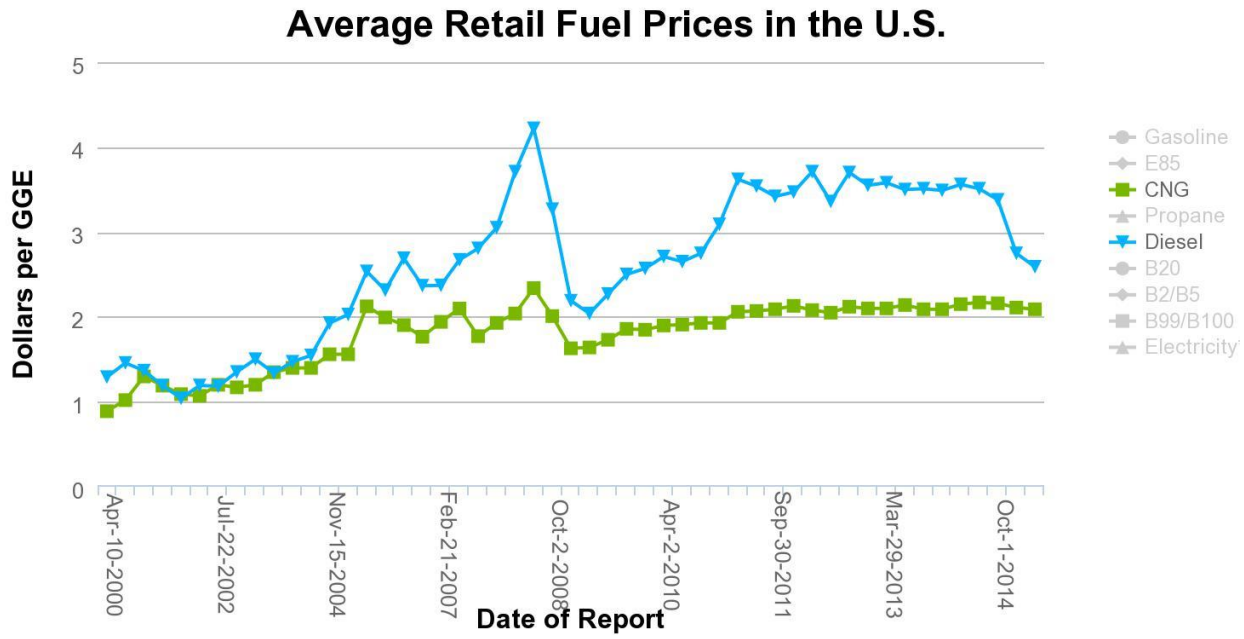
LCFS TF2-33

[4] See www.arb.ca.gov/msprog/tech/presentation/lowernoxfuel.pdf.
[5] See www.afdc.energy.gov/uploads/publication/cng_infrastructure_costs.pdf.
[6] See www.afdc.energy.gov/fuels/prices.html.
[7] See Table 12 at www.eia.gov/forecasts/aeo/tables_ref.cfm.

Overall, as documented above, there are substantial disadvantages associated with heavy-duty natural gas vehicles relative to diesel vehicles, and there is no technical basis that supports CARB's implied assumption that there will be a dramatic increase in the population of such vehicles. This conclusion is supported for the nation as a whole by EIA which forecasts little growth in the number of heavy-duty natural gas vehicles, and a decrease in the total amount of natural gas used by those vehicles over time.[8] CARB's LCFS illustrative compliance scenarios are therefore based on arbitrary and unsupported speculation which is inconsistent with CARB's own analysis outside the LCFS rulemaking process and with EIA's analysis.

LCFS TF2-34

Figure 1



[8] See Table 50 at www.eia.gov/forecasts/aeo/tables_ref.cfm.

Exhibit C to Declaration of James M. Lyons

Exhibit C

Impact of CARB's Flawed Assumption Regarding Natural Gas Use in Heavy-Duty Vehicles on CARB Illustrative Compliance Scenario

As described in Attachment B, it has only now become apparent that CARB's LCFS Illustrative Compliance Scenario envisioning dramatic growth in natural gas use by heavy-duty vehicles has no empirical or specific analytic basis. The available information shows now and has long shown that the only reasonable assumption is that there will be little or no growth in natural gas use in heavy-duty vehicles. Given this, it is important to understand the impact associated with correcting CARB's flawed assumptions for the Illustrative Compliance Scenario.

LCFS TF2-35

In order to perform this assessment, the May 22 Illustrative Compliance Scenario was used as the starting point, and CARB staff's assumptions regarding the use of conventional natural gas and renewable natural gas were corrected such that the total demand for natural gas remained at 110 million diesel gallon equivalents during the years 2015 through 2025. It was assumed that renewable gas would be used to the maximum degree feasible based on CARB's original forecast up to a maximum of 110 million diesel gallon equivalents. Diesel fuel was assumed to replace the reduced volume of natural gas relative to CARB's original assumptions.

LCFS TF2-36

In Table 1, the original May 22 diesel deficit and conventional and renewable natural gas credit volumes are compared to those resulting from the corrected assumptions described above. As shown, the corrected assumptions lead to reduced natural gas credits and increased diesel deficits, relative to the May 22 version.

Table 1
Calendar Year 2014-2025 Diesel Deficit and Natural Gas Credit Volumes
(Flawed vs. Corrected NG Use Assumptions)

	MMTs of Credits or Deficits											
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
	May 22 Scenario											
Diesel Deficits	-0.46	-0.45	-0.91	-1.57	-2.23	-3.33	-4.41	-4.30	-4.27	-4.23	-4.26	-4.29
Conv. Natural Gas Credits	0.19	0.15	0.10	0.09	0.07	0.05	0.01	0.01	0.01	0.01	0.01	0.01
Renewable NG Credits	0.18	0.50	0.66	0.85	1.22	1.54	2.01	2.53	2.88	3.23	3.58	3.93
Sum	-0.09	0.20	-0.15	-0.63	-0.94	-1.74	-2.39	-1.76	-1.38	-0.99	-0.67	-0.36
	May 22 Scenario - With Corrected Heavy Duty Natural Gas Assumptions											
Diesel Deficits	-0.46	-0.45	-0.92	-1.60	-2.30	-3.47	-4.65	-4.60	-4.62	-4.64	-4.72	-4.81
Conv. Natural Gas Credits	0.19	0.12	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Renewable NG Credits	0.18	0.50	0.66	0.85	1.03	0.99	0.96	0.96	0.96	0.96	0.96	0.96
Sum	-0.09	0.17	-0.20	-0.72	-1.27	-2.47	-3.69	-3.64	-3.66	-3.68	-3.76	-3.85

A similar comparison of total LCFS program credits and deficits as well as the total credit balance is provided in Table 2. As highlighted in Table 2, with the corrected assumptions, the credit surpluses forecast by CARB for the years 2021 to 2025 become deficits indicating that compliance with the LCFS regulation would not occur. Therefore, CARB's conclusion that compliance with the LCFS regulation is demonstrated by the May 22 version of the Illustrative Compliance Scenario is incorrect and has no empirical or analytical support in the rulemaking file.

LCFS TF2-36
continued

CARB staff could try to formulate other Illustrative Compliance Scenarios that demonstrate compliance based on other assumptions, which would likely include greater use of biodiesel in heavy-duty vehicles. However, use of these different assumptions would require revisions to CARB staff's environmental and economic analyses, which should be made available for public review and comment.

Table 2
Calendar Year 2014-2025 LCFS Program Credits and Deficits
(Flawed vs. Corrected NG Use Assumptions)

	MMTs of Credits or Deficits											
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
	May 22 Scenario											
Total Credits	4.12	5.71	9.00	10.65	12.10	13.09	14.29	17.08	19.08	21.08	22.78	24.44
Total Deficits	-2.35	-2.31	-6.75	-8.68	-11.43	-15.99	-20.38	-19.87	-19.43	-19.02	-18.65	-18.31
Total Credit Balance	4.76	8.16	10.40	12.37	13.04	10.14	4.05	1.26	0.90	2.97	7.10	13.23
	May 22 Scenario - With Corrected Heavy Duty Natural Gas Assumptions											
Total Credits	4.12	5.67	8.95	10.58	11.83	12.49	13.23	15.50	17.15	18.80	20.15	21.46
Total Deficits	-2.35	-2.31	-6.76	-8.71	-11.49	-16.12	-20.62	-20.16	-19.78	-19.42	-19.11	-18.82
Total Credit Balance	4.76	8.12	10.31	12.18	12.52	8.89	1.50	-3.16	-5.80	-6.42	-5.37	-2.74

Exhibit A to Declaration of Thomas L. Darlington

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

CALIFORNIA AIR RESOURCES BOARD

DECLARATION OF THOMAS L. DARLINGTON

I, Thomas L. Darlington, declare as follows:

1. I am an engineer with training and expertise in lifecycle emissions analysis, the use of models to estimate lifecycle emissions and to attribute emissions to the production, distribution and use of various fuels, and use of regulations to control mobile-source emissions. My areas of expertise also include land-use change ("LUC") modeling and the application of econometric models to attributional and consequential lifecycle emissions analysis. Following my graduation from the University of Michigan in 1979, I served for eight years as an Engineer and Project Manager at the United States Environmental Protection Agency's Motor Vehicle Emissions and Fuels Laboratory in Ann Arbor, Michigan. Thereafter I worked at Detroit Diesel Corporation and General Motors Corporation, and as the Director of Mobile Source Programs at Systems Application International. I am the President of Air Improvement Resource ("AIR"), a company formed in 1994 to provide mobile source emission modeling to government and industry. A copy of my CV is attached to this Declaration as Exhibit "A."

2. I have participated on behalf of renewable fuels producers in the public consultation and rulemaking processes at the California Air Resources Board ("ARB" or "the Board") to consider, adopt and revise the low-carbon fuel standard ("LCFS") regulation since 2008. I testified at the Board's February 2015 hearing concerning proposed amendments to the LCFS regulation. I am fully familiar with the models released by CARB to establish and implement the LCFS regulation, including the versions of the Global Trade Analysis Project ("GTAP") modeling systems used by CARB or proposed for use by the CARB staff as part of the current and proposed LCFS regulation.

3. I make this Declaration based upon my personal knowledge, my training and expertise, and my familiarity with the subjects that I address here.

A. Overview of LCFS Regulation's Treatment of Price-Yield Elasticity

4. The price-yield elasticity is an important parameter used in the GTAP model[1] to estimate the magnitude of land use changes in response to biofuel expansion. The price-yield elasticity is a measure of the change in yield with a change in price of a commodity. A price-yield elasticity of 0.25, therefore means that if corn prices increase by 1%, corn yield would be expected to increase by 0.25%. The increase in yield is brought

[1] GTAP stands for Global Trade Analysis Project, which is the model ARB uses to develop the land use impacts of biofuels.

about by producers using seed types that are resistant to drought and disease, more intensive planting, possibly more fertilizer, irrigation, and other methods.

5. The increase in investment by producers to achieve a higher yield is justified by the increase in the prices the producer will obtain for the crop. In GTAP, the predicted increase in prices is a result of "shocking" the model with increased demand for feedstocks for biofuels. When the model is shocked with this increase in demand, the model responds by simulating an increase in price of various commodities. This in turn leads to some crop switching (to biofuel feedstocks), higher yields on existing land (due to the YPE elasticity) and conversion of pasture and, to a much lesser extent, forest to cropland.[2]

6. In GTAP, the price-yield parameter (or elasticity) is referred to as YDEL; ARB refers to it as YPE. ARB used five different price-yield elasticities in its analysis of land-use emissions (0.05, 0.1, 0.175, 0.25, and 0.35) for all biofuels.[3] The average of these five values is 0.185.

7. To select these five levels, ARB relied on (1) input from the expert working group (EWG) on elasticities, (2) its own review of various price-yield studies, and (3) a report by David Rocke reviewing some price-yield studies.[4] While the Rocke report was provided by ARB with the ISOR, the data Rocke relied upon to critique one of the studies, the Perez study, was not provided by ARB for review until August 1, 2015.

8. ARB's comments on the Rocke study appear at the end of Attachment 1 to Appendix I of the ISOR. Appendix I discusses the land use emissions estimated by ARB, and Attachment 1 discusses ARB's method for determining YPE values to use in estimating land-use emissions. ARB's summary of the Rocke report is below:

> Staff contacted with David Rocke from the University of California, Davis to perform a statistical analysis of the data used by some of the researchers in Table 1-2. David reviewed analysis (and data where available) for Goodwin et al, Perez, and Berry and Schlenker and additional studies and concluded based on methodologically sound analyses, yield price elasticities are small to zero.

9. Since ARB relied on Rocke's review of recent studies in selecting YPE values, we reviewed Rocke's analysis of the Perez data, and his review of the other studies. In this report, we will show that:

(i) ARB's Elasticity Values Expert Working Group (EWG) recommended a mid-point value of 0.25, not 0.185.

LCFS TF2-37 (cont. on pg 3, bottom)

[2] In the real world, fallow or idled lands are also converted to crops resulting in little real land use change. However, GTAP currently does not currently model the conversion of idle or fallow land.

[3] Table I-4, Appendix I, Detailed Analysis for Indirect Land Use Change, Initial Statement of Reasons, ARB.

[4] *Statistical Issues Related to the Low-Carbon Fuel Standard*, David M. Rocke, PhD, October 31, 2014, under contract 13-405 (2014).

(ii) ARB arbitrarily relied on the Rocke study to select a range of YPE values and a mid-point that were significantly lower than what the EWG recommended.

LCFS TF2-38 (cont. on pp 4 -6)

(iii) The Rocke study critically evaluated another study, the Perez study that derived a price yield value of 0.29, which supports the EWG recommendation to ARB.

LCFS TF2-39 (cont. on pp 6-7)

(iv) The Rocke study used only part of the Perez data to attempt to duplicate Perez's results. Since the Perez results were not duplicated by Rocke's analysis of the Perez data, Rocke assumed that Perez's results were inappropriately determined. Rocke's analysis constitutes bad modeling practice, is inconsistent with ARB's modeling methodologies used in connection with other regulations, and is unsupported by the evidence in the Perez study.

LCFS TF2-40 (cont. on pp 7-8)

(v) Emissions associated with indirect land use change for biofuels are significantly greater (i.e., 15% higher for corn ethanol) with a central YPE value that ARB chose of 0.185 than with the 0.25 that EWG recommended.

LCFS TF2-41 (cont. on pp 9-11)

Each of these aspects is discussed further below. As an initial matter, however, it is important to be clear that the time allowed for comment on the new material placed in the docket is not sufficient to prepare all the analysis that could and should be possible in a regular 30- or 45-day comment period. For example, now that the limitations of the Rocke study are known, including the fact that Rocke relied on only a very limited set of the Perez data, stakeholders should be permitted time to conduct studies that use the best available scientific data to assess the relationship between price and yield, and to submit a full price-yield analysis to CARB for consideration in the current rulemaking. AIR has done what is possible in the limited time allowed, but does not understand why it has taken until August 2015 to provide materials that were requested in the fall of 2014. AIR's ability to comment has been limited and prejudiced by this delay.

LCFS TF2-42

B. ARB's Elasticity Values Expert Working Group (EWG) <u>Recommended a Mid-Point Value of 0.25, not 0.185</u>

10. The EWG's summary recommendation on price-yield is as follows:

> It is not clear if GTAP can assign different elasticities to different crops in different countries. If not then if the long-run price-yield elasticity not accounting for double-cropping is set at 0.175, and if South America and the United States are the countries that contribute the most incremental commodity production in response to higher prices, *then a mid-point value of 0.25 for the price-yield*

LCFS TF2-37 continued

elasticity seems reasonable (emphasis added). If differentiation can occur by country, then setting the price-yield elasticity to 0.175 for countries with no double cropping, 0.25 for the U.S. and 0.30 for Brazil and Argentina will provide a more reasonable approximation to reality."[5]

LCFS TF2-37 continued

When ARB varied price-yield, they did this variation for all countries simultaneously, (i.e., they did not utilize separate values for the US and Brazil/Argentina). Thus, the EWG recommendation is clear – the central, or average value used in land use modeling, if regional-specific values are not used, should be 0.25.[6]

C. ARB Arbitrarily Relied on the Rocke Study to Select a Range of YPE Values and a Mid-Point that Were Significantly Lower Than What the EWG Recommended

LCFS TF2-38 continued

11. ARB's Attachment 1 to Appendix I contains a discussion of the EWG recommendations, the Rocke report, and other recent YPE research. ARB summarizes the recent research in the table below, which is taken directly from Attachment 1 of Appendix I of the ISOR.

[5] *Final Recommendations from the Elasticity Values Subgroup*, ARB LCFs Expert Workgroup, http://www.arb.ca.gov/fuels/lcfs/workgroups/ewg/010511-final-rpt-elasticity.pdf

[6] In Attachment 1 to Appendix I of the ISOR, ARB quotes the EWG report statement "perhaps a reasonable increment to the short-run elasticity to account for long-run response is 0.05, which brings the average value between 0.10 to 0.25." This seems to support the ARB-selected central value of 0.185. However, the quote is followed by a paragraph where the EWG discusses the impacts of double-cropping on its YPE recommendation. Thus, the range of "between 0.10 to 0.25" was not the EWG's final recommendation on YPE, as the final recommendation is given two paragraphs later. Additionally, the GTAP model ARB used to model land use emissions is capable of having separate price-yield elasticities by region, so ARB could have adopted the EWG recommendation to utilize 0.25 for the US, 0.30 for Brazil/Argentina, and 0.175 for all other countries.

Table 1-2. Updated Literature Estimates of YPEs				
Authors	Period	Elasticity	Crop	Data, Method
Huang and Khanna	1977-2007	0.15	U.S. corn, soybean, wheat	County level data, instrumental variable (IV)
Smith and Sumner	1961-2005	Negative and Significant	U.S. corn	County level data, ordinary least squares (OLS)
Berry and Schlenker	1961-2009	0.1, Net	U.S. corn	Country level data, instrumental variable
Goodwin, et al	1996-2010	0.01 short run, 0.19-0.27 long run	Iowa, Illinois, Indiana Corn	Ordinary least squares
Perez	1960-2004	0.29	Iowa corn and soybeans	Duality-Bayesian

12. The first three studies appear to support low YPEs. The last two studies support the EWG recommendation of a central value of 0.25. With regard to the Smith and Sumner study, ARB notes that it is "a work in progress."[7] It is also worth noting that none of these studies evaluate double-cropping. Double- or multiple-cropping, is the common practice of planting more than one crop on the same land in the same year. Researchers use higher values of YPE to simulate double- or multiple-cropping.

LCFS TF2-38 continued

13. ARB contracted with Rocke to evaluate the last three studies (Berry and Schlenker, Goodwin, and Perez). ARB summarized Rocke's conclusions:

> David (Rocke) reviewed analysis (and data where available) for Goodwin et al, Perez, and Berry and Schlenker and additional studies, and concluded that based on methodologically sound analyses, yield price elasticities are generally small to zero.[8]

14. ARB's conclusion in Attachment 1 to Appendix I is as follows:

> Taking all these (issues) into consideration, and with a wide range of likely values for YPE from published literature, staff used a range of values between 0.05 and 0.35 to conduct scenario runs for all biofuels studied for the LCFS. These input values are used for all

[7] See footnote 55 of Attachment 1 to Appendix I of the ISOR.

[8] Appendix I to ISOR, Attachment 1-5.

crops and regions for the 30 scenario runs conducted for each of the 6 biofuels.[9]

LCFS TF2-38 continued

15. ARB failed to inform the public that its central or average value was 0.185, or 26% less than the EWG recommendation. ARB clearly relied on the Rocke analysis to select a central value that was less than the EWG recommendation.

D. The Rocke Study Critically Evaluated Another Study, the Perez Study, that Derived a Price Yield Value of 0.29, that Supports the EWG Recommendation to ARB

LCFS TF2-39 continued

16. While Rocke reviewed all three studies, he only obtained and analyzed data from one study – the Perez study.[10]

> The data were used in a 2012 dissertation of Juan Francisco Rosas Perez. In these works, the price elasticity of yield was estimated from data on corn (maize) in Iowa for 1960-2004, and was said to be in the range of 0.29. The data set was publicly available so it was used for a re-analysis. The analysis used by Perez was complex, and can be criticized for insufficiently handling autocorrelation in the series. Therefore, a simpler analysis was conducted that should have similar results to the more complex analysis if the latter is not flawed.[11]

17. Rocke performed time-series regressions of corn supply in a given year by corn price in that year, by corn supply in the previous year, and by corn price in the previous year. Rocke used the log of these variables in his regressions, apparently on the premise that the coefficient for price (either the current year or the previous year) would provide a measure of YPE. Rocke failed to find a relationship between yield and price in either the current or previous year. As noted above, Rocke attributes Perez' finding of a YPE of 0.29 to Perez insufficiently handling autocorrelation. Autocorrelation is the concept of supply in the current year being somewhat dependent on supply in the previous year rather than on other factors such as price.

18. In his final statement in the report for ARB, Rocke states:

> As documented in Berry (2011), Berry and Schlenker (2011) and Roberts and Schlenkler (2013), much of the literature providing purported estimates of the price elasticity of yield is deeply methodologically flawed. In addition to the problems of endogenity and autocorrelation that are badly handled, there are other important issues. In Goodwin et al, for example, 15 years of data are multiplied into 405 datapoints by considering 27 different districts. But there

[9] Attachment 1 to Appendix I, 1-6.

[10] *Essays on the environmental effects of agricultural production*, Juan Francisco Rosas Perez, Iowa State University (2012). Graduate These and Dissertations. Paper 12737. http://lib/dr.iastate.edu.etd.

[11] Rocke, page 5.

> are still only 15 price values and it is hard to believe that the strong relationships of weather, price, and technology within a given year can be handled by econometric tricks. The analyses, such as those by Roberts and Schlenker (2013) that are methodologically sound all show small to zero price elasticities of yield.[12]

LCFS TF2-39 continued

In other words, Rocke dismisses both Goodwin and Perez as methodologically unsound.

19. We repeated Rocke's simplified analysis of the Perez data. We were able to replicate Rocke's results, using two different statistical packages, in order to establish our ability to work with Rocke's methods. We did not have adequate time to replicate Perez's analysis. Fundamentally, price-yield elasticity cannot be properly estimated with ordinary least squares (OLS) regressions of current price, last year's price, the current supply, and last year's supply only (i.e., the Rocke simplified analysis). Such a narrowly focused analysis is unreliable and is an indefensible modeling practice, and it is not a practice that ARB relies on in other analyses it performs.[13] There are too many other factors influencing yield (supply) that should be accounted for in a reliable prediction model.

E. The Rocke Study Only Used Part of the Perez Data to Attempt to Duplicate Perez's Results

LCFS TF2-40 continued

20. In his 2012 dissertation entitled "Essays on the Environmental Effects of Agricultural Production," Juan Francisco Rosas Perez describes his complex, multi-faceted agricultural prediction system. The mechanics, mathematical, and statistical components of this system cannot be fully addressed in this report, given the limited time since its relevance to the Rocke work and the relevant content of the dissertation have become available and known. Nevertheless, in brief: Perez's model is designed to estimate the impact on supply (and under his assumptions the underlying yield) in relation to a wide range of related parameters. The estimated yields can be determined for corn, soybeans, other crops, and livestock products.

21. The related parameters used by the Perez model are divided into two categories, "inputs," which are usually more time dependent and variable, and so-called "netputs," which are usually more stable. The inputs category includes the quantities and prices for fertilizer, hired labor, and intermediates. The broad intermediate parameters cover seeds, pesticides, energy (petroleum fuels, natural gas, and electricity), and other

[12] Rocke, page 6.

[13] ARB's Predictive Model for gasoline is a good example of the modeling practices that ARB relies on (see www.arb.ca.gov/fuels/gasoline/premodel/premodel.htm.) The Predictive Model estimates emissions from cars and trucks in response to a number of gasoline inputs, including sulfur, benzene, T50, T90, aromatics, olefins, volatility, and total oxygen. All of these inputs are recognized to influence vehicle emissions to varying degrees. If ARB were to analyze the emissions data focusing on only one of these fuel parameters at a time, it would likely find certain fuel parameters to be statistically insignificant. ARB did not do that; it analyzed all of the input parameters that affect emissions simultaneously in creating the Predictive Model. Similarly, ARB should, in determining the impact of price on yield, not rely on analyses that examine only price impacts on yield, but rely on studies that attempt to model as many factors as possible on crop yields.

purchased intermediate inputs (contract labor services, custom machine services, machine and building maintenance and repairs, and irrigation). The "netputs" category includes agricultural capital, Conservation Reserve Program (CRP) land, family labor, farmland, and farm related output. In his analysis, Perez obtained data from 1960-2004 and transformed it to fulfill the requirements of his model.

LCFS TF2-40
continued

22. The results of Perez's model are summarized in the table below, which was taken directly from his report. As can be seen, the elasticity of corn yield to corn price ranges from 0.14 to 0.53, with a median of 0.29.

Table 9. Corn yield elasticities with respect to selected prices and quantities.

	Lower bound	Median	Upper bound
Elasticity of corn yields with respect to:			
Corn price	0.14	0.29	0.53
Hired Labor price	-0.29	-0.12	0.01
Intermediate Inputs price	-0.43	-0.15	-0.01
Fertilizer price	-1.09	-0.17	0.04
Hired Labor quantity	0.000	0.190	0.461
Intermediate Inputs quantity	0.412	0.420	0.429
Fertilizer quantity	0.413	0.422	0.431

Note: Lower and upper bounds represent extremes of the 95% highest probability interval of the marginal posterior density function of each elasticity.

23. Clearly the Perez analysis takes into account many more factors affecting yield than Rocke's simple analysis of only a small part of the Perez data. The fact that Rocke's simple analysis using incomplete data failed to confirm the Perez results does not negate the Perez results. The Perez results also fall in line with the Goodwin et al results. Goodwin et al performed a detailed analysis similar to Perez, where many factors affecting yield were included in the prediction model.

24. Regarding Rocke's criticism of Perez insufficiently handling autocorrelation, Perez does address this issue in the dissertation:

> We assume there is no autocorrelation within equations, but that there is a contemporary correlation among the equation errors. The assumption of autocorrelation absence arises from the fact that, prior to the estimation, we take pseudo-differences of the time-series to remove serial autocorrelation found in the time series.[14]

[14] Perez, page 100.

Either Rocke failed to read this part of the dissertation, or he did read it and disagreed with how Perez handled autocorrelation. In either case, Rocke does not explain in his report for ARB what is wrong with how Perez handled autocorrelation.

LCFS TF2-40 continued

25. Rocke's simple analysis, using only some of the Perez data, is not supported by the evidence, and does not negate the Perez results. ARB's reliance on Rocke's evaluation of the Perez data in selecting price yield values is misplaced. If CARB does not agree with our position on Rocke's analysis, it should explain why, in full detail, and provide us and other stakeholders an adequate opportunity to respond before taking final action on the LCFS regulatory proposal. In particular, CARB should address the following issues:

- Whether ARB believes Rocke's very limited analysis of price and supply data alone constitutes an adequate analysis of the Perez data, when ARB's own methods of analyzing data are much more robust that Rocke's;
- Why ARB deviated from the EWG recommendation of 0.25 for a central value or average value for YPE; and
- What exactly was wrong with how Perez handled autocorrelation in his analysis.

F. LUC Emissions For Biofuels Are Significantly Greater With a Central YPE Value of 0.185, as Opposed to the 0.25 Recommended By the EWG

26. Emissions attributed to LUC for biofuels are significantly higher, and will be overestimated, with a YPE value of 0.185 than with 0.25.

LCFS TF2-41 continued

27. AIR has run the GTAP model that ARB uses to estimate land use change emissions for various biofuels. We were able to replicate many of ARB's land use emission outputs, in order to establish our ability to work with ARB's model.

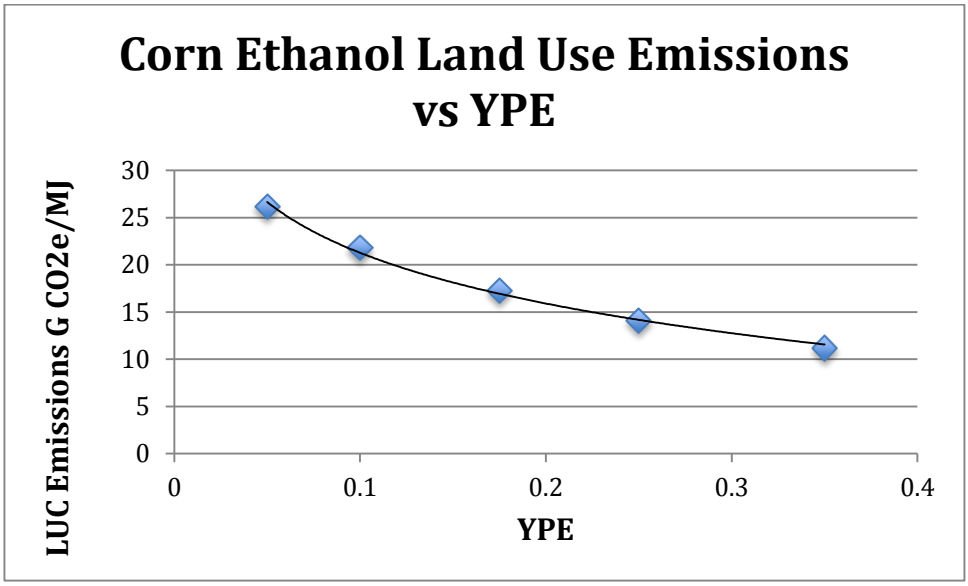
28. ARB ran 30 different GTAP scenarios for each biofuel to estimate LUC emissions. The LUC emissions were estimated as the average of the 30 unique scenarios. For corn ethanol, ARB's average of the 30 scenarios is 19.8 gCO2/MJ of ethanol. In each of these scenarios, ARB varied several input elasticities, including the price-yield elasticity and two other elasticities. As indicated earlier, there are five input price-yield elasticities, and the average of these is 0.185, which is lower than the central value of 0.25 recommenced by the EWG. To do this correctly, one would have to select five price-yield elasticities whose average is 0.25. One possibility—and one that CARB should either use, or justify not using—would be to select the following elasticities: 0.15, 0.20, 0.25, 0.30, and 0.35.[15] These would be used in place of the current price-yield elasticities, and the input elasticities of the other two inputs would remain the same. The 30 scenarios should

[15] There are many other price-yield elasticities that would average 0.25; this is only one example.

then be re-run and new average emissions would be estimated from the new GTAP runs. This average value would then be compared to the 19.8 gCO_2/MJ.

29. To illustrate the impact of the price-yield parameter on corn ethanol land use emissions, we provide a chart below which uses ARB's estimate of corn ethanol land use emissions at the five different YPE values. This chart uses scenarios 2, 4, 6, 8, and 10 in ARB's Table I-4. The other elasticities were held constant in these scenarios; only YPE was altered.

LCFS TF2-41
continued



30. The chart shows the high degree of sensitivity of land use emissions for corn ethanol to this input parameter. Small changes in the range and average of YPE values chosen for this analysis are important in estimating land use emissions from biofuels.

31. The time allowed for comments on the Rocke report did not allow running 30 new scenarios. Instead, we ran just two scenarios; one using the ARB average inputs, and a second one using 0.25 for price-yield and the average inputs for the other two elasticities. These two scenarios are shown in Table 1. Given the time constraints, we assume that the difference in these two scenarios will approximate the difference between the two averages of 30 scenarios. The actual differences could be either greater or lesser than estimated here.

LCFS TF2-41
continued

Table 1. Scenarios Used to Estimate Impact of Difference Between EWG Recommendation and ARB Price-Yield				
Scenario	Price-Yield	PAEL	ETA	Irrigation Constraint
1 – EWG price yield, ARB average for all other	0.25	0.3/0.15	Baseline	On
2 – ARB average	0.185	0.3/0.15	Baseline	On

PAEL = yield elasticity target for cropland/pasture
ETA = elasticity of effective area with respect to harvested area

32. The land use emissions we obtained for these two scenarios are shown in Table 2. We have used ARB's latest AEZ-EF model with GTAP to estimate emissions for these two scenarios. The corn ethanol LUC emissions difference is 2.5 g CO_2/MJ. Therefore, we would expect that if the 30 scenarios were actually run for both cases, the difference in the averages of the 30 scenarios would be close to 2.5 g/MJ; however, it could be higher because Scenario 2, which represents average ARB inputs, is 17.14 gCO_2e/MJ, and the average of the 30 scenarios for corn ethanol is higher at 19.8 gCO_2e/MJ.

Table 2. Corn Ethanol LUC Emissions (gCO2e/MJ)	
Scenario	LUC Emissions
1 – EWG	14.64
2-ARB	17.14
Difference (2-1)	2.50 (15%)

ARB's corn ethanol land use value is 19.8 gCO_2e/MJ. If the emissions of the 30 scenarios run with new YPE values with an average of 0.25 are 2.5 gCO_2/MJ lower, then the new corn ethanol land use value would be 17.3 gCO_2e/MJ.

33. There would be corresponding changes in all biofuels if ARB adopted the EWG central value of 0.25 for price-yield. In addition, the baseline carbon intensities for 2016-2020 would also change, as well as the annual targets, because 10% corn ethanol is included in the baseline 2016-2020 values.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed this 17th day of August, 2015 in Holland, Michigan.

Thomas L. Darlington

Exhibit A to Declaration of Thomas L. Darlington

Thomas L. Darlington
President, Air Improvement Resource Inc.

Profile

Thomas L. Darlington is President of Air Improvement Resource, a company formed in 1994 specializing in mobile source emission modeling. He is an internationally recognized expert in mobile source emissions modeling, lifecycle analysis, and land use modeling.

Professional Experience

1994-Present	President, Air Improvement Resource
1993-1994	Director, Mobile Source Programs, Systems Application International
1989-1994	Senior Engineer, General Motors Corporation, Environmental Activities
1988-1989	Senior Project Engineer, Detroit Diesel Corporation
1979-1988	Project Manager, U.S. EPA, Ann Arbor, Michigan

Recent Major Projects

- Developed Life Cycle reports and complete applications for 8 plants for the California Low Carbon Fuel Standard; six are currently registered, two plants are pending. Five plants were corn ethanol plants, one is sorghum and two are cellulose.
- Participated in and provided written comments on ARB's three 2014 iLUC workshops
- With Purdue and Don O'Connor, conducted study of iLUC emissions of rapeseed and other oilseeds in 2013 utilizing an updated version of GTAP
- Reviewed EPA's palm oil iLUC emissions in 2013
- Submitted comments on ARB's new GREET2.0 model
- Reviewed CARB's land use emissions for soybean biodiesel
- Reviewed the land use impacts of the RFS2 from EPA, including the notice of Proposed Rule, Regulatory Impact Analysis, and approximately one hundred documents in the rulemaking docket.
- Completed a land use study for Renewable Fuels Association and reviewed California Air Resource Board's Initial Statement of Reasons for the Low Carbon Fuel Standard
- Represented three stakeholders in the recent development of the ARB Predictive Model for reformulated gasoline in California (Alliance of Automobile Manufacturers, Renewable Fuels Association and Western States Petroleum Association)
- Represented two stakeholders in EPA's development of the MOVES on-highway emissions model (Alliance of Automobile Manufacturers and Engine Manufacturers Association)

- Developed the effects of ethanol permeation on on-highway and off-highway mobile sources in California and other states for the American Petroleum Institute
- Studied gasoline and diesel fuel options for Southeast Michigan (for SEMCOG, API and Alliance of Automobile Manufacturers)

Recent Publications

"Study of Transportation Fuel Life Cycle Analysis: Review of Economic Models Use to Assess Land Use Effects", CRC-E-88-3, July 2014.

"Land Use Change Greenhouse Gas Emissions of European Biofuel Policies Utilizing the Global Trade Analysis Project Model", Darlington, Kahlbaum, O'Connor, and Mueller, August 30, 2013.

"A Comparison of Corn Ethanol Lifecycle Analyses: California Low Carbon Fuels Standard (LCFS) Versus Renewable Fuels Standard (RFS2)", June 14, 2010. Renewable Fuels Association and Nebraska Corn Board. This study compared and contrasted the corn ethanol lifecycle analyses performed by both CARB (as a part of the LCFS) and the EPA (as a part of RFS2).

"Review of EPA's RFS2 Lifecycle Emissions Analysis for Corn Ethanol", September 25, 2009. Conducted for Renewable Fuels Association. This study reviewed EPA's land use GHG emissions assessment for corn ethanol, including the FASOM and FAPRI models and Winrock land-use types converted and emission factors by ecosystem type. The study made many recommendations for improving the land-use and emissions modeling.

"Review of CARB's Low Carbon Fuel Standard Proposal", April 15, 2009. Conducted for Renewable Fuels Association. This study reviewed CARB's analysis of land use emissions using GTAP6 and CARB's overall lifecycle emissions for corn ethanol. This study made many recommendations for improving the land use and lifecycle emissions of corn ethanol.

"Emission Benefits of a National Clean Gasoline", August 2008. Conducted for the Alliance of Automobile Manufacturers. This study evaluated the nationwide criteria pollutant emission reductions of a national clean gasoline standard.

"Land Use Effects of Corn-Based Ethanol", February 25, 2009. Conducted for Renewable Fuels Association. This study evaluates possible land use changes and GHG emissions associated with these land use changes as a result of the renewable fuel standard mandated 15 billion gallons of corn ethanol required by calendar year 2015. The study utilized projections of land use in the US and rest of world performed by Informa Economics, LLC, as well as newer estimates of the land use credits of co-products produced by ethanol plants to evaluate possible land use changes.

"On-Road NOx Emission Rates From 1994-2003 Heavy-Duty Trucks", SAE2008-01-1299, conducted for the Engine Manufacturers Association. This study examined

manufacturers consent decree emissions data to determine on-road NOx emission rates, and deterioration in emissions from heavy-duty vehicles. (Peer reviewed publication)

"Evaluation of California Greenhouse Gas Standards and Federal Energy Independence and Security Act - Part 2: CO2 and GHG Impacts", SAE2008-01-1853, conducted for the Alliance of Automobile Manufacturers. This paper evaluated the comparison of greenhouse gases from cars and light trucks in the US under both the Federal and California GHG policies. (Peer reviewed publication)

"Effectiveness of the California Light Duty Vehicle Regulations as Compared to Federal Regulations", June 15, 2007. Conducted with NERA Economic Consulting and Sierra Research for The Alliance of Automobile Manufacturers. This study compares the emission benefits of the California and Federal light duty vehicle regulations for HC, CO, NOx, PM, SOx, and Toxics taking into account the difference in emission standards, new vehicle costs and its effect on fleet turnover, new vehicle fuel economy and its effect on vehicle miles traveled, and other factors. Both the EPA MOBILE6 and ARB EMFAC on-road emissions models were used to estimate changes in emissions inventories.

"The Case for a Dual Tech 4 Model Within the California Predictive Model", May 20, 2007. Conducted with ICF International and Transportation Fuels Consulting for the Renewable Fuels Association (RFA). This study developed separate emissions vs fuel property models for lower and higher Tech 4 (1986-1995) vehicles, and showed that utilizing this alternative Predictive Model would result in a higher compliance margin for fuels containing higher volumes of ethanol. It was thought that this could lead to higher ethanol concentrations in the state, but even if the dual model is not used, it is a better representation of the 2015 inventory than the ARB single model.

"Updated Final Report, Effects of Gasoline Ethanol Blends on Permeation Emissions Contribution to VOC Inventory From On-Road and Off-Road Sources, Inclusion of E-65 Phase 3 Data and Other Updates", June 20, 2007. Conducted for the American Petroleum Institute. This report updates the earlier March 3, 2005 report for API utilizing data collected by CRC and others since of the time of the earlier report.

Final Report, Development of Technical Information for a Regional Fuels Strategy, February 28, 2006. Conducted for the Lake Air Directors Consortium (LADCO). This report provided guidance to the LADCO states (Midwestern states) concerning how to model different types of fuel control programs (in particular) using EPA mobile source models, and how to set up the baseline input files so that results are consistent between the different states.

"Emission Reductions from Changes to Gasoline and Diesel Specifications and Diesel Engine Retrofits in the Southeast Michigan Area", February 23, 2005. Conducted for the Southeast Michigan Council of Governments (SEMCOG), the Alliance of Automobile Manufacturers, and the American Petroleum Institute. This study examined the on-road and off-road emission benefits of many different possible gasoline and diesel fuel

specifications that the state could adopt to help meet the 8-hour ozone standards. This study formed the basis for the state's move to lower RVP summer gasoline.

"Examination of Temperature and RVP Effects on CO Emissions in EPA's Certification Database, Final Report", CRC Project No. E-74a, April 11, 2005. Conducted for the Coordinating Research Council. This study compared CO vs temperature results from the MOBILE6 model to the certification data, and recommended further testing, which is being conducted by the CRC at this time.

"Effects of Gasoline Ethanol Blends on Permeation Emissions Contribution to VOC Inventory From On-Road and Off-Road Sources" March 3, 2005. Conducted for the American Petroleum Institute (API). Using data from the CRC-E-65 program, and data collected by the California EPA and Federal EPA, this study estimated the impacts of ethanol use on increasing permeation VOC emissions from on-road vehicles, off-road equipment and vehicles, and from portable containers. Emission inventory estimates were made for a number of geographical areas including the state of California, and results showed that the permeation effect increases anthropogenic VOC inventories by 2-4%.

Review of EPA Report "A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions", February 11, 2003. Conducted for the American Petroleum Institute. This study critically examined the methods that EPA used to develop the impacts of biodiesel fuels on HC, CO, NOx, and PM emissions.

"Well-To Wheels Analysis of Advanced Fuel/Vehicle Systems – A North American Study of Energy Use, Greenhouse Gas Emissions, and Criteria Pollutant Emissions", May 2005. Conducted for General Motors Corporation, with Argonne National Labs. This study examined many different well to wheels pathways for various fuels, and their impacts on GHG and criteria pollutant emissions.

"Potential Delaware Air Emission Impacts of Switching From MTBE to Ethanol in the Reformulated Gasoline Program", May 26, 2005. Conducted for Lyondell Chemical Company. This study examined the HC, CO, and NOx impacts of switching from MTBE to ethanol.

"Potential Massachusetts Air Emission Impacts of Switching From MTBE to Ethanol in the Reformulated Gasoline Program" June 17, 2005. Conducted for Lyondell Chemical Company. This study is similar to the Delaware study above.

"Potential Maryland Air Emission Impacts of a Ban on MTBE in the Reformulated Gasoline Program", October 18, 2005. Conducted for Lyondell Chemical Company. This study is similar to the Delaware study above.

"MOBILE6.2C with Ethanol Permeation and Ethanol NOx Effects", February 8, 2005. Conducted for Health Canada. This study modified the MOBILE6.2C model for ethanol permeation VOC and ethanol NOx effects.

Education

B. Sc., (Materials and Metallurgical Engineering), University of Michigan, Ann Arbor, 1979
Post Graduate Courses (Business Administration), University of Michigan, Ann Arbor, 1982

Comment Letter 2_TF_LCFS_GE Responses

LCFS TF2-5

The comment argues that ARB has failed to meet disclosure requirements with respect to natural gas (NG) fuel forecasts, has failed to project the number of NG vehicles and has failed to identify the basis for the fuel estimate it used. This comment is not directed to any change in the 3rd 15-day notice, and as such needs no response. However, for clarity purposes ARB staff disagrees that the analysis of future NG demand was flawed because ARB staff made no detailed estimate of the number of natural gas vehicles (NGVs). First, we note that the proposed regulation neither requires nor is predicated on a given number of NGVs or the use of a given volume of natural gas for transportation.

Secondly, Appendix B of the ISOR contains explicit discussion of how ARB considered estimates of the potential for growth in the use of NG as a fuel independent of any requirement of the LCFS (See pages B-24 to B-26 and B-35). A number of NG growth estimates were available to the ARB as the ISOR was being developed. These included estimates by the California Energy Commission, ICF consulting, the Boston Consulting Group, and the EIA. Each is referenced in the ISOR and was publically available at the time the ISOR was released. These references projected substantial growth in NG use, thus providing ARB staff with the information needed to include NG as a fuel used to comply with the LCFS. These sources explicitly estimated the potential growth of NG use, thus eliminating the need to estimate the numbers of vehicles needed associated with the increase use of the NG.

LCFS TF2-8

The comment suggests that in the event that biodiesel fueled heavy-duty vehicles are used in place of those fueled by natural gas, it may lead to increases in NOx emissions.

The proposed ADF Regulation is designed to reduce NO_X emissions from biodiesel, over time. If more biodiesel were to be used in place of natural gas- or any other fuel- it would be subject to the provisions of the ADF regulation which is designed to mitigate NOx increases from biodiesel. For more information on NOx emissions from biodiesel please see response to comment **ADF 17-4** which also contains a reference to comment **ADF 17-3**.

LCFS TF2-9

The comment states that there is no evidence to suggest that substantial increases in heavy-duty gas vehicles are reasonably foreseeable. Appendix B of the ISOR contains explicit discussion of how ARB considered estimates of the potential for growth in the

use of NG as a fuel independent of any requirement of the LCFS (See pages B-24 to B-26 and B-35). For the reasons described above in responses to comment **LCFS TF2-5** and **LCFS TF2-8**, substantial evidence was provided in support of this assumption used throughout the EIR. No revisions are necessary.

LCFS TF2-11 This comment argues that ARB has failed to provide an environmental impact analysis with respect to NG vehicles.

This comment is not directed to any change in the 3rd 15-day notice, and as such requires no response. Nonetheless, ARB staff note that the ISOR is explicit that the LCFS is unlikely to impact, in any notable way, the amount of NG that is consumed by vehicles (ISOR Appendix B pages B-27-28). Consequently, there is no reason to expand the environmental impact assessment relative to the number of NG vehicles.

Furthermore, the EA considers what is reasonably foreseeable. As stated on page 31 of the EA:

> Actual compliance responses under the proposed LCFS and ADF regulations may vary from those set forth here because the LCFS is a market-based program and as such, fuel producers and suppliers would ultimately determine how the required reduction in CI is achieved. While innumerable variations in these compliance responses could be posited as possible outcomes of the proposed LCFS regulation, those variations are considered by ARB to be largely speculative. The compliance responses described here are based on a reasonable range of assumptions and therefore provide a sound basis for evaluating the proposed action's reasonably foreseeable environmental impacts.

These assumptions are consistent with standards of adequacy described in CEQA Guidelines (i.e., CEQA Guidelines Section 15151). That is, the EA provided a good-faith effort at disclosure that provides decision-makers with information related to the environmental consequences of the proposed regulation. This analysis provides enough relevant information and reasonable inferences such that fair arguments support the conclusions presented throughout the EA (CEQA Guidelines Section 15384[a]). Information associated with the compliance scenarios and environmental analysis includes facts, reasonable assumptions predicated upon facts, and expert opinion support by facts be used

to discuss environmental effects (CEQA Guidelines Section 15384[b]).

Please see responses to comment **TF2-24**, **TF2-25**, and **TF2-29** in regards to the referenced attachment to the comment letter.

LCFS TF2-12 This comment states that ARB has failed to evaluate how a lower level of NG use might affect the availability of LCFS credits.

This comment is not directed to any change in the 3rd 15-day notice, and as such needs no response. However, for clarity purposes ARB staff note that the illustrative compliance scenario provides one possible mix of fuels that would enable compliance with the LCFS targets through 2020. The LCFS provides great flexibility to use different mixes of fuels to produce the needed credits.

Appendix B of the ISOR describes the development of the illustrative compliance scenario used to evaluate the environmental effects of the proposed regulation. This provides a thorough discussion of assumptions used to determine the feasibility of complying with an LCFS CI reduction goal of ten percent by 2020. Projections for NG use are described, beginning on page B-24 of Appendix B of the ISOR. This discussion is re-produced as follows:

> For natural gas, staff looked at a transportation demand in California rather than fuel availability. The availability of natural gas for fuel consumption is not in question because of the abundance of natural gas. The question is how much natural gas will be used by the transportation sector. To answer that question, staff looked at several reports that projected natural gas use in the transportation sector. … . Staff also solicited and received natural gas projections from the California Natural Gas Vehicle Coalition. The range of projections through 2020 from the studies was between approximately 600 million DGE to about 1.2 billion gallons of DGE. Recent data showed a slightly more conservative trend, so staff took a conservative approach and used the high estimate at 900 million DGE, the medium case at approximately 600 million DGE, and the low case at approximately 300 million DGE in 2020.

Because this provides substantial evidence to support projections and assumptions used to evaluate environmental effects associated with the Proposed Regulation, NG discussion are

adequate. Please see response to comment **LCFS TF2-11** for a discussion related to standards of adequacy under CEQA.

LCFS TF2-19

The comment states that iLUC is generally unsound, that the CI of corn ethanol is too high, and the LCFS regulation will create incorrect "market signals" contrary to the intended program goals. The commenter states that ARB should either adopt the 0.25 recommended by the EWG or start the rulemaking over with a new 45-day notice and ISOR explaining why 0.25 was not used.

ARB has outlined the approach used in the iLUC analysis in Appendix I of the ISOR. The rationale for using a range of Yield Price Elasticity (YPE) values between 0.05 and 0.35 is also provided in the same Appendix. A Peer Review of the iLUC analysis in April 2015 concluded that the approach used by ARB in the proposed iLUC analysis is scientifically sound. ARB therefore, does not foresee the need to undertake a new rulemaking process as stated by the commenter. See response to **LCFS 8-9**.

As for regionalized values for YPE, in Attachment 1 of Appendix I of the ISOR, ARB clearly stated "However, there are currently no data available to estimate YPE by crop and by region. Hence it is not possible to use regional and crop-specific YPE in the GTAP-BIO model at the present time." ARB therefore, did not utilize regionalized YPEs for the current analysis.

The fact that the commenter does not agree with ARB's approach or that one commenter claims that the approach is not supported does not require ARB to start the rulemaking process over. Likewise, a request to start the process over does not bind the agency to stop a rulemaking. ARB declines the invitation

LCFS TF2-23

The commenter believes that the 15-day public comment period was inadequate, thus ARB should re-start the entire rulemaking process based on the addition of a handful of technical documents that the commenter itself requested.

ARB disagrees. ARB complied with all requirements of the APA, and ARB's decision to provide materials not covered by the APA's rulemaking file provisions does not indicate otherwise. ARB staff also disagrees with the commenter's characterization of the relevant documents as "extensive new information regarding CARB's analyses." As the commenter indicates, some of the data pertained to "the Rocke analysis," not ARB's analysis, and the other document contained some background information (the relevant

portions of which were provided in the ISOR's Appendix B and none of which represents a new analyses or alters the proposed regulation in any way).

ARB staff also disagree with the commenter's characterization of ARB's actions related to the commenter's Public Records Act as "dilatory" and notes that the court also expressly rejected this characterization in the only ruling (a tentative one) that has been issued in the relevant litigation. In addition, the commenter's opinions concerning ongoing litigation are not directed to any change in the 3rd 15-day notice, and as such need no response.

LCFS TF2-29 The comment speculates that new compliance scenarios relying on the increased use of biodiesel might be developed, which may lead to increases in NOx emissions. The comment also suggests that ARB staff's assessment relies on unsupported speculation regarding economics and heavy-duty natural gas vehicles.

See response to comment **LCFS TF2-8**, which contains references to comments **ADF 17-4** and **ADF 17-3**. Please also see response to comment **LCFS T2-26**.

LCFS TF2-30 The comment provides introductory comments associated with concerns related to ARB's assumptions regarding natural gas use in heavy-duty vehicles. See responses to comments **LCFS TF2-5, LCFS TF2-9, LCFS TF2-11 and LCFS TF2-12.**

LCFS TF2-36 The comment, in the form of an "Exhibit C", seeks to support and present the concerns related to credit generation from NG fuel forecasts used in the illustrative compliance scenario previously expressed in comment **LCFS TF2-12.**

This comment is not directed to any change in the 3rd 15-day notice, and as such needs no response. However for clarity purposes we have addressed related concerns about credit generation in the response to **LCFS TF2-12.**

This page intentionally left blank.

Comment letter code: 5_OP_ADF_POET2013

Commenter: Brian Guarraci

Affiliation: POET LLC

The following letter was submitted to the ADF Docket during the 45-day comment period.

This page intentionally left blank.

5_OP_ADF
_POET2013

POET
HUMAN + NATURE
P / 605 965 2200 4615 N. LEWIS AVE. SIOUX FALLS, SD 57104 POET.COM

December 11, 2013

By Electronic Mail

Clerk of the Board
California Air Resources Board
1001 I Street
Sacramento, California 95812

Re: Proposed Regulation for Commercialization of Alternative Diesel Fuels

Dear Madam:

On behalf of POET, LLC ("POET"), I write to endorse the Comments being submitted today by Growth Energy on the proposed regulatory action concerning alternative diesel fuels to be considered at the Board's two-day hearing this week. POET is a member of Growth Energy and agrees with Growth Energy that the CARB staff's proposal requires significant, but feasible, revisions. POET is a strong supporter of biodiesel fuels as part of a national strategy to achieve energy independence and sustainable transportation fuels. The key point in Growth Energy's comments is that simple changes are needed in the proposed regulation to protect against unintended increases in smog-forming emissions. As one of the Nation's leading suppliers of ethanol, POET seeks only to ensure that all alternative fuels are required to appropriately mitigate any increases in emissions of any pollutant with adverse health effects associated with the use of those fuels.

Three points in the Growth Energy comments warrant emphasis.

First, the available data demonstrate that, without mitigation, the increased use of biodiesel fuels that will result from implementation of the low-carbon fuel standard ("LCFS") regulation can be expected to increase emissions of oxides of nitrogen ("NOx"). The California Environmental Quality Act ("CEQA") requires mitigation of the risks of increased NOx emissions, in the locations and at the times when those emissions would occur. POET urges the Board to consider carefully its obligations under CEQA, as recently clarified by the Fifth District Court of Appeal in *POET LLC et al. v California Air Resources Board*, (2013) 218 Cal. App. 4th 681. ADF 5-1

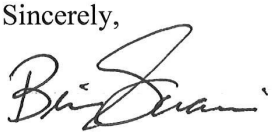
Second, POET shares Growth Energy's concern that the Board not adjourn the important task of assessing the environmental aspects of the proposed regulation to a *post hoc* process, after the Board has committed itself to the proposed ADF regulation. The Court of Appeal has addressed the relevant requirements of CEQA and CARB's implementing regulations in its recent decision. *See* 218 Cal. App. 4th at 719-32. ADF 5-2

Finally, like Growth Energy, POET is skeptical that all required materials have been placed in the "rulemaking file" for this proposed regulatory action. *See* Growth Energy Comments at 5, 14-15. POET is particularly concerned by the absence of complete data from testing conducted on CARB's behalf to characterize NOx emissions when engines are operated on biodiesel, as described in a report by Mr. Robert Crawford, which is included in Growth Energy's Comments. CARB must ensure that the rulemaking file is complete and must allow the public adequate opportunity to study and comment on all relevant data. As Growth Energy explains in its Comments, the California Administrative Procedure Act would not permit the Board to take further action on this regulatory item until the defects in the rulemaking file have been addressed.

ADF 5-3

Thank you for considering our Comments and those of Growth Energy, as well as other stakeholders in this important rulemaking effort.

Sincerely,



Brian Guarraci
Senior Counsel
POET, LLC

Comment Letter 5_OP_ADF_POET2013 Responses

ADF 5-2 The comment questions whether ARB is adjourning the important task of assessing the environmental aspects of the ADF Regulation to a post hoc process. ARB disagrees. The environmental impacts of the proposed regulation, including the three-stage introduction of future alternative fuels, were considered as part of the environmental analysis of the ADF Regulation and the multimedia evaluation of biodiesel. Furthermore, the ADF approval process set forth in the proposed regulation includes rigorous evaluations of each new fuel as it introduced and data on it is collected. ARB Staff will continue to ensure that new ADFs are subject to the emissions analysis and multimedia evaluation required under the three-stage process of the proposed ADF Regulation. This three-stage process constitutes an extensive evaluation of a candidate fuel, which would need to be completed before it may become commercialized. Each stage limits the quantity of fuel that may be used and is subject to the standard that it must not result in greater adverse effects on public health or the environment compared to diesel.

This page intentionally left blank.

Comment letter code: 7_OP_ADF_CRE

Commenter: Harry Simpson

Affiliation: Crimson Resources

The following letter was submitted to the ADF Docket during the 45-day comment period.

This page intentionally left blank.

7_OP_ADF _CRE

7_OP_LCFS _CRE

CRIMSON RENEWABLE ENERGY, LP

17731 Millux Road
Bakersfield, CA 93311
Tel: (661) 617-8610
Fax: (720) 475-5399

February 13, 2014

Chairwoman Mary Nichols
California Air Resources Board
1001 I Street
Sacramento, CA 95812

CC: All California Air Resources Board Members

Via online submission at http://arb.ca.gov/lispub/comm/bclist.php.

RE: comments regarding the proposed Alternative Diesel Fuel (ADF) Regulations and the Low Carbon Fuel Standard

Dear Chairwoman Nichols:

As California's largest in-state producer of biodiesel (we utilize used cooking oil and distiller's corn oil to produce an ultra-low carbon alternative diesel fuel with an average quarterly carbon intensity for 2013 and 2014 of 12 to 16.5) , we are naturally very interested in the proposed Alternative Diesel Fuel (ADF) Regulations and the Low Carbon Fuel Standard (LCFS). Any proposed ADF regulations and/or changes to LCFS could have a profound impact on the California biodiesel market and on the ultimate viability of our Bakersfield biodiesel plant. The Crimson team would like to thank members of the ARB staff and Board Members for their hard work on this rulemaking and their ongoing willingness to engage with us and other industry stakeholders. We greatly appreciate the time that ARB staff members have taken and the positive relationships they've encouraged.

Economic Impact

Before getting into our comments on the proposed ADF regulations and the future direction of LCFS, I would like to provide some additional information about our biodiesel production facility in Bakersfield, California. Specifically, I hope this information will provide the Air Resources Board and its affiliated regional air districts a context to better understand the economic impact of proposed ADF regulations and LCFS.

Our biodiesel production facility in Bakersfield currently has 25 full time employees, and an additional 6 long term, full-time contractors. The plant was built in order to serve the market for very low carbon fuels created by the LCFS.s Based on our spending in 2014, our annual direct economic contribution was $40 million, of which approximately 87% was spent within California and significant portion of this was spent in Bakersfield and other parts of the Central Valley. The average annual 2014 compensation per person employed at the plant not including the senior management positions is approximately $64,000. Furthermore, several of our plant employees came to us without the full range of experience that is required and we have invested significantly in their training.

We are also currently in the midst of an expansion project that began in early 2014 and will be completed in summer 2015 entailing a total investment of nearly $10 million. The first phase of this project was completed in May 2014 enabling us to increase our annualized production rate from 9.5 mil gal/yr to 14mil gal/yr. Upon completion, our plant capacity will grow to 22 mil gal/yr. At that point, the plant will make a direct economic contribution of $70 - $90 million per year (depending on raw material prices) with 89-93% of this being spent within California, and 36-38 full time employees and long-term contractors.

Thus we believe that our biodiesel production facility is making a strong and growing economic and job creation contribution locally (which is also considered an economically disadvantaged area) and within California. However, it is important to note that we are but one plant out of 5 current biodiesel producers. The California Energy Commission estimated that in 2014 biodiesel production within California will be approximately 40 million gallons. Based on our Bakersfield plant's spending this year, this would come out to a total direct economic contribution of approximately $122 million in 2014. The CEC has projected in-state biodiesel production to grow to 55 million gallons in 2016, representing an economic contribution of approximately $200 million. These figures deserve serious

ADF 7-1

CRIMSON
RENEWABLE ENERGY, LP

17731 Millux Road
Bakersfield, CA 93311
Tel: (661) 617-8610
Fax: (720) 475-5399

acknowledgement given the fact that the ADF Rulemaking will reduce the market opportunity for biodiesel in California and this would be disproportionately felt by in-state producers such as Crimson, especially given the markedly higher costs of operating in California as compared to elsewhere in the U.S. or internationally. The same is true if the ARB decides to push back the timeline for LCFS carbon reductions.

ADF 7-1 cont.

Emissions / Health Benefits

As we and other stakeholders have pointed out previously to ARB staff, biodiesel is a solution to very specific problems associated with petroleum diesel's emissions profile – namely the well-known toxics, particulates, and carcinogens that are currently causing unacceptable levels of respiratory illness in California, especially in the Central Valley, the areas surrounding the Port of Long Beach and Port of Los Angeles, and especially among California's children and elderly and its economically disadvantaged communities (such communities tend to be concentrated near industrial areas where truck traffic is disproportionately higher than in other communities). Indeed, "Biodiesel's reduction in PM emissions and associated risks" were acknowledged in the ARB staff presentations at previous ADF Rulemaking Workshops and some air districts in California are out of compliance for PM reductions. Besides PM reduction, biodiesel also provides significant reductions in polycyclic aromatic hydrocarbons (PAHs), nitrated PAHs, and the ozone potential of spectated hydrocarbons. According to the Union of Concerned Scientists and the American Lung Association (http://www.ucusa.org/clean_vehicles/trucks_and_buses/page.cfm/pageID=1429), PM and other hydrocarbon emissions within California are responsible for an estimated 3,000 premature deaths , 2,700 cases of bronchitis, and 4,400 hospital admissions, ultimately creating additional healthcare costs totaling $21+billion.

Biodiesel also provides very large reductions in carbon/GHG emissions (85-95% reduction in carbon/GHG for biodiesel made from used cooking oil and distiller's corn oil from ethanol plants) that are critical to meeting LCFS carbon reduction requirements. According to ARB, in Q1/2014 biodiesel provided 18% of all LCFS credits generated.

Thus we strongly urge the ARB to consider the PM, hydrocarbon toxics, and carbon/GHG reductions and associated health benefits when evaluating any ADF regulatory proposal. Additionally, we urge the ARB to consider that the proposed ADF regulations would be in effect during a period when New Technology Diesel Engines (NTDEs, which reduce all tailpipe NOx emissions by 90% regardless of type of fuel) are being phased in due to existing California law.

ADF 7-2

Comments on LCFS Reauthorization and Specific Aspects of the Proposed ADF Regulations

We ask that ARB Members consider the following points as it continues deliberations on LCFS reauthorization and the proposed ADF regulations.

1. LCFS is working as intended – ARB reporting on LCFS credit generation and deficits from 2011 through Q3/2014 shows 9.80 mil MT credits generated and 5.84mil MT in deficits, creating excess credits of 3.96 mil MT. This data is consistent with original ARB staff projections for the rate of credit generation at this point in the program. Clearly the LCFS has created sufficient market signals to attract the necessary volumes of alternative fuels. Our plant in Bakersfield is but one example among many of how LCFS has influenced investment decisions to create alternative fuel production capacity.

LCFS 7-1

2. LCFS carbon reduction timelines – We strongly urge the ARB and its Members to maintain the original LCFS CI reduction at 10% by 2020. We further encourage the ARB to establish stronger compliance curves to continue progress beyond 2020. Maintaining the 10% reduction is 2020 is absolutely critical to send the right market signals to encourage the availability of large volumes of alternative fuels, development of new low carbon fuel technologies, and incentivize significant alternative fuel utilization. Any pushing back of this timeline would send the opposite signal, devalue alt fuel investments made thus far, and discourage future investment. We believe the 10% reduction is fully achievable in 2020. We agree with the findings in the 2/2/15 Promotum report sponsored by the National Resource Defense Council, stating a $100/MT LCFS credit price will incentivize sufficient volumes of alt fuels to be produced and imported into California and reducing CI intensity of petroleum based fuels. Using alternative diesel fuels as a case in point, there is sufficient excess industry-wide production capacity to greatly increase the volumes of biodiesel and renewable diesel

LCFS 7-2

CRIMSON
RENEWABLE ENERGY, LP

17731 Millux Road
Bakersfield, CA 93311
Tel: (661) 617-8610
Fax: (720) 475-5399

imported into California (the National Biodiesel Board reports 2.5 bil gal of current U.S. biodiesel production capacity vs actual 2014 domestic production of 1.6 bil gal). — LCFS 7-2 cont.

3. LCFS Program integrity – In line with creating transparent and predictable market rules, ARB should adopt rule proceedings in the event that fraudulent credit trades or other invalid activities are discovered. We would recommend that ARB carefully consider the experience of the US Environmental Protection Agency in its enforcement of the Renewable Fuel Standard (RFS). Delayed prosecutions and a lack of concern for collateral damage caused to good faith market participants undermined respect for the RFS program and the value of RFS credits. We would encourage ARB to insulate good faith market participants from disproportional impacts and to avoid wholesale invalidation of credits. Due to the complex and novel nature of environmental attribute markets, ARB must invest in sufficient resources and personnel to ensure effective enforcement. — LCFS 7-3

4. Impact of ADF Regulations on California Biodiesel Industry – From a California biodiesel producer's perspective the proposed ADF regulations are not ideal for the simple fact that, despite the various economics , emission and health benefits offered by biodiesel, limits will be placed on biodiesel usage in California. However, we do believe that the proposed ADF regulations reflect input from the biodiesel industry and many other stakeholder groups. ARB Staff was really done outstanding job in reaching out to all stakeholders for consistent engagement. As such we feel that the biodiesel usage limits prescribed by the proposed ADF regulations are not unreasonable. They are workable and will achieve the desired goals for NOx management while retaining the ability to meaningfully take advantage of the significant benefits offered by biodiesel blending in California. — ADF 7-3

5. ADF Regulation implementation timeline – The proposed ADF regulations will require significant change within the industry, including new labeling at each retail dispenser and the joint development of new compliance and tracking mechanisms. Other agencies such as the Division of Weights and Measures will require time to adapt their biodiesel related regulations (there may be a need to change the current California labeling requirements at retail dispensers).Thus we believe the implementation timelines as stated in the proposed ADF regulations are reasonable and necessary. — ADF 7-4

6. Mitigation options - We applaud the ARB's understanding that DTBP additive is not an ideal mitigation option for several safety, financial and operational reasons, and thus preserved in the proposed ADF regulations the ability to approve other NOx mitigation additives. We would only add that we hope ARB staff will diligently pursue this in a timely manner in partnership with the biodiesel industry, and consider the use of current commercially available cetane enhancers. — ADF 7-5

7. Accounting for NTDE and Sunset Provisions -. NTDE vehicles which reduce NOx by 90%+ already make up 25%+ of the current heavy duty diesel fleet in California and will grow to 95% by 2023 as required by ARB fleet turnover regulations. In light of this, we believe it is completely reasonable and appropriate that the ADF regulations will sunset when vehicle miles travelled by NTDE heavy duty vehicles reach 90% of the total miles travelled by the California heavy-duty diesel vehicle fleet. — ADF 7-6

We greatly appreciate this opportunity to comment. Please feel free to contact me should you have any questions.

Sincerely yours,

Harry Simpson
President
hsimpson@crimsonrenewable.com
Tel: 720-475-5409

This page intentionally left blank.

Comment Letter 7_OP_ADF_CRE Responses

ADF 7-1

This comment states that the ADF Regulation carries potential negative economic impacts on biodiesel providers within the State of California. Staff proposed that the biodiesel in-use requirements come into effect on January 1, 2018, to accommodate logistical and infrastructural changes required while businesses develop the ability to comply with the regulation as well as to help offset the economic impacts to industry. In addition, because staff expects the increasing use of NTDEs will eliminate biodiesel NOx impacts over time, the proposed biodiesel provisions include a sunset provision to avoid setting limits on biodiesel use any longer than is necessary. Without this sunset provision, the biodiesel NOx control requirements would stay in place longer than needed, creating an unnecessary economic burden on biodiesel producers, marketers, and consumers.

ARB is proposing that NOx control levels sunset when EMFAC (ARB's model for estimating emissions from California on-road vehicles) shows more than 90 percent of Vehicle Miles Travelled (VMT) by NTDEs. The sunset is expected to trigger by 2023. Staff would conduct a program review on or before December 31, 2019, pursuant to the proposed section 2293.6(a)(6)(A), to verify that the offsetting factors are on track and that the in-use requirements for biodiesel are operating as expected. At the time of the program review, staff would also review the sunset provision timeline. ARB staff has designed the regulation to minimize negative economic impacts to industry, while making necessary steps to reduce NOx emissions from biodiesel.

For more information on the ADF Regulation implementation date please see response to comment **ADF 17-21**.

ADF 7-2

The comment suggests that ARB considers the PM, hydrocarbon toxics, and carbon/GHG reductions and associated health benefits when evaluating the ADF Regulation. The comment also urges ARB to consider that the ADF Regulation would be in effect during a period when NTDEs are being phased in due to existing California law. The environmental impacts of the proposed regulation were considered as part of the environmental analysis of the ADF Regulation and the multimedia evaluation of biodiesel. ARB understands the benefits provided by the use of biodiesel in place of conventional as reflected in the development of our ADF Regulation.

As stated in the Staff Report, consumption of ADFs, such as biodiesel, is expected to increase in the coming years due to various policy incentives. These fuels would help California meet its climate and petroleum reduction goals, provide fuel diversity, and contribute PM benefits. It is important to ensure that the full commercialization of these fuels does not increase air pollution or cause other environmental concerns. The proposed ADF Regulation would ensure this by subjecting new ADFs to a rigorous, phased environmental review with specific terms and conditions.

Please also see response **ADF 7-1** for details on expected impacts of NTDEs.

ADF 7-3 The comment states that while the ADF Regulation is not completely ideal for biodiesel producers in California, the proposal is reasonable and balanced to address both industry's needs and the environmental concerns. Staff appreciates stakeholders' involvement and feedback during this rulemaking process.

ADF 7-5 The comment states that the use of di-tert-butyl peroxide (DTBP) additive as a mitigation option is not ideal and that the commenter appreciates that the ADF Regulation allows for the approval of other NOx mitigation additives. In addition, they request that ARB staff actively pursue, alongside the biodiesel industry, the identification and approval of alternative additives for NOx mitigation. Thank you for the comments regarding DTBP and certification of alternative mitigation options. Staff would continue to work with industry to pursue additional low NOx emissions biodiesel formulas and NOx control additives in a timely manner.

Comment letter code: 8_OP_ADF_NBB

Commenter: Shelby Neal

Affiliation: National Biodiesel Board

The following letter was submitted to the ADF Docket during the 45-day comment period.

This page intentionally left blank.

National Biodiesel Board
1331 Pennsylvania Ave., NW
Washington, DC 20004
(202) 737-8801 *phone*

National Biodiesel Board
605 Cla
Jefferso
(800) 84

17_OP_LCFS_NBB

8_OP_ADF_NBB

February 16, 2015

Mary D. Nichols
Chair
California Air Resources Board
P.O. Box 2815
Sacramento, CA 95814
Submitted via electronic mail.

Re: Written comments from the National Biodiesel Board on proposed Regulations for the Commercialization of Alternative Diesel Fuels and a Low Carbon Fuel Standard.

Dear Chair Nichols:

Thank you for the opportunity to comment on these regulations. We sincerely value the job you and all ARB board members and staff undertake in protecting the state's environment and public health.

By way of background, the National Biodiesel Board (NBB) serves as the trade association for the U.S. biodiesel and renewable diesel industries. The NBB represents more than 90 percent of domestic biodiesel and renewable diesel production. In addition to governmental affairs activities, the association coordinates the industry's research and development efforts.

Before delving briefly into a few key regulatory areas, I would like to express our appreciation to the Air Resources Board (ARB) for the cooperation we have received over the past several years. Biodiesel has encountered unique regulatory challenges as a result of the fact that it is the first alternative diesel fuel to ascend to commercial scale. I am pleased to report that, in each situation we have encountered, ARB staff have diligently worked through whatever issues were present with great skill, integrity, and professionalism. It has been a pleasure to work with staff on numerous matters of precedent-setting importance.

LCFS 17-1

Alternative Diesel Fuel Regulation (ADF)

Speaking candidly, and strictly from a practical standpoint, we view NOx mitigation for biodiesel as unnecessary. This view is based on anticipated levels of biodiesel use in the marketplace and air quality modeling studies sponsored by the National Renewable Energy Laboratory and others. These studies show no measurable impacts on ground level ozone from widespread use of B20 due to the fact that small NOx increases are overwhelmed by large decreases in PM and other pollutants.

ADF 8-1

That said, the NBB and its member companies fully support the ADF regulation as drafted. While ARB staff may have chosen a more conservative approach than our industry would have, in a perfect world, preferred, the regulation is clearly underpinned by robust data and technical analysis. Moreover, we view ARB's conservative mindset as appropriate in light of its statutory mission.

ADF 8-2

In the final analysis, the ADF regulation should be viewed as an enhancement to the Low Carbon Fuel Standard (LCFS) because it provides much-needed regulatory certainty for California's biodiesel industry and it identifies a clear, certain, and rational path forward, both for biodiesel and other "new" fuels. Importantly, we also believe the regulation provides strong assurances to stakeholders that use of biodiesel under the LCFS will only result in air quality benefits.

ADF 8-2 cont.

Production and Feedstock Growth

Because of the LCFS, every biodiesel producer in the state is in some phase of expansion, waste feedstock collection rates are higher than they have ever been, and California is developing into a hub for "next generation" feedstock research and development with companies such as REG Life Sciences and Solazyme. These investments by environmental entrepreneurs are being made based on the promise of a stable, long-term GHG reduction policy. For this reason, we support maintaining the 10 percent by 2020 carbon intensity reduction requirement.

LCFS 17-2

Implementation Schedule

After careful analysis, we believe the overarching 10 percent by 2020 objective is workable. Certainly, there can be no question that the diesel requirement is achievable since more than 1.4 billion gallons of biodiesel and renewable diesel have been produced domestically each of the past two years. In light of these fuels' widespread availability and attractive pricing (typically the same as, or less than, petroleum), we see diesel substitutes as a highly attractive early compliance option. In addition, we are bullish on the growth prospects for the California biodiesel and feedstock industries. Continued in-state growth and development will make long-term compliance even easier, even less expensive, and even more beneficial to the state's economy.

LCFS 17-3

Biodiesel Fuel Pathways

We are in general agreement with the technical analysis that underpins the changes in lifecycle assessment for soybean oil, canola oil, and inedible corn oil. Of course, every scientist and stakeholder will, to some extent, have differing views on such inherently complex matters but, on the whole, ARB staff have done a superb job in integrating the most advanced science into these fuel pathways.

LCFS 17-4

Thank you, in advance, for your consideration of our views on these important matters. If I may be of any assistance, please feel free to contact me at any time at (573) 635-3893.

Sincerely,

Shelby Neal
Director of State Governmental Affairs

Cc: California Air Resources Board

Comment Letter 8_OP_ADF_NBB Responses

ADF 8-1

The comment states that NOx mitigation for biodiesel is unnecessary based on anticipated levels of use and air quality modeling studies that show no measurable impacts on ground level ozone and large decreases in PM and other pollutants. . The ADF regulation allows the use of biodiesel and resulting benefits while setting specifications to control NOx, which is a precursor to ground level ozone.

The statistical methods of staff's analysis are described in Chapter 6 of the ADF staff report. Additionally, an independent statistical analysis of the same data was conducted, and is included as Appendix G of the ADF staff report. These analyses capture the emissions effects of each particular blend level. Staff's analysis relied on basic statistical principles and used few assumptions. The independent statistical analysis reached the same statistical conclusions as staff's analysis. The complete set of statistical results from the comparison of NOx emissions from biodiesel vs. CARB diesel are listed below:

- B5 soy is significantly higher than CARB diesel
- B10 soy is significantly higher than CARB diesel
- B5 animal is not significantly higher than CARB diesel
- B10 animal is not significantly higher than CARB diesel

The staff's proposal acknowledges the beneficial effects of biodiesel use in reducing PM emissions.

Because the data analysis showed a statistical increase in NO_X from the use of soy biodiesel, staff modified the current proposal from the 2013 proposal to conservatively account for increased NO_X emissions from biodiesel blends B5 and below when compared to CARB diesel. These emissions are offset in the current proposal by the use of renewable diesel and NTDEs.

The proposed ADF Regulation is designed to reduce, over time, the NO_X emissions from biodiesel. The analysis that staff performed to arrive at the conclusion that NO_X emissions would decrease over time, including assumptions, technical review, and data selection, is described in detail in the ADF staff report, especially in Chapter 7 and Appendix B. That analysis was conducted using the best available data to evaluate the impacts of

the ADF Regulation. Additionally, staff's analysis was completed in consultation with stakeholders and industry experts.

As a sensitivity check, staff considered several statistical models, including a linear regression model. All yielded results that support staff's conclusions: soy based biodiesel yields higher NOx emissions than conventional diesel at blend levels of 5 percent and higher, and animal based biodiesel yields NOx emissions that are indistinguishable from the variability in emissions from conventional diesel at blend levels of 5 and 10 percent.

One can speculate that additional B5 testing might lead to the detection of statistically significant emissions from animal based biodiesel blends, but staff based their analysis on the best available data. The fact that a statistically significant difference was not detected suggests that the magnitude of such a difference, if it exists, is small.

For more information about Staff's emissions analysis please see response to comment **ADF 17-4**.

Comment letter code: 11_OP_ADF_IWP

Commenter: Curtis Wright

Affiliation: Imperial Western Products

The following letter was submitted to the ADF Docket during the 45-day comment period.

This page intentionally left blank.

31_OP_LCFS
_IWP

P.O. Box 1110
Coachella, CA 92236
(760) 398-0815
(760) 398-3515

11_OP_ADF
_IWP

Imperial Western Products, Inc.

February 16, 2015

Mary D. Nichols
Chair
California Air Resources Board
1001 I Street
PO Box 2815
Sacramento, CA 95812

RE: Proposed Adoption of a Regulation Governing the Commercialization of Motor Vehicle Alternative Diesel Fuels; Proposed Re-Adoption of an Updated Low Carbon Fuel Standard

Dear Ms. Nichols,

Imperial Western Products (IWP) is a biodiesel producer located in Coachella, California. We have been producing biodiesel continuously since 2001, and have made over 54 million gallons of biodiesel. Almost all of the biodiesel we make is made from used cooking oil collected throughout California, and the fuel we sell is sold back into the same areas. In the early years of our biodiesel production, we had to rely on specialty markets, where people who wanted to use biodiesel were willing to go to great lengths to buy it. This resulted in uneven demand, and our business had many wild swings in profitability. We would increase production, then slow production. We would hire and then lay off workers.

Upon the introduction of the federal Renewable Fuel Standard (RFS), and California's Low Carbon Fuel Standard (LCFS), we began to see more and more interest from larger, established fuel providers. These programs, especially the LCFS, resulted in more widespread blending of biodiesel into diesel at the fuel terminals in California, which resulted in steady demand for our biodiesel. Of the 54 million gallons of biodiesel we have made, 30 million gallons have been made since 2011. This demand has allowed us to hire more workers, and keep production steady throughout the year. We currently employ 30 workers directly in the biodiesel production plant. These jobs are good paying manufacturing jobs located in an area where these jobs are scarce. Many of our employees worked in temporary agriculture jobs, or in service jobs in the Coachella valley prior to coming to IWP. In addition to the workers who are employed directly in the biodiesel production plant, we have dozens of employees who work in our used cooking oil collection business. These workers are located throughout the state.

LCFS 31-1

I would like to point out three back stories of some of our employees. Lee Munoz grew up in Coachella, and was working for a television satellite dish installer when we hired

P.O. Box 1110
Coachella, CA 92236
(760) 398-0815
(760) 398-3515

him to work in the biodiesel plant in 2002. Lee began to learn about biodiesel production, became a shift supervisor, and is now Production Manager overseeing 22 plant operators.

Danny Chiang was also raised in the Coachella valley. A mechanical engineer and graduate of UC Berkeley, he was working in a clothing store in Rancho Mirage when we hired him in 2011. Danny quickly learned about biodiesel production, and oversaw installation of a plant-wide control system. Danny programmed all of the plant control system, and not only supervised installation, but actually did a lot of the wiring himself. Danny is now lead plant engineer and supervises another engineer.

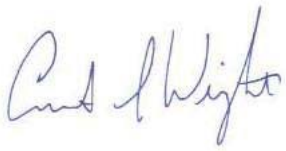
Eduardo Zepeda grew up in Coachella and attended the University of California Riverside and studied mechanical engineering. One of his professors, Dr. Wayne Miller, would bring his chemical engineering class to our plant every year on a field trip. I called Dr. Miller in the spring of 2012 and asked him if he had any students who would be interested in a summer internship. He allowed me to post a message to his students, and Eddie responded and was hired. After graduating, we hired him full time. He is now learning the biodiesel production process and has successfully completed several projects, including a water treatment and disposal system.

These are just three of the success stories in our biodiesel plant, and all are possible because of steady demand for biodiesel in California. The LCFS has added value to blending biodiesel in California, and when it gets back on track it will provide additional stability to the market which will allow our company to plan for the future, and continue to provide good paying jobs. **LCFS 31-2**

With LCFS back on track, the Alternative Diesel Fuel (ADF) regulations will provide a framework for biodiesel to be blended and prevent any adverse emission impacts until the fleet turnover of new technology diesel engines is achieved. It is important to us that the ADF regulations have a clearly defined sunset, when 90% of the miles travelled are done by new technology diesel engines, and that this end point is reviewed annually so that as soon as this milestone is reached, limits on biodiesel blending are removed. With this provision, hopefully LCFS reductions won't be hindered. We feel strongly that biodiesel, California's advanced biofuel, will be important in helping reach LCFS goals. **ADF 11-1**

IWP has been making biodiesel in the Coachella valley since 2001, and with re-adoption of LCFS and implementation of ADF we are confident we can continue to increase biodiesel production to displace petroleum, lower greenhouse gasses, lower criteria air pollutants, and provide jobs in California.

Sincerely,



Curtis Wright

Comment Letter 11_OP_ADF_IWP Responses

ADF 11-1

This comment states that a clearly defined set of deadlines is needed for when the limits on biodiesel use would be removed. Staff agrees with the comment and has clarified the regulation accordingly as part of the 15-day changes. Staff has added section 2293.6(a)(4)(B) to further clarify the sunset provision process.

Please see response **ADF 7-1**.

This page intentionally left blank.

Comment letter code: 13_OP_ADF_WSPA

Commenter: Catherine Reheis-Boyd

Affiliation: Western States Petroleum Association

The following letter was submitted to the ADF Docket during the 45-day comment period.

This page intentionally left blank.

13_OP_ADF
_WSPA

Western States Petroleum Association
Credible Solutions • Responsive Service • Since 1907

Catherine H. Reheis-Boyd
President

February 17, 2015

Clerk of the Board, Air Resources Board,
1001 I Street,
Sacramento, CA 95814
http://www.arb.ca.gov/lispub/comm/bclist.php

Re: **Public Hearing to Consider the Proposed Regulation on the Commercialization of Alternative Diesel Fuels – Board Agenda Item 15-2-3**

The Western States Petroleum Association (WSPA) appreciates the opportunity to submit written comments for the record on the above proposed rulemaking. WSPA is a non-profit trade association representing twenty-five companies that explore for, produce, refine, transport and market petroleum, petroleum products, natural gas and other energy supplies in California, and four other western states.

WSPA has worked extensively with ARB over the past few years on this alternative diesel regulation, and believes the approach outlined in the proposed regulation is the best based on the large number of issues and considerations.

Although we do not believe the petroleum industry should be responsible for mitigating the NOx increases of biodiesel through the means of potentially problematic additives or reformulating base diesel formulations, and we question whether the mitigation options indicated in the regulation are realistic in practice, we are prepared to work with staff as implementation issues arise in the coming years.

Sincerely,

1415 L Street, Suite 600, Sacramento, California 95814
(916) 498-7752 ▪ Fax: (916) 444-5745 ▪ Cell: (916) 835-0450
cathy@wspa.org ▪ www.wspa.org

c.c. ARB Board Members – arbboard@arb.ca.gov
Virgil Welch – vwelch@arb.ca.gov
Richard Corey – rcorey@arb.ca.gov
Jack Kitowski – jkitowsk@arb.ca.gov
Samuel Wade – swade@arb.ca.gov
Elizabeth Scheehle – escheehl@arb.ca.gov
Jim Aguila – jaguila@arb.ca.gov
Lex Mitchell – amitchel@arb.ca.gov

Western States Petroleum Association Comments on CARB's Notice of Public Hearing to Consider the Proposed Regulation on the Commercialization of Alternative Diesel Fuels – February 19th, 2015 Board Hearing

The Western States Petroleum Association (WSPA) appreciates the opportunity to submit written comments for the record on the above proposed rulemaking. WSPA is a non-profit trade association representing twenty-five companies that explore for, produce, refine, transport and market petroleum, petroleum products, natural gas and other energy supplies in California, and four other western states.

We understand that at the February 19-20 ARB Board Hearing, the Board will consider re-adoption of the Low Carbon Fuel Standard (LCFS) Regulation as well as adoption of the Alternative Diesel Fuel (ADF) Regulation. We also understand that staff has jointly progressed these two rulemakings and considers them intimately connected as a joint regulatory action "package" to address Court requirements emanating from the July 15, 2013 State of California Court of Appeal, Fifth Appellate District (Court) opinion in POET LLC *v.* California Air Resources Board (2013) 218 Cal.App.4th 661. The judge's opinion was that ARB did not adequately address biodiesel NOx emissions that could potentially result from LCFS implementation. The ADF regulation represents staff's proposed solution to address California Environmental Quality Act deficiencies associated with biodiesel NOx impacts. WSPA is providing separate comments on the two concurrent rulemakings and we regret the unavoidable overlap that is likely to occur within our respective comment submissions.

WSPA has worked with ARB over the past few years on this alternative diesel regulation and believes the approach outlined in the proposed regulation is the best based on the large number of issues and considerations. We are prepared to discuss our comments further with ARB staff, if needed.

Key Points / Highlights

WSPA's key comments are summarized below. More detailed discussion on individual sub-topics is provided in the balance of our submission:

- **CEQA** - WSPA strongly believes combining the ADF and LCFS processes into one CEQA "project" is not procedurally appropriate, and will result in an insufficient environmental analysis. ARB should analyze the LCFS and the ADF as two separate projects. At the very least, ARB must acknowledge the possibility that the two regulations will not be adopted or implemented concurrently, and should rework the Draft EA to clarify the impacts from each of the regulations, and the specific mitigation measures applicable to each. **ADF 13-1**

  Furthermore, the alternatives analysis presented by the Draft EA is woefully insufficient when it comes to the ADF. In essence, the Draft EA only analyzes a complete, as-is adoption of the ADF and a "no project" alternative for the ADF, **ADF 13-2**

without analyzing any other of the potentially feasible scenarios, such as adoption of a different type of ADF regulation. The Draft EA offers no explanation as to why alternatives to the ADF were not analyzed. CEQA does not permit such an oversight.

ADF 13-2 cont.

- **Regulatory Approach** - WSPA believes ARB has appropriately determined the set points (pollutant control levels) for biodiesel blends in the state comprehending both seasonal requirements and biodiesel quality considerations. WSPA supports ARB's approach which comprehends the contribution of in use-requirements such as New Technology Diesel Engine (NTDE) market penetration and Renewable Diesel use. We believe staff reviewed all available engine testing data and, while we remain skeptical of the strength in the data at low biodiesel blend levels (B5), we concur that higher level biodiesel blends would result in NOx emission increases in the legacy fleet, if left unmitigated.

- **Sunset** - WSPA supports ARB's decision to sunset the program when the percentage of Vehicle Miles Travelled (VMT) by NTDE heavy duty vehicles reaches 90% of the total VMT by heavy duty diesel trucks. We agree that emissions control technology featured in newer heavy duty engines obviates the need for further/continued biodiesel blend NOx mitigation controls.

- **Two-Year Lead Time** - WSPA recommends ARB reconsider its proposal to provide a two-year lead time for affected stakeholders to prepare for mitigation of higher level biodiesel blends as such preparations, in our opinion, will likely require a minimum of three years.

ADF 13-3

- **Interim Program Reviews** - WSPA recommends ARB incorporate additional interim program reviews in the ADF regulation and align the schedule for such reviews with any corresponding interim program reviews or staff reports stipulated in the LCFS. We recommend a minimum of two reviews for both programs by 2020, and prefer annual staff reports to the Board to assess the health of the programs. We presume staff will be monitoring the status/progress of both programs closely and believe annual staff reports to the Board will help identify any elements needing program changes, as well as any market condition issues necessitating accelerated agency response.

ADF 13-4

- **DTBP** - We do not believe ARB has conducted a thorough assessment of the NOx reduction additive (di-term-butyl- peroxide – DTBP) which is included as a NOx mitigation measure in the ADF regulation. We recommend staff fully re-examine the use of DTBP for a purpose other than it was originally intended (which was cetane enhancement) and at levels substantially higher than the parts per million range that is recommended for use in other applications. We also recommend ARB check on notification requirements with EPA relative to requiring a PMN (Pre-manufacturing notification) or other documentation for materials being used for other than their intended purpose. Impacts to be evaluated should include, but not be limited to, the following:

ADF 13-5

- Full multimedia evaluation of environmental impacts (e.g. fate and transport and non-combustion air emissions),
- Toxicological impacts,
- Safety impacts (e.g. peroxide stability and interactions with other additives such as anti-oxidants), and,
- Materials compatibility impacts (e.g. OEM approval, metallurgical compatibility in distribution storage, piping, and fueling equipment).

ADF 13-5 cont.

Detailed Comments

1. Satisfying CEQA

A. Combining into One Project:

Combining the ADF and LCFS processes into one CEQA "project" is not procedurally appropriate, and results in an insufficient environmental analysis. ARB should analyze the LCFS and the ADF as two separate projects. At the very least, ARB must acknowledge the possibility that the two regulations will not pass concurrently, and should revise the Draft EA to clarify the impacts from each of the regulations, and the specific mitigation measures applicable to each.

The Draft EA published by ARB is the environmental document for both the LCFS and the ADF regulations. While these two rulemakings are being developed concurrently, they are also being treated as two separate processes. Because the two regulations are subject to two separate rulemakings, there is the possibility that one regulation could pass but the other could not, or that one regulation could be challenged and its implementation delayed while the other continues to move forward.

ADF 13-6

ARB has cited CEQA Guidelines §15378(a) in support of its approach to combine environmental review of the two regulations into one CEQA "project." However, section 15378(a) of the Guidelines simply states that a "project" is "the whole of an action, which has a potential for resulting in either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment…" While section 15378(c) of the Guidelines clarifies that a "project" can include an activity that requires more than one discretionary approval by one or multiple government agencies, the Guidelines nowhere provide for a "project" that encompasses two separate activities that happen to be related to one another, but are not interdependent. *See* CEQA Guidelines §15378(c).

Interdependence, an element lacking here, is key to including separate actions under the umbrella of one CEQA "project" for purposes of environmental review. *Tuolumne County Citizens for Responsible Growth, Inc. v. City of Sonora* (2007) 155 Cal.App.4th 1214, 1230-1231 [finding a road realignment and construction of a shopping center were part of the same "project" because the shopping center's opening was legally dependent upon the road's realignment]. The LCFS and

ADF 13-7

ADF regulations certainly pertain to related subject matter, but they are not legally dependent upon one another—the LCFS can exist without the ADF (and indeed has in the past), and vice versa.

Both statute and regulation recognize the need to analyze separate "projects" in circumstances similar to these. For example, while a real estate developer may request a rezoning of property, as well as a tentative subdivision map, for purposes of effectuating development, those two related but separate actions are recognized as distinct "projects." *See El Dorado Union High School Dist. v. City of Placerville* (1983) 144 Cal.App.3d 123, 129-130; CEQA Guidelines §15037. Just as with the two related but distinct rulemakings here, each of these two legal actions, which may very well impact the same development, nonetheless may occur without the other and in completely separate processes, and may produce significantly different impacts.

ADF 13-7 cont.

Simply put, CEQA does not allow ARB to take two different activities which each have different impacts and require different analyses and pass them off as one "project" to streamline its environmental review process. The process that ARB has adopted here makes it impossible to separate out which impacts stem from the LCFS regulations and which from the ADF regulations, <u>even though the two rules are being considered in separate rulemakings, have distinct impacts as a practical matter, and may not both be adopted, or may be adopted on different schedules</u>.

ADF 13-8

CEQA requires that environmental review documents be "written in a manner that will be meaningful and useful to decision makers and to the public." Cal. Pub. Res. Code §21003(b); *see Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 392. When neither decision makers nor the public can meaningfully understand the impacts that will arise from each proposal and available mitigation, the usefulness of the Draft EA as a valuable decision-making tool is significantly undermined, contravening the intent of CEQA.

ADF 13-9

B. <u>Inadequate Alternatives Addressed:</u>

The Draft EA also fails to adequately analyze alternatives. Under CEQA, an environmental review document "must consider a reasonable range of alternatives to the project" and must "make an in-depth discussion of those alternatives identified as at least potentially feasible." *See Preservation Action Council v. City of San Jose* (2006) 141 Cal.App.4th 1336, 1350; *Sierra Club v. County of Napa* (2004) 121 Cal.App.4th 1490. The purpose of such an analysis is to allow informed decision making, and the onus for analyzing a sufficient range of alternatives falls squarely on the agency. *Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 405.

ADF 13-10

But ARB's Draft EA falls far short of this requirement. The Draft EA only analyzes a "no project" alternative—LCFS regulations being set aside as a result of the *POET* decision and no adoption of the ADF; a second alternative—re-

ADF 13-11

adopting the existing LCFS without any of the proposed updates and adopting the ADF regulation as proposed; and finally, a "Gasoline-Only Compliance Curve" alternative—an alternative that would remove the diesel standard from the LCFS so that the compliance curves apply only to gasoline and gasoline substitute fuels. Despite the Draft EA's statement that it presents a fourth action alternative—the "No Trading Case Alternative" –ARB never includes a description of that alternative in the Draft EA.

ADF 13-11 cont.

ADF 13-12

Additionally, ARB's description of the alternatives is somewhat misleading. The alternatives that ARB discusses are more accurately described as: (1) no LCFS and no ADF; (2) re-adoption of the existing LCFS and adoption of the proposed ADF as-is; and (3) the "Gasoline-Only Compliance Curve Alternative," which, like the first alternative, would not adopt the proposed ADF, or any rule on alternative diesel fuels. There is no analysis of an alternative that would involve re-adoption of the proposed LCFS with a different ADF regulation. In contravention of CEQA, this analysis overlooks potentially less impactful options. *See Citizens of Goleta Valley v. Board of Supervisors* (1990) 53 Cal.3d 553, 566.

ADF 13-13

The mere three alternatives presented by the Draft EA insufficiently represent the broad scope of alternatives, and fail to take into account clearly feasible scenarios—such as an ADF regulation that is substantively different from the one proposed by ARB. In fact, the Draft EA analyzes no alternatives beyond a "no project" alternative for ADF: either the ADF is not adopted at all, or it is adopted exactly as is. ARB cannot limit the alternatives analysis on the ADF without explaining "in meaningful detail" the basis for its conclusion that there are no feasible alternatives to the ADF as proposed. *Laurel Heights Improvement Assn.*, 47 Cal.3d at 405.

ADF 13-14

CEQA requires the Draft EA explore more alternatives than the three presented here. ARB has provided an insufficient "alternatives analysis" in connection with these rulemakings, and therefore the Draft EA should be revised accordingly.

ADF 13-15

2. Program Dates & Timetables

A. Start Date and Timeline:

WSPA appreciates and supports ARB's apparent effort to provide lead time for affected parties (biodiesel producers and blenders) to implement the necessary capital facility modifications to enable the biodiesel blend NOx mitigation that will be required to enable higher level biodiesel blending in the future. We also recognize that staff acknowledges the relationship between ADF and LCFS program requirements and the fact that, directionally, increased LCFS CI reduction requirements as we approach 2020 will drive the need for higher levels of biodiesel in the CA marketplace.

Our industry will likely not be called upon to provide the lion's share of the facilities necessary to mitigate higher level biodiesel blends as this task will be far greater for biofuel producers. However, we are concerned about the potential

ADF 13-3 cont.

availability and cost of pre-mitigated biodiesel by 2018 and question whether the lead time provided is sufficient (approximately 2 years if the regulation is adopted in 2015 and goes into effect in 2016).

We disagree with staff's statement that a two year lead time is consistent with "established CARB policy" which, in our experience, has been a minimum of three years and oftentimes four years, depending on the degree of complexity of the preparations required. Staff has recognized the need for additional logistical capabilities (additive storage and injection facilities to address the safety and environmental risks poses by DTBP) to be put in place, the need for additional changes by fleet operators focusing on exempted NTDE or light-duty diesel fleets, and the lead time required for testing and certification of alternative formulations comprehending higher biodiesel blend levels. Recognizing that all these are valid concerns, WSPA recommends staff reexamine their two year proposal to complete preparations, as it seems unduly optimistic given current construction and permitting timetables (and lead times) necessary in California, and the typical three year timeframe required to prepare for and conduct a successful alternative diesel formulation certification engine test program.

ADF 13-3 cont.

B. Sunset Date:

WSPA supports staff's proposal to set a program "sunset date" and to have that date comprehend the degree of market penetration of NTDEs in the California heavy duty diesel market. We expect staff will examine and further refine the in-use requirements and market outlook during interim program reviews/reports to the Board. In conducting such reviews we believe staff should examine the net NOx impact of the relevant factors (e.g., degree of Low Saturation B5 blending, renewable diesel use and NTDE VMT market share) in determining whether the proposed sunset can be advanced. We note the projections of Table 4.1 include significant NOx reductions starting in 2018 and recommend that staff consider sunsetting the program as early as possible, provided that doing so results in no projected NOx increase.

ADF 13-16

WSPA also recommends that staff define the particulars/specifics of how the program sunset will be implemented by affected stakeholders, including better definition of how staff plans to advise our industry that the program will be sunsetting (i.e., Guidance document, Board Action, etc.) and how much time staff envisions will transpire between when the time analyses indicate the sunset trigger has been met, and the time industry can actually implement the associated changes. Obviously, we would prefer to more fully understand the pathway and hope that it includes clear provisions for quick action by staff when the time arrives.

C. Interim Program Reviews:

As noted above, WSPA recognizes that staff, under Par. 2293.6(6) plans a program review of biodiesel in-use requirements by 12/31/2019 to determine their efficacy

ADF 13-4 cont.

and, in doing so, staff will consider the effects of offsetting factors that impact NOx emissions. We support staff's proposal to do so, but feel that the schedule of interim program reviews and staff reports to the Board on the ADF program needs to be aligned with that proposed for the LCFS program as the two are related.

The LCFS ISOR document proposes an interim review by 1/1/2019 which is not in line with the ADF program review. Furthermore, as indicated in our WSPA LCFS comments, we feel that the single targeted program review for the LCFS is insufficient and would come too late to materially impact our 2020 LCFS compliance burden. To this end, we are recommending that annual program reviews and staff reports to the Board be incorporated in both regulations.

ADF 13-4 cont.

3. <u>Appropriateness of "Set-points" or Triggers for Mitigation</u>

WSPA has worked closely with ARB over the past two years in reviewing the available emissions data from engine test programs on ARB biodiesel blends. We examined programs where both ARB diesel was used as the base fuel, and programs where diesel fuel "approaching ARB properties" was used in an effort to get around the obvious difficulties of insufficient data in certain blend ranges (e.g. B0-B5). Several different engine test programs involving different engines and test protocols further complicated staff's difficult task. We appreciate the difficulty staff had in arriving at the appropriate pollutant control levels when faced with data mostly concentrated around B0, B5 and B20 and little in between. We offered to assist in providing technical oversight in the design and execution of the most recent technical program at UC-Riverside. WSPA members shared proprietary engine emissions data in an effort to ensure that ARB's decisions were based on the best available data.

WSPA recognized early on that the potential success of staff's proposal to implement a novel regulatory approach in the ADF where NOx (and/or other air pollutant impacts) resulting from use of biodiesel blends in California would require mitigation upon meeting a pollutant control trigger level was largely dependent on staff's ability to appropriately determine those set points based on the available data. We also recognized the in-use requirements for biodiesel blends would have to be flexible enough to not impede fuel blenders' ability to rely on this important renewable blendstock to meet the Carbon Intensity reduction goals of the LCFS program.

ADF 13-17

We believe staff has taken the time to understand our technical input and recognize the final proposal includes the aspects of in-use NOx mitigation impact on NTDEs, market penetration of renewable diesel, and the difference in NOx-forming tendency between Low and High Saturation biodiesel.

A quick review of WSPA feedback provided in 2013 when staff first introduced this novel regulatory approach indicates that the fundamental principles we put forward as being essential for the ADF regulation's success have been largely fulfilled:

- The proposal has been kept relatively simple:
  - The proposed biodiesel blend control levels are on a per-gallon basis.
  - The proposed biodiesel blend control levels apply state-wide
  - Staff proposes dual trigger controls based on seasonality and biodiesel saturation level.
- The proposal includes biodiesel blend mitigation trigger levels that will remain unchanged throughout the duration of the program.
- The proposal comprehends the offsetting in-use mitigation effects of such as NTDE introduction (i.e., fleet turnover) and renewable diesel market penetration.
- There is appropriate balance between the reporting and record-keeping requirements for both biodiesel producers and biodiesel blenders and distributors. We remain hopeful that as the regulation moves into the implementation phase, we can work with staff to recognize potential synergies in these areas with the existing recordkeeping and reporting requirements associated with the LCFS.
- Staff has made it clear that program duration is finite and tied to market penetration of advanced-emission controlled heavy duty diesel engines such as those featured in 2010 and newer trucks.

ADF 13-17 cont.

WSPA's primary difference of opinion with staff's analysis in support of setting the biodiesel mitigation threshold levels included in the proposed rulemaking, involves the degree of certainty presented by staff in the existence of a statistically significant NOx increase (of approximately 1%) for Low Saturation biodiesel at the B5 level. We find staff's conclusions to be more reflective of the selection of studies chosen for inclusion in the analysis, and their choice of statistical methodology, rather than a true reflection of a definitive trend established by a strong underlying database. Despite the additional "data points" generated by the most recent UC-Riverside study, the available data at the B5 level remains rather limited.

Nevertheless, while WSPA remains unconvinced that the perceived NOx increase at the B5 level is real, WSPA also recognizes that staff is not proposing additional NOx mitigation controls for B5 blends (beyond the offsetting impacts of NTDE and renewable diesel market penetration). WSPA agrees with staff that the NOx increase is statistically significant in the B10-B20 range and supports the overall proposed mitigation threshold structure pivoting on biodiesel degree of saturation and seasonal seasonality.

4. **<u>Workability of Mitigation Options</u>**

A. <u>GTL:</u>

There is no indication that GTL is still a mitigation option. WSPA requests that GTL be clearly identified as a mitigation option.

ADF 13-18

B. <u>Evaluation of DTBP:</u>

ADF 13-5 cont.

WSPA is concerned that adequate Multi-Media Evaluation (MME) has not been performed with regard to the use of di-tertiary butyl peroxide (DTBP) at the concentrations currently required for mitigation in the proposed Alternative Diesel Fuel (ADF) regulations.

A review of the "STAFF REPORT - Multimedia Evaluation of Biodiesel" dated November 2013, only includes an evaluation of combustion air emissions impact (i.e. NOx reduction) due to the use of the DTBP additive. The report does not include an evaluation of the following impacts associated with use of DTBP as a biodiesel blend additive:

- Release Scenarios
- Biodiesel Production, Storage, Distribution, and Use
- Biodiesel Toxicity
- Transport and Fate
- Waste generation and waste management

Because ARB is setting the blend level of DTBP as part of the proposed regulation, and given the recommended blend levels of DTBP in the proposed ADF rule are at least an order of magnitude greater than typical CARB diesel additives, we feel ARB should fully evaluate the potential impacts of the proposed formulation, including but not limited to:

- Toxicity of ADF approved blends
- Soil, surface water, and ground water
- Diesel storage equipment
- Additive storage and blending equipment
- Equipment used in the transport and dispensing of diesel fuel
- Motor vehicles using diesel fuel (including a review with Original Equipment Manufacturers).
- Air emissions impacts related to non-combustion diesel fuel activities (e.g. transport and storage)

In addition, a review of MSDS for DTBP from two manufacturers[1, 2] indicate there are specific issues regarding DTBP that are not discussed in ARB's MME. We feel the MME should include an evaluation of the DTBP specific issues listed below prior to approving the use of DTBP at the recommended concentrations:

- DTBP decomposes at approximately 80^{o}C; recommended maximum storage temperature 40^{o}C[1, 2]
- Flash point of 6^{o}C, highly flammable at room temperature[1, 2];
- Precautions are needed to guard against electrostatic discharge [1, 2]
- Control of vapor space, such as nitrogen blanketing, may be required or recommended [2]

ADF 13-5 cont.

[1]United Initiators MSDS for DTBP from: http://www.united-initiators.com/products/details/di-tert-butyl-peroxide/

[2] Azko Nobel TRIGONOX B MSDS from: https://www.akzonobel.com/polymer/msds/

- Segregation of DTBP from accelerators, stabilizers, acids, bases, and heavy metals is highly recommended[1, 2]
- Use only stainless steel 316, polypropylene, polyethylene, or glass lined equipment for storage[2]
- Must avoid contact with rust, iron and copper[2]

ADF 13-5 cont.

We note the Tier I, Tier II, and Tier III MME reports all concluded that the impact of priority or widely used additives would need further evaluation (see excerpted references in Appendix 1 attached).

C. Certification of Alternative Diesel Fuel Formulations

WSPA supports staff's proposal to allow the certification of alternative diesel fuels resulting in emissions equivalence with diesel under Subarticle 3, Appendix 1, Par (a)(2), however we have the following questions and comments:

- As outlined elsewhere in our comments, two years is not a realistic timetable for planning, undertaking and completing such testing. Staff should comprehend that such testing is typically an iterative process; it is likely that initial testing of any candidate will fail and will need to be fine-tuned based on the results of the failed initial attempt before the next engine test is initiated. This can oftentimes be repeated several times before a successful outcome is obtained.

ADF 13-3 cont.

- In our experience, the cost of such a program can easily run in the $2-3 million range per successful formula certification, reflecting pre-certification scoping quality testing as well as a number of engine test repeats as outlined above.

ADF 13-19

- We are puzzled by staff's decision (Appendix 1, Par (a)(2)(A)) to not allow applicants the flexibility of using any ARB certified alternative diesel formulation as the reference fuel for the certification of a higher biodiesel content formulation. ARB's own testing in assessing the NOx impact of biodiesel blends at UC-Riverside was conducted using a reference fuel that was representative of typical in-use CARB diesel. Insisting that the 10% aromatics (Table A9) content test fuel be employed for this purpose ignores the fact that there is no such fuel currently on the market and that all existing alternative formulations have already been tested (and passed) against such a reference fuel. It stands to reason that, if a B20 alternative formulation candidate yields equivalent NOx emissions against an in-use alternate CARB diesel formula, and if that same alternate CARB diesel formula yielded equivalent NOx emissions to the reference 10% aromatics fuel, then the B20 formulation should be deemed to result in no NOx increase over the reference fuel.

ADF 13-20

- Staff describes the required biodiesel additive certification fuel under Appendix 1, Par (a)(2)(D) as a "virgin soybean oil" material. This is inconsistent with staff's effort throughout the remainder of the ISOR to consistently distinguish among biodiesel alternatives by saturation level and not feedstock source. We recommend that it be changed in this section accordingly. In the same Paragraph we note Table A.8 which reports the targeted range of properties of the biodiesel candidate fuel, the unadditized cetane number of which is listed as 47-50. We have several comments on this requirement:

    - For formulas involving higher levels of Low Saturation biodiesel, there should be no minimum cetane number specified, as a lower cetane number would only reflect a more difficult to mitigate biodiesel. If an applicant has access to such a material and can successfully mitigate its NOx impact, why shouldn't they be allowed to perform the necessary testing to do so? The applicant should always have the ability to self-specify a narrower cetane number range in their particular application.
    - For formulas involving higher levels of Low Saturation biodiesel, the maximum cetane number should be lower than the 56 cetane number cut-off between Low Saturation and High Saturation biodiesel - less an allowance to reflect ASTM test reproducibility at that CN level. This is necessary to ensure that no High Saturation biodiesel can be used in the certification testing. The corresponding certification should stipulate that it is applicable to biodiesel quality reflecting the material that was tested.
    - For formulas involving higher levels of High Saturation biodiesel, the maximum cetane number should be no lower than the 56 cetane number cut-off between Low Saturation and High Saturation biodiesel plus an allowance to reflect ASTM test reproducibility at that CN level. This is necessary to ensure that the lowest quality High Saturation biodiesel would yield no NOx increase and thus the corresponding certification would be applicable to all High Saturation biodiesel. The applicant should always have the ability to self-specify a narrower cetane number range in their particular application, i.e., a higher minimum High Saturation biodiesel cetane number.

ADF 13-21

- We find the language in Appendix 1 (a)(2)(G)(2) unduly vague and extremely difficult (if not impossible) to comply with. We recommend it be struck from the proposed ADF regulation language. If ARB continues to include such language in the ADF rules we would urge staff to address our concerns (outlined below), such that testing requirements must be clearly defined and implementable. Furthermore, in defining the technical specifics of these requirements, we request that ARB involve impacted stakeholders in the selection of appropriate tests and procedures.

ADF 13-22

Our concerns (previously submitted to ARB in December 2014) regarding the lack of specificity in the rule language related to toxicity testing, include:

- The methods to be used for cellular testing are not defined. A variety of test designs is available for each of the cellular-level effects tests, but few of them are standardized and the results may not be comparable among the various tests for a given effect:
  - The rule should clearly define tests, toxicity endpoints, and methods related to cellular testing.
  - The rule should specify the number of samples, treatments, and replicates to be evaluated.
  - The specified tests, protocols, and sample sizes should account for natural variability in cellular level response and sample composition.
  - Impacted stakeholders should have adequate time to provide input into and comment on any such proposal.
- The rule should specify the means of generating and collecting the particulate exhaust sample(s).
- The rule should include a defined procedure for conducting exposures to the PM in a consistent, representative manner.
- The rule should specify that both PM exposure procedures and cellular testing must be conducted by qualified laboratories with rigorous QA/QC procedures.

In the absence of any defined methodology on toxicity testing, each applicant required to perform testing can choose a different test design(s), which will result in an accumulation of data for multiple formulations, amongst which comparison can't readily be made. We emphasize that key to ensuring appropriate comparisons is the number of samples, treatments, and replicates to be evaluated. These parameters must be considered and specified in the ADF regulation requirements.

ADF 13-22 cont.

5. <u>Recordkeeping and Reporting</u>

WSPA appreciates and supports ARB's apparent effort to keep the reporting and recordkeeping requirements for biodiesel under the ADF relatively simple and focused primarily on biodiesel producers/importers that are likely to have more responsibilities, particularly regarding the potential NOx mitigation of their product. The burden on blenders, distributors, and retailers should be minimized as much as possible for both the recordkeeping and reporting obligations, focusing primarily on being able to identify/reconcile the volumes and type of B99/B100 bought and the disposition of those volumes in various biodiesel blends. Associated records (invoices, PTD's, etc.) with the appropriate information on the volume/type of NOx control employed, should round out the program tracking segment of the regulation and provide adequate assurance that the control levels

listed in Table A.1 and the in-use requirements listed Appendix 1 are performing satisfactorily.

Although the intent in this area is as described above (and consistent with information presented throughout the ADF workshops leading to the proposed regulation), the actual regulatory language is not adequately defined. We are concerned that the requirements (as described) are vague such that they could potentially be read to include unnecessarily burdensome provisions on our industry.

ADF 13-23

Below we offer some areas where additional clarity would be helpful regarding the requirements in the recordkeeping and reporting segment of the regulation (Paragraphs 2293.6 and 2293.8):

- We would like clarification of whether the biodiesel reporting requirements outlined in Par. 2293.8 (b) apply to fuel blenders. Par. 2293.6(a)(1) states: *"Starting January 1, 2016, any person who produces, imports, blends, sells or offers for sale or supply any biodiesel, shall be subject to the reporting requirement of Stage 3A, pursuant to Par. 2293.8(b)."*

  The biodiesel definition outlined in Par. 2293.2 applies to B99/B100 only. There is a separate definition for biodiesel blends in this Paragraph and staff has not explicitly included "biodiesel blends" in the above text, implying that it only applies to producers/importers. However, Par. 2293.8(b)(2) (A) appears contradictory in that it seems to comprehend ADF blenders:

  "Each report shall include… the volume of ADF and ADF blend offered, supplied or sold during each month."

ADF 13-24

- Similarly, we would like clarification as to whether the pollutant control level requirements outlined in Par. 2293.6(a)(2) apply to fuel blenders. Par. 2293.6(a)(1) states:

  "Starting January 1, 2018, any person who produces, imports, blends, sells or offers for sale or supply any biodiesel, shall be subject to pollutant control levels under Subsection (a)(2) of this Section."

  Once again, the biodiesel definition outlined in Par. 2293.2 applies to B99/B100 only. There is a separate definition for biodiesel blends in this Paragraph and staff has not explicitly included "biodiesel blends," potentially implying that the requirement only applies to producers/importers. However, Par. 2293.6(a)(2) appears contradictory in that it seems to comprehend blenders:

  "Biodiesel blends above the pollutant control level for NOx emissions are required to employ one of the in-use requirements for biodiesel listed in Appendix 1."

ADF 13-25

The logical interpretation would be that biodiesel blenders would be affected by this provision only if they are engaging in mitigation activities themselves. It would be helpful to have staff confirm that this is their intention.

ADF 13-25 cont.

- If staff intended for the above requirements to apply to producers of biodiesel blends, our industry would have to report test "results of a specified number of representative samples" and the "volume/quantity of the applicable in-use requirements" indicated in Par. 2293.8(b)(2)(B), (C) and (D).

  It is understandable that biodiesel producers/importers would have the responsibility for performing the necessary testing at an appropriate frequency to ensure that their product is appropriately classified in the product transfer notification statements they provide the oil industry (e.g., Low Saturation versus High Saturation, NOx mitigated versus Non-Mitigated). It is also understandable that biodiesel/producers would have to report on the nature of mitigation employed and any associated/pertinent in-use requirement data.

  It is not intuitively clear, however, why blenders would be required to perform such testing, i.e., why can't blenders rely on the notification statements from producers/importers on what the precise characteristics of the biodiesel are and consequently how they need to manage their biodiesel blending operations? Once again, we believe staff should clarify that these requirements would only apply to a blender, if that blender were to be engaged in mitigating the B100/B99 they receive to producing biodiesel blends requiring mitigation per Par. 2293.6(a)(2). Biodiesel blenders not producing blends requiring mitigation and simply adhering to the volumetric maxima of Par. 2293.6(a)(2), or purchasing pre-mitigated biodiesel, should be excluded from the reporting requirements of Par. 2293.8(b)(2)(B), Par. 2293.8(b)(2)(C) and 2293.8(b)(2)(D). For those blenders, a monthly volumetric reconciliation of purchased volumes of B99/B100 against the disposition of those volumes in the various biodiesel blends produced should suffice.

ADF 13-26

- Staff should clarify the requirement in Par. 2293.8(c)(4)(C) to include a statement on invoices indicating NOx control for each biodiesel blend transaction applies only if mitigation is employed consistent with the provisions of Appendix 1, either by the blender themselves or by the blender's biodiesel provider (pre-mitigated).

ADF 13-27

6. Appendices

Appendix A: Proposed Regulation

- On page 27 of Appendix A, it states the proposed regulation requires more information for a Stage 3B (no mitigation required) submission than on p. 22. What is the purpose of providing results of a specified number of representative samples for an ADF that has no emissions impact?

ADF 13-28

Appendix D: Draft Environmental Analysis

- In the ADF background, it states that ADFs are not hydrocarbons. This is not accurate unless ARB is going to say that all renewable diesel sources are not ADFs and also should be exempt from the ADF regulation completely. **ADF 13-29**

- On page 25, ARB staff mentions the use of a biodiesel cetane index whereas in fact none exists. There should be language stating that this is in development for potential future use in the regulation or deleted from the text. **ADF 13-30**

Appendix E: Summary of DOF Comments to the Combined LCFS/ADF SRIA and ARB Responses

- On page 18, ARB is attributing PM, HC and CO emission reduction benefits from increased biodiesel to the LCFS. The section does not show how staff will apportion the emissions, but WSPA would like to reinforce the fact the ULSD/DPF combo is responsible for a vast majority of the reduction to be seen between now and 2020, all of which has been in force prior to the LCFS program. **ADF 13-31**

Appendix G: Supplemental Statistical Analysis

- In the summary, it mentions there is no statistical difference between B5 soy and B10 Animal. However, it does NOT mention that there is a statistical difference between B5 soy and B5 Animal as well as B10 soy versus B10 Animal. The staff's report needs to give Animal biodiesel equal treatment in the write up. **ADF 13-32**

7. **Additional Technical Comments**

- On page 25 of the ISOR, in the SWRCB regulation section, ARB mentions that B5 has undergone UL certification. It is important to include the fact that fuels above B6 have not undergone independent certification and there is no current activity to obtain certification. As such, B6-B20 blends of biodiesel are generally stored above ground. ARB's ISOR also makes no mention of the UST status of renewable diesel as expressed by the joint SWRCB/ARB statement saying that Renewable diesel should be treated the same as CARB Diesel. **ADF 13-33**
  http://industries.ul.com/wp-content/uploads/sites/2/2015/01/B5_Biodiesel.pdf
  http://www.arb.ca.gov/fuels/lcfs/20130731arbwaterboardjointstatementrd.pdf

- In the ISOR on page 41, in the NOx Emissions Data Analysis section, ARB mentions that B5-soy is 1% higher NOx than CARB Diesel and is highly statistically significant; B10-soy is 2% higher; B5-animal is not statistically different; and B10 animal is not statistically different from CARB Diesel. However, in Appendix G it was stated that B5-soy and B10 Animal **ADF 13-34**

were statistically no different. There is evidently a conflict between the ISOR and Appendix G that needs correcting.

ADF 13-34 cont.

- Chapter 7, Air Quality and Environmental Justice in the ISOR – p. 50: WSPA notes in the discussion of emission reductions, that the introduction of biodiesel only provides PM, HC and air toxic benefits for legacy, pre-2007 vehicles. For 2007 and later vehicles, these benefits would have been realized with or without biodiesel in the market. The benefit should not be lumped into the biodiesel benefit side.

ADF 13-35

- On page 52, it states biodiesel provides short-term PM, HC and air toxics benefits due to legacy vehicles. Long-term benefit would already be realized by the fleet turnover to NTDEs that was in motion prior to the biodiesel regulation, so ARB needs to revise its claims.

ADF 13-36

- On page 9 of the ADF15 Notice, under benefits, it states "*Premature deaths caused by ultra-fine particles are expected to decrease by 90 per cent in 2020 due to biodiesel and renewable diesel replacing petroleum diesel*." This statement should not be included as a benefit because the vehicle fleet turnover would reduce ultra-fine particles with or without biodiesel or renewable diesel. The contribution benefit lies solely with the ULSD/DPF combo and should not be attributed to biodiesel or renewable diesel.

ADF 13-37

8. <u>Previous 2013 ADF Postponed Hearing - WSPA Comments that are still relevant</u>

- **<u>2293.2 Definitions</u>**

Changes to definitions should be made as follows:

<u>Biodiesel Blend</u>

A biodiesel blend may consist of biodiesel blended with petroleum based diesel, renewable diesel, GTL, and/or other Fischer-Tropsch fuels. Therefore, the term "petroleum based" within the definition of "Biodiesel Blend" should be replaced with the broader term "CARB diesel" as follows:

ADF 13-38

"Biodiesel Blend" means biodiesel blended with ~~petroleum based~~ ***<u>CARB</u>*** *diesel fuel."*

We assume CARB diesel includes GTL, renewable diesel, etc.

<u>"Diesel Substitute"</u>

"Diesel Substitute" is a circular term as defined in the proposed regulation, because renewable diesel is both CARB diesel and under this definition a "Diesel Substitute". We believe the term "Low Emission Diesel" or something similar conveys ARB's intent better than the term "Diesel Substitute". "Diesel

ADF 13-39

Substitute" should be replaced with this updated term throughout the proposed regulation and have the following definition:

*"~~Diesel Substitute~~ **Low Emission Diesel**" means ~~any liquid fuel that is intended for use with CARB diesel or CARB diesel blends in a compression ignition engine~~ **a type of CARB diesel fuel that can reduce emissions of one or more criteria or toxic air contaminants relative to reference CARB diesel**. "~~Diesel substitute~~ **Low Emission Diesel**" includes, but is not limited to, renewable diesel; gas-to-liquid fuels; Fischer-Tropsch fuels; CARB diesel blended with additives specifically formulated to reduce emissions of one or more criteria or toxic air contaminants relative to reference CARB diesel; and CARB diesel specifically formulated to reduce emissions of one or more criteria or toxic air contaminants relative to reference CARB diesel."*

ADF 13-39 cont.

"Hydrocarbon"

The definition of "Hydrocarbon" is as follows:

"Hydrocarbon means any chemical mixture that is composed solely of hydrogen and carbon."

This definition ignores the fact that hydrocarbon mixtures, although of an elemental composition consisting primarily of carbon and hydrogen, also contain sulfur, oxygen or nitrogen from residual impurities and contaminants (excluding added oxygenated materials). To avoid potential confusion, we recommend ARB instead adopt the definition used in ASTM D975 for "hydrocarbon oil" as the definition for "hydrocarbon" in the ADF regulation as follows:

ADF 13-40

*Hydrocarbon means ~~any chemical mixture that is composed solely of hydrogen and carbon~~. **a homogeneous mixture or solution with elemental composition primarily of carbon and hydrogen and also containing sulfur, oxygen and/or nitrogen from residual impurities and contaminants and excluding added oxygenated materials.***

- **Section 2293.3 Exemptions**

Paragraph 2293.3 (b) exempting CARB diesel from the ADF regulation states CARB diesel blends are comprised solely of CARB diesel and one or more diesel additives that comprise "in the aggregate" no more than 1.0 percent by volume of the CARB diesel blend. EPA limits additives in diesel fuel to 1 percent individually per 40 CFR80.521(b)(1) . We believe ARB should do the same for consistency. Therefore, section 2293.3 (b) should be modified as follows:

ADF 13-41

*"CARB diesel blends comprised solely of CARB diesel and one or more diesel additives **individually** comprising ~~in the aggregate~~ no more than 1.0 percent by volume of the CARB diesel blend. This provision does not apply to additives used pursuant to the in-use requirements specified in Appendix 1;"*

40CFR80.521 is accessible via the Electronic Code of Federal Regulations at:

http://www.ecfr.gov/cgi-bin/text-idx?SID=ca97c6c0579783920cb5aab1e3ae3def&node=40:17.0.1.1.9.9.63.11&rgn=div8

ADF 13-41 cont.

- **Section 2293.4 General Requirements Applicable to All ADFs**

  ARB made no changes addressing previous WSPA comments that Part (b) of this paragraph indicates an ADF must meet all of DMS' regulatory requirements/standards. We can foresee a possible problem whereby the two agencies (ARB and DMS) adopt current ASTM versions at different times – thereby making it difficult if not impossible to comply with both versions for a period of time.

ADF 13-42

- **Section 2293.5 (d) Commercial Sales Not Subject to In-Use Requirements**

  If ARB has determined that there are no potential adverse emission impacts for an ADF (the fuel is a Stage 3B ADF) and no mitigation measures and/or sales restrictions are required for that ADF, why then does a "fuel provider" (term not defined) need to submit quarterly reports to the ARB Executive Officer? This reporting seems unnecessary and redundant as ARB implies the production/import volume information will already be captured within LCFS quarterly submittals. Please explain the purpose of this requirement.

ADF 13-43

Appendix 1:
Supplemental Western States Petroleum Association Comments on
ARB's Alternative Diesel Fuel Regulation

Excerpts from the Tier I, II & III Biodiesel MME Reports on
The *Need for Additive Impact Assessment* Prior to Widespread Use

Final Tier III Report[3]
The Executive Summary of the final Tier III MME report for biodiesel states the following related to additives (*emphasis* added).:

From the EXECUTIVE SUMMARY, section Issues of Ongoing Concern:

Additives

- As with air emissions, it should be recognized that, due to the large number of fuel formulations along with the resources and cost required to evaluate each formulation, it is not feasible to assess all combinations of engine types and fuel formulations. This is especially the case with additives, since the number of additive and feedstock combinations could be very large. So it will be important in future assessments to target a smaller set of archetypal and informative combinations of engines and fuel formulations. The *Air Emissions* studies evaluated two additives both for NO_x reduction. Neat biodiesel fuels were also additized with a stability additive to help provide sufficient stability against oxidation throughout the program (Durbin et al, 2011). *Effects of other additives such as biocides and cold flow enhancers may be necessary if these are planned for use. Additional additives for NO_x reduction may also need to be tested prior to widespread use* i.e. urea.

ADF 13-44

- California low-aromatics and -sulfur diesel-fuel formulations require the addition of cetane enhancers to achieve required emissions reductions. These additives are anticipated to be used in biodiesel blends as well. Further reducing the aromatics also can reduce lubricity and most California diesel includes a lubricity additive. Further, when diesel is distributed by pipeline, the pipeline operator may inject corrosion inhibiting and/or drag reducing additives. A typical additive package may contain: a detergent/dispersant, one or more stabilizing additives, a cetane number improver, a low temperature operability additive (flow improver or pour point reducer), and a biocide. Each refiner or marketer is likely to use a different package of additives and a different treat rate. The specific chemical composition of the additives used by various biodiesel manufactures is typically not specified and the environmental impact of these additives is not well described. *The impact from releases of associated additives and production chemicals not yet characterized could be of concern unless state guidelines restrict additives to those already in use and/or already characterized.*

ADF 13-45

[3] http://www.arb.ca.gov/fuels/multimedia/meetings/Biodiesel_FinalReport_May2013_101113.pdf

- However, in the case of B20, it is reasonable to assume that most of the additives used in biodiesel are currently used in CARB ULSD and would continue to be used with no substantive difference in environmental impact due to additives. If this is the case, then new studies on multimedia transport and impact from additives would not be needed *except where impacts in conventional ULSD use are either unknown or unacceptable*.

ADF 13-46

Toxicity

- Assessing the aquatic toxicity of biodiesel is a priority in California for a variety of reasons. First, … *Third, the possibility of additives may also create differences in the toxicity of biodiesel used in California rather than the biodiesel used in previous studies*. ….

ADF 13-47

Transport and Fate

- While the results of the existing biodegradation experiments appear favorable for B100 and biodiesel blends with diesel, further evaluation is needed using the most up to date reference fuel for the state of California, CARB ULSD #2. *In addition, due to various additive components not included in this multimedia assessment that may be necessary to improve fuel combustion properties, additional study of biodegradation is also needed to evaluate the impacts from the additives*. Additives to prevent microbial growth in the fuel during storage and use may lead to significantly reduced biodegradation. Reducing biodegradation may lead to increased transport and mobility in the environment, especially in the subsurface where cleanup is especially difficult. Since biodiesel is a mild solvent, the solvency could potentially remobilize pre-existing chemical compounds in the area affected by a release.

ADF 13-48

Tier II MME Report[4]

The Tier II report stated there are knowledge gaps related to use additives and recommended additional testing:

From EXECUTIVE SUMMARY,

Remaining Tier II Uncertainties

- *Additional testing addressing the potential toxicity of additives including chemical analysis of exposure medium is needed*.
- *Of the three groups of additives only blends with antioxidants, and biocidal additives (biodegradation experiments only) were studied*. Cold flow additives were not studied in any of the performed experiments. The impact of cold flow additives on aquatic toxicity and biodegradation needs to be studied….

ADF 13-49

Tier I Report[5]

[4] http://www.arb.ca.gov/fuels/multimedia/meetings/Biodiesel_FinalTierII_Jan2012_110413.pdf
[5] http://www.arb.ca.gov/fuels/multimedia/meetings/Biodiesel_FinalTierIReport_Sep2009_110413.pdf

The conclusion of the Tier I MME report, it was stated that evaluation of additive impacts needs to be evaluated as part of the Tier II evaluations:

From EXECUTIVE SUMMARY,

Key Information Gaps and the Tier-II Sampling Plan

1. **Additives impacts.** To provide a stable useful, and reliable fuel, additive chemicals will need to be introduced into almost all biodiesel blends. These additives will be required to control oxidation, corrosion, foaming, cold temperature flow properties, biodegradation, water separation, and NOx formation. The specific chemicals and amounts used have not been well defined for the emerging industry in California. A careful evaluation the possible chemicals would be beneficial to California and may lead to a "recommended list" or "acceptable list" that would minimize the uncertainty of future impacts as industry standards are developed.

   The impact of various additives that may be used with *biodiesel blends needs to be considered for releases to the air, water, and soils. Additives may affect fuel quality or storage stability in unintended ways. Because the properties of additives can potentially alter the characteristics of biodiesel, increasing its environmental and health risks, there is a need for additional tests on biodiesel with specific concentrations of additives*. In particular it is necessary to assess the impact of
   - cold flow property controllers on surface water- biodiesel interaction and on subsurface multiphase transport of biodiesel (see number 2 below).
   - biocides and anti-oxidants on biodegradation (see number 3 below).
   - *all priority additives on human and ecosystem toxicity*

ADF 13-50

2. **Subsurface fate and transport properties.** The impacts of leaks and spills of biodiesel fuel product during transport, storage, and distribution have not been addressed. This is an important issue for California. Because the chemical composition of biodiesel differs significantly from that of petroleum diesel, it is expected that infiltration, redistribution, and lens formation on water tables will differ for the two fuels, leading potentially to significant differences in relative impacts to groundwater quality. Properties governing these processes are density, viscosity, and interfacial tensions. *Component (including additive) solubility into the water phase ultimately governs water quality and so inter-phase solubilization of individual components also needs to be identified. To address these issues requires experiments with conventional soil column tests that will be used to establish relative transport behaviors among different fuel compositions* and for site-specific analyses. But the relevance of these results for state-wide assessments should be considered along with the value of full-scale comparative field tests with releases into the groundwater, or into the vadose zone just above the groundwater table.

ADF 13-51

This page intentionally left blank.

Comment Letter 13_OP_ADF_WSPA Responses

ADF 13-1 The comment states that the proposed LCFS and ADF Regulations should be analyzed as two separate projects. See response to comment **LCFS 40-24**.

ADF 13-2 The commenter suggests that an alternative version of the proposed ADF Regulation should have been analyzed in the Draft EA. To the extent the joint LCFS/ADF project has potential environmental impacts, they result from the LCFS. Accordingly, staff analyzed alternative versions of the LCFS. The primary objective of the proposed ADF Regulation is to establish a comprehensive path to bring new or emerging diesel fuel substitutes to the commercial market in California as efficiently as possible while preserving or enhancing public health, the environment, and the emissions benefits of the State's existing diesel regulations. The proposed ADF Regulation also establishes specific rules governing the use of biodiesel fuel to ensure its use would meet the program goals of protecting public health and the environment.

The proposed ADF Regulation was developed for specific reasons: to commercialize alternative diesel fuels and to provide feasible mitigation to reduce NO_X emission impacts associated with biodiesel. Staff considered and rejected several NOx-reducing additives other than the one incorporated into the ADF, so in a sense alternatives were explored but not formally analyzed as alternatives to the entire LCFS/ADF project. See also response to comment **ADF 13-5** and **LCFS 40-35**. The no-project alternative is infeasible as a result of objectives of this regulation and the fact that mitigation requirements associated with the proposed ADF Regulation must be adopted to implement LCFS. Because the commenter does not provide a suggestion of an alternative that was not described in the document, no further response can be provided.

ADF 13-5 The comment recommends that ARB conduct a thorough assessment of the NO_X reduction additive proposed to be used as mitigation. Several additives were included in the consideration of potential mitigation options in support of the proposed ADF Regulation, including those that were evaluated and tested as part

of the ARB Emissions Study,[7] B20 Preliminary and Certification Testing,[8] and biodiesel multimedia evaluation. As part of the ARB Emissions Study,[9] DTBP and 2-EHN were tested and further evaluated as part of the biodiesel multimedia evaluation. A total of five other additives were evaluated as part of the B20 Biodiesel Preliminary and Certification Testing.[10] Based on the results of the studies, DTBP was the only additive to fully mitigate the NO_X impact from the candidate B20 biodiesel fuel. Therefore, DTBP was the only additive included as a mitigation option under the proposed ADF Regulation, although the regulation allows parties to propose emission-equivalent formulations or additives in Appendix 1 to the regulation.

We appreciate the suggestion to check with U.S. EPA on specified issues. ARB staff plans to coordinate with U.S. EPA as that agency performs further analysis.

ADF 13-6 The comment states that ADF and LCFS should be analyzed under separate EAs. Please see response to comment **LCFS 40-24**.

ADF 13-7 The commenter implies that ARB has improperly cited CEQA Guidelines Section 15378(a) to support the approach of reviewing the proposed LCFS and ADF together in the Environmental Assessment. Please see response to comment **LCFS 40-24**.

The commenter also refers to two court cases to support the assertion that the proposed LCFS and ADF Regulations should not have been analyzed in one EA. See response to **LCFS 40-26**.

ADF 13-8 The commenter suggests that it is not clear which regulation, ADF or LCFS, would result in the impacts discussed in the Draft EA. Please see responses to comments **LCFS 40-27** and **ADF 13-7**.

ADF 13-9 The commenter refers to the case *Laurel Heights Improvement Association v. Regents of University of California* (1988) 47 Cal.3d 376, implying that the EA is not meaningfully informative. See responses to **LCFS 40-27** and **LCFS 40-29**.

[7] Durbin, T.D. et al. *CARB Assessment of the Emissions from the Use of Biodiesel as a Motor Vehicle Fuel in California "Biodiesel Characterization and NOx Mitigation Study."* October 2011.
[8] Durbin, T.D. et al. *CARB B20 Biodiesel Preliminary and Certification Testing.* July 2013.
[9] Durbin, T.D. et al. *CARB Assessment of the Emissions from the Use of Biodiesel as a Motor Vehicle Fuel in California "Biodiesel Characterization and NOx Mitigation Study."* October 2011.
[10] Durbin, T.D. et al. *CARB B20 Biodiesel Preliminary and Certification Testing.* July 2013.

ADF 13-10 The commenter is correct in stating that an environment review document must consider a reasonable range of alternatives to the project. In addition to case law, CEQA Guidelines Section 15126.6 describes requirements for consideration and discussion of alternatives.

See response to **LCFS 40-31**.

ADF 13-11 The commenter states that the Draft EA only analyzed a no project alternative. See responses to **LCFS 40-30** through **LCFS 40-36.**

ADF 13-12 The commenter notes that the Draft EA presents a "No Trading Case Alternative," but does not describe it further. See response to **LCFS 40-33**.

ADF 13-13 The commenter states that the titles provided for the project alternatives are misleading but doesn't identify any alternative titles that would address the commenter's concerns.

See response to **LCFS 40-34**.

ADF 13-14 The commenter states that the Draft EA does not provide a sufficient number of alternatives to the proposed regulations. See responses to **LCFS 40-30** through **LCFS 40-36**.

ADF 13-15 The commenter states that additional alternatives should have been analyzed to comply with CEQA requirements. This issue is addressed in **LCFS 40-32** through **LCFS 40-45** and in detail in **LCFS 40-36**.

ADF 13-17 The comment reviews the features of the ADF Regulation that comport with the commenter's earlier suggestions in 2013. The commenter expresses doubts that the NOx increase assumed to occur at the B5 level are real. Rather, the commenter believes that the perceived NOx increases are an artifact of which studies ARB chose to rely on.

ARB staff relied on the best available data to compare Low Saturation biodiesel (e.g., soy-based blends) with CARB diesel. The Staff Report, chapter 6, subpart 3 contains general results of our findings, while a more thorough analysis can be found in Appendix G. In these sections, staff explains that B5 soy-based blends consistently resulted in an increase of about 1 percent in NO_X emissions over CARB diesel, while B10 soy-based blends consistently produced about a 2 percent increase. In both of these cases, the results were found to be statistically significant given the

number of tests performed. Therefore, the data support our conclusions. For more information on staff statistical analysis please see responses to comments **ADF 17-9** and **ADF B3-74**

ADF 13-18 The comment requests that Gas-To-Liquid diesel (GTL) be clearly identified as a mitigation option. GTL is no longer an allowable in-use control option for biodiesel in the proposed regulation for the same reason as renewable diesel. This is because any fungible diesel replacement can be considered an offsetting factor and is not an in-use control because such use could potentially constitute double counting of emissions benefits. GTL is a diesel fuel with a high cetane number that has been shown to reduce emissions of NO_X and PM compared to CARB diesel. As such, GTL meets the definition of "*offsetting factor*" in the proposal and may be used to offset the emissions of pollutants from the use of an ADF.

ADF 13-20 The comment asserts that commercially available diesel should be allowed as the reference diesel in place of 10 percent aromatic reference diesel when undergoing certification under the proposed ADF Regulation. This is because commercially available diesel has already been deemed equivalent to the 10 percent aromatic reference diesel. Staff disagrees. The ADF Regulation compares fuels to California diesel. The 10 percent aromatic reference "CARB diesel" is the fuel against which all California diesel formulations are compared and is the standard for diesel emissions comparison when determining equivalence. Therefore, use of the 10 percent aromatic reference diesel in the ADF Regulation to determine equivalency with diesel is appropriate and consistent with existing fuel policies. Accordingly, biodiesel should be compared to the same reference diesel fuel in order to control the conditions of the testing and to ensure that results from testing are comparable across the diesel aromatic regulation and the ADF Regulation. If a commercial diesel were to be used to determine equivalence it would lead to additional error and thus may mask some fuel based changes due to variation in the baseline.

Regarding the comment's argument that biodiesel testing used commercial diesel, this is correct; however, the purpose of that testing was not to determine equivalence with diesel fuel but rather to measure the effects of biodiesel derived from multiple feedstocks in different engines using different duty cycles than are required for certification so the use of commercial diesel fuel was appropriate. Many more tests, engines, and a variety of feedstocks and baseline fuels were used in the studies that staff relied upon than would be used in a certification test program.

ADF 13-22

The comment states that language in Appendix 1 (a)(2)(G)2 is vague. In the ADF Regulation, ARB staff has identified properties that are important for understanding the potential health effects from the use of a fuel formulation with additives; e.g., cellular tests on the particulate emissions from heavy-duty engines show no greater harm than the fuel reference for mutagenicity, inflammation, DNA damage, or oxidative stress with the use of any such additive. However, test methods for performing the tests that determine these properties are not standardized at this time, and what might be an appropriate methodology in one circumstance may not be adequate in another. Prescribing specific test methodologies in the regulation as urged in the comment is not possible given the lack of standardization and the need to tailor tests based on the substance being assessed. For that reason, the regulation lists the properties to be tested and leaves the specific test methods to be established on a case-by-case basis. Because test methodology would be adjusted based on the substance and properties being tested, these methodologies are not a standard of general application that are included in the proposed regulation.

While we understand the desire for easily comparable results, we believe the flexibility for applicants would be more valuable. Staff would work with applicants to determine the exact details of appropriate test methods during the application process. In addition, the test requirements for the number of samples, treatments, and replicates would be in the test procedure which would allow adequate comparisons to be made when needed.

Also, with regard to the rule's need to specify the use of qualified laboratories with rigorous QA/QC procedures, the rule requires that, as part of the test protocol submitted pursuant to Appendix 1 (a)(2)(A)1, ARB approve both the entity proposed to conduct the tests and the quality assurance and quality control procedures. Thus, ARB would be able to ensure that the tests are done with adequate quality controls in place.

ADF 13-29

The comment states that the Draft EA incorrectly defines an alternative diesel fuel as a liquid fuel that is not a hydrocarbon. The text in the first paragraph of Section 2.B of the Draft EA has been modified as follows:

> Complementary State and federal policies, such as the federal Renewable Fuel Standard (RFS) and LCFS, are expected to drive increased demand in California for ADFs. ADFs include <u>any fuel used in diesel engines that is not a</u>

reformulated diesel fuel as defined in sections 2281 and 2282 of Title 13, CCR, and does not require engine or fuel system modifications for the engine to operate, other than minor modifications (e.g., recalibration of the engine fuel control) that may enhance performance. Examples of ADFs include, but are not limited to, biodiesel, Fischer-Tropsch fuels, and emulsions of water in diesel fuel. ~~liquid fuels that are not hydrocarbon, but can replace petroleum-based diesel fuel, and are not covered under existing alternative fuels specifications (13 CCR 2290 et seq)~~. The purpose of the proposed ADF Regulation is twofold: 1) establish a comprehensive, multi-stage process governing the commercialization of ADF formulations in California's market; and, 2) to establish special provisions for biodiesel as the first recognized ADF and to permit its use within California's commercial fuels market in volumes and blends that would result in no significant adverse impacts on public health or the environment relative to conventional petroleum CARB diesel. Regulation of ADFs is necessary to ensure that the rapid development of these fuels in response to LCFS and RFS does not interfere with the public health and environmental standards enforced by ARB.

ADF 13-30 The comment states that the text of the Draft EA should be modified to explain that a biodiesel cetane index does not exist and would be developed for potential future use. The comment is correct; there is no biodiesel cetane index. ARB staff made a clerical error. Staff intended to reference "cetane number," not "cetane index." Section 2.F. of the EA has been modified to reflect this change.

ADF 13-31 The comment questions whether the PM, HC, and CO reductions attributed to the LCFS program in Appendix E of the Combined LCFS/ADF SRIA are appropriate. The commenter is correct that this decrease is much less than that achieved by the use of diesel particulate filters, whose reductions were not attributed to the LCFS. Staff attributed only the PM and other pollutant decrease directly attributable to biodiesel and renewable diesel to the LCFS since biodiesel and renewable diesel use would presumably increase with the LCFS.

ADF 13-34 The comment indicates that there is a conflict between the ISOR and Appendix G. There is no conflict. In Appendix G, the statistical relationship between B5 soy and B10 animal NOx emissions is described as not significant and is a description of the statistical

relationship between two biodiesel blends. In contrast, on page 41 of the ISOR, the statistical differences shown are a comparison of the biodiesel blends to *CARB diesel*, rather than a comparison of one blend of biodiesel to a different biodiesel blend.

The complete set of statistical comparisons between biodiesel and CARB diesel are listed below:

- B5 soy NOx emissions are significantly higher than CARB diesel NOx emissions.
- B10 soy NOx emissions are significantly higher than CARB diesel NOx emissions.
- B5 animal NOx emissions are not significantly higher than CARB diesel NOx emissions.
- B10 animal NOx emissions are not significantly higher than CARB diesel NOx emissions.

ADF 13-35 The comment states that in the discussion of emission reductions in the ISOR, the introduction of biodiesel only provides air toxics benefits for legacy, pre-2007 vehicles. Staff looked separately at the impacts of biodiesel in pre-2007 and 2007 and later engines. Staff attributed PM, but not HC reductions, to biodiesel used in all vehicles, including 2007 and later engines. Engineering analysis supports the expectation that biodiesel would yield the roughly the same percentage diesel PM benefit in 2007 and later engines equipped with a diesel particulate filter. However, this would result in a lower absolute reduction in PM emissions, since the reduction would occur from a lower baseline. Staff did not examine the effects of air toxics other than diesel PM.

For more information on staff's statistical analysis please see response to comments **ADF 17-9** and **ADF B3-74**.

ADF 13-36 The comment states that ARB should not include PM benefits from use of biodiesel in NTDEs. Please see response to **ADF 13-35**.

ADF 13-37 The comment states that the 90 percent reduction in premature death from biodiesel and renewable diesel use by 2020 claimed in the ADF 45-day notice should be attributed to the use of diesel particulate filters. The 90 percent claim was a typographical error, it should have read "premature deaths caused by ultra-fine particles are expected to decrease by 90 in 2020." In other words the reduction in premature deaths was expressed erroneously as a

percent rather than number of premature deaths. Please also see response to **ADF 13-35**.

ADF 13-43 The comment asks why quarterly reports would need to be submitted to ARB for Stage 3B fuels. In the event ARB needs to do additional analysis on 3B fuels, the data from those fuels would be necessary. The quarterly reporting requirement parallels that of the LCFS, and can be satisfied by using the LRT. ARB staff made 15-day changes clarifying that the LRT could be used for reporting of Stage 3B fuels. The responsible parties must provide notice to ARB of their intent to use the LRT prior to report submittal.

ADF 13-44 The comment reproduces text from the final Tier III MME Executive Summary. As stated at the beginning of Appendix 1, these statements are in fact excerpts from the Biodiesel MME Tier I, II, and III Reports.[11,12,13] Appendix 1 was attached and specifically referenced in comment **ADF 13-5**. The specific statement that references Appendix 1 of comment 5 is provided verbatim below

> We note the Tier I, Tier II, and Tier III MME reports all concluded that the impact of priority or widely used additives would need further evaluation (see excerpted references in Appendix 1 attached).

The excerpt from the Tier III MME Executive Summary states that the effects of other additives such as biocides and cold flow enhancers may be necessary if these are planned for use. Also, additional additives for NOx reduction may also need to be tested prior to widespread use.

A multimedia evaluation of biodiesel was conducted and reviewed by the California Environmental Policy Council (CEPC) pursuant to HSC section 43830.8. As defined in HSC section 43830.8(b), a multimedia evaluation is the identification and evaluation of any significant adverse impact on public health or the environment from the production, use, or disposal of the motor vehicle fuel that may be used to meet the fuel specifications. Therefore, a complete multimedia evaluation was conducted for biodiesel in line with the proposed fuel specifications as part of the proposed ADF

[11] Ginn, T.R. et al. *California Biodiesel Multimedia Evaluation Tier I Report*. September 2009.
[12] Ginn, T.R. et al. *California Biodiesel Multimedia Evaluation Tier II Report on Aquatic Toxicity, Biodegradation, and Subsurface Transport Experiments.* January 2012.
[13] Ginn, T.R. et al. *California Biodiesel Multimedia Evaluation Final Tier III Report*, June 2014.

Regulation. The MMWG's conclusions and recommendations to the CEPC are based on biodiesel fuels that meet the proposed ADF Regulation and approved additives used during testing. Since fuel specifications are not being established for a specific fuel additive under the proposed regulation, a full multimedia evaluation of the additive is beyond the scope of the biodiesel evaluation and not required. Furthermore, all fuel additives produced and commercially distributed are required to meet federal requirements and health effects testing under the Clean Air Act section 211.

In June 2015, the CEPC reviewed the biodiesel multimedia evaluation and proposed ADF Regulation, and determined at its June 23, 2015 meeting, that the use of biodiesel in California consistent with the proposed ADF Regulation would not pose a significant adverse impact on public health or the environment compared to CARB diesel fuel.

For the complete response, please see response **ADF 13-5**.

ADF 13-45 The comment reproduces text from the final Tier III MME Executive Summary. This is a replication of staff's statements in the executive summary of the Tier III biodiesel report. This is not an original comment and therefore no further response is needed.

ADF 13-46 The comment states that in the case of B20, it is reasonable to assume that most of the additives used in biodiesel are currently used in CARB ULSD and would continue to be used with no substantive difference in environmental impact due to additives. Please see response to **ADF 13-5**.

ADF 13-47 The commenter notes that the Tier II Biodiesel MME states that "the possibility of additives may also create differences in the toxicity of biodiesel used in California rather than the biodiesel used in previous studies." Please see responses to comments **ADF 13-44** and **ADF 13-5**.

ADF 13-48 The comment reproduces text from the final Tier II MME Executive Summary. Please see response **ADF 13-44** and **ADF 13-5**.

ADF 13-49 The comment reproduces text from the final Tier II MME Executive Summary. Please see response **ADF 13-44** and **ADF 13-5**.

ADF 13-50 The comment reproduces text from the final Tier II MME Executive Summary. Please see response **ADF 13-44** and **ADF 13-5**.

ADF 13-51 The comment reproduces text from the final Tier II MME Executive Summary. Please see response **ADF 13-44** and **ADF 13-5**.

Comment letter code: 16_OP_ADF_POET

Commenter: Joshua Willter

Affiliation: POET LLC

The following letter was submitted to the ADF Docket during the 45-day comment period.

This page intentionally left blank.

16_OP_ADF _POET

POET
HUMAN + NATURE
O / 605 965 2200 4615 N. LEWIS AVE. SIOUX FALLS, SD 57104 POET.COM

February 17, 2015

By Electronic Mail

Clerk of the Board
California Air Resources Board
1001 I Street, 23rd Floor
Sacramento, CA 95812

Re: Proposed Amendments to the California Low-Carbon Fuel Standards Regulation and the Proposed Regulation of the Commercialization of Alternative Diesel Fuels

Dear Madam:

POET LLC, a member of Growth Energy, concurs in the comments being filed today by Growth Energy, including the environmental analysis under the California Environmental Quality Act offered by Growth Energy, as well as the alternative to the above-captioned proposed amendments and regulations that have been proposed by Growth Energy. Please file this letter in the two separate dockets for the the proposed amendments to the California Low-Carbon Fuel Standards ("LCFS") regulation and the proposed regulation of the commercialization of alternative diesel fuels

ADF 16-1

POET LLC expects to file additional comments prior to the close of the record in the LCFS proceeding.

Thank you for your consideration and assistance.

Sincerely,

Shailesh Sahay
Regulatory Counsel

Revised POET CEQA concurrence 17 feb

This page intentionally left blank.

Comment Letter 16_OP_ADF_POET Responses

ADF 16-1 Concurrence with comments filed by Growth Energy is noted. Please see responses to Comment Letter 17_OP_ADF_GE.

This page intentionally left blank.

Comment letter code: 3_B_ADF_GE

Commenter: Joshua Willter

Affiliation: Growth Energy

The following letter was submitted to the ADF Docket during the First Board Hearing. The comment letter is 561 pages long. Only pages 132 – 204, 211– 224, 235 – 242, 271 – 277, 317 – 321, 365 – 376, and 519 – 558 contain environmental comments and are reproduced here.

This page intentionally left blank.

12_B_LCFS _GE

3_B_ADF _GE

Comments of Growth Energy on the Air Resources Board Staff Presentations at a Public Consultation Meeting on Regulations for Commercialization of Alternative Diesel Fuels

These comments respond to the CARB staff's request for comments on the staff's presentations at the November 21, 2014 public consultation meeting on the proposed adoption of regulations to govern commercialization of alternative diesel fuels, including as part of compliance strategies for the California Low Carbon Fuel Standard ("LCFS") regulation.

1. Methodology for Assessing Impact of Biodiesel Use on NOx Emissions

As Growth Energy has commented previously, CARB staff's approach to assessing the NOx emission impacts of biodiesel and biodiesel blends in heavy-duty diesel engines is flawed.[1] The staff's approach does not adequately protect the environment, in part because it ignores the fact that the existing emissions test data indicate that there are statistically significant increases in emissions of oxides of nitrogen (NOx) at biodiesel blend levels below B5, the lowest level at which CARB staff has chosen to perform testing. As fully explained in an expert report prepared for Growth Energy by Mr. Robert Crawford of Rincon-Ranch Consulting,[2] any sound statistical analysis of the available data indicates that statistically significant increases in NOx emissions occur at biodiesel blend levels below B5.

ADF B3-1

In light of the recent release of biodiesel emissions data by CARB staff, Mr. Crawford has updated his work to include all of that data. The results of this updated analysis were summarized by Jim Lyons of Sierra Research during a presentation made at the October 20, 2014 ADF workshop, and detailed documentation regarding the updated analysis was provided to CARB staff

ADF B3-2

[1] See Attachments A – D.

[2] See Crawford, R., "NOx Emission Impact of Soy- and Animal-based Biodiesel Fuels: A Re-Analysis," December 10, 2013.

by Mr. Lyons via email on October 24, 2014,[3] along with a request that it be posted on agency's ADF website.

As CARB staff has been advised, inclusion of the newly released biodiesel emission test data does not alter Mr. Crawford's previous findings. Likewise, the CARB staff's decision to characterize biodiesels as "low saturation" or "high saturation," instead of "soy" or "animal" based," does nothing to alter Mr. Crawford's findings or protect against increases in NOx emissions resulting from biodiesel use in California. CARB staff has not posted Mr. Crawford's updated analysis on the agency's ADF webpage; has never discussed or explained why it has not adopted Mr. Crawford's approach; and did not discuss Mr. Crawford's revised analysis in any way during the November 21, 2014 workshop. CARB staff appears determined to avoid full public review of the available data, in violation of its environmental protection regulations and the statutes that apply to this rulemaking, including the California Environmental Quality Act ("CEQA") and the Global Warming Solutions Act of 2006 ("AB 32").

ADF B3-2 cont.

2. Proposed Biodiesel Control Levels

For what it treats as low saturation biodiesel blends, CARB staff is proposing a control level of B5 from April 1 to October 31 of each year and a control level of B10 throughout California during the rest of the year. What this means, based on the proposed regulatory language[4] released by CARB staff, is that during the summer, mitigation of increased NOx emissions is not required until low saturation biodiesel blend levels exceed B5 (e.g., B6)—despite the fact that ***CARB staff acknowledges that statistically significant impacts occur at the B5***

ADF B3-3

[3] Although these were already provided to CARB staff, materials related to Mr. Crawford's most recent analysis are attached to these comments.

[4] Proposed Section 2293.6(a)(2).

level.[5] Given this, there can be no dispute that the staff proposal will result in increases in NOx emissions in California. Such an outcome, however, is not permitted under CEQA and AB 32.

ADF B3-3 cont.

During the winter the control level for low saturation biodiesel blends increases from B5 to B10, meaning that NOx mitigation is not required until the biodiesel blend level reaches B11. As a result, CARB staff is allowing unmitigated increases in NOx emissions in California to as much as double during the winter. Further, Growth Energy is not aware of, nor has CARB staff identified, any other NOx control measure affecting stationary, area, or mobile sources that is allowed to be relaxed during the winter months anywhere in California. Such an inconsistency cannot be squared with CARB's CEQA obligations or the requirements of AB 32, which include the avoidance of controls that would have the effect of increasing regulated emissions (such as NOx) or hampering compliance with state and federal ambient air quality regulations.

ADF B3-4

For high saturation biodiesel blends, CARB staff is proposing a year-round control level of B10, meaning that NOx mitigation is not required until the B11 level. Again, this is above the B10 level at which even CARB staff has determined that statistically significant increases in NOx emissions will occur; therefore, it will allow unmitigated increases in NOx emissions to occur throughout California.

Growth Energy again urges CARB staff to revise its proposal to ensure that it is protective of California air quality by requiring mitigation of potential NOx emission increases from all levels of biodiesel blends, the need for which is indicated by Mr. Crawford's work. CARB cannot risk increases in NOx emissions by failing to require year-round NOx mitigation for low saturation

---

[5] This was acknowledged by CARB staff at the October 20th workshop. See *http://www.arb.ca.gov/fuels/diesel/altdiesel/20141017_ADF_statistical_analysis.pdf* and *http://www.arb.ca.gov/fuels/diesel/altdiesel/20141017_ADF_discussion_paper.pdf*

biodiesel blends beginning at the B5 level, and for high saturation biodiesel blends beginning at the B10 level.

ADF B3-4 cont.

3. New Technology Diesel Engines and the Sunset and Exemption Provisions

CARB staff claims, currently without empirical support or any other explanation, that the use of biodiesel blends in so-called "new technology diesel engines" (NTDEs) will not result in increased NOx emissions regardless of the type of biodiesel used or the blend level up to at least B20. Based on that claim, CARB staff is proposing to eliminate the requirements for mitigation of biodiesel-related NOx emission increases when the population of vehicles equipped with NTDEs in the California truck fleet reaches a certain level and for biodiesel blends used by centrally fueled truck fleets that are composed of at least 90% of vehicles equipped with NTDEs. The available studies in the peer-reviewed literature, which have been previously identified by Growth Energy for CARB staff,[6] contradict the staff's claim. The proposed exemptions for fleets of vehicles comprised mainly of vehicles equipped with NTDEs and the sunset provisions are therefore not permitted under the governing statutes because they would permit an unmitigated risk of increased NOx emissions, and adverse impacts on air quality.

ADF B3-5

4. Definitions of CARB Diesel and Blend Level

At present, CARB staff is proposing to define "CARB diesel" to which biodiesel will be allowed to be blended under the ADF regulation as follows:[7]

> *...a light or middle distillate fuel that may be comingled with up to five (5) volume percent biodiesel and meets the definition and requirements for "diesel fuel" or "California nonvehicular diesel fuel" as specified in 13 CCR 2281, et seq. "CARB diesel" may include: renewable diesel; gas-to-liquid fuels; Fischer-Tropsch diesel; CARB diesel blended with additives specifically formulated to reduce emissions of one or more criteria or toxic air contaminants relative to reference CARB diesel;*

ADF B3-6

[6] See Attachment D

[7] Proposed Section 2293.2(a)(9)

and CARB diesel specifically formulated to reduce emissions of one or more criteria or toxic air contaminants relative to reference CARB diesel.

The "blend level" of a biodiesel blend or blend of another ADF would be defined[8] as follows:

...the ratio of an ADF to the CARB diesel it is blended with, expressed as a percent by volume. The blend level may also be expressed as "AXX," where "A" represents the particular ADF and "XX" represents the percent by volume that ADF is present in the blend with CARB diesel (e.g., a 20 percent by volume biodiesel/CARB diesel blend is denoted as "B20").

Because "CARB diesel" can contain up to 5% biodiesel and the control levels proposed by CARB staff above which NOx mitigation is required are defined in terms of "blend levels," the actual biodiesel content of a biodiesel blend under the staff proposal could be as much as 5% greater than the "blend level" used to determine if NOx mitigation is required. Thus, for example, under the staff proposal NOx mitigation of a summer blend of "low saturation" biodiesel blend would not be required even though it contains 10% biodiesel and the unmitigated NOx emissions would be as much as twice those assumed by CARB staff.

ADF B3-6 cont.

There are at least two ways by which CARB staff could easily address this issue. The first would be to require biodiesel blenders to test the CARB diesel fuels they use in order to determine the biodiesel content and type of biodiesel present in a given CARB diesel before blending occurs. The second would be to require that biodiesel blenders use only CARB diesel fuels that have been certified as containing no biodiesel. In any case, CARB staff must modify its proposal to ensure that the actual biodiesel content of blends is accurately known and that appropriate NOx mitigation requirements are imposed. Failure by CARB staff to require accurate measurement and reporting of the biodiesel content of biodiesel blends will lead to unmitigated increases in NOx emissions

[8] Proposed Section 2293.2(a)(4)

along with other potential issues, including violations of pump labeling and vehicle manufacturer warranty requirements.

ADF B3-6 cont.

5. Phase-In Requirements and Program Review

Under the current staff proposal, although the ADF regulation would become effective on January 1, 2016, ***mitigation of increased NOx emissions from the use of biodiesel blends would not be required until 2018.***[9] In addition, CARB staff is proposing to perform a "review" of efficacy of the NOx mitigation requirements of the biodiesel provisions of the ADF regulation by December 31, 2019. [10] As in other respects, the CARB staff proposal fails to adequately protect against adverse air quality impacts and violates the statutes governing this rulemaking. To comply with CEQA and AB 32, the Board must mandate in the ADF rulemaking that mitigation of NOx increases commences as soon as the amended LCFS regulation becomes effective. CARB staff has not explained and cannot explain why California air quality should be exposed for an additional two years to adverse effects from the impacts of increased NOx emissions owing to biodiesel use (which CARB staff itself has estimated to be currently 1.3 tons per day statewide,[11] even after incorrectly assuming that there is no NOx increase from use of biodiesel in NTDEs).

ADF B3-7

Similarly, with respect to the program review, instead of acting to ensure that there are no adverse air quality impacts associated with biodiesel use by proposing mitigation requirements for all biodiesel blends of B1 and above, CARB staff is proposing to wait three years after the implementation of the ADF regulation before making an effort to "determine the efficacy" of the proposed NOx mitigation provisions. As pointed out numerous times in these and previous

ADF B3-8

[9] Proposed Section 2293.6(a)(1)

[10] Proposed Section 2293.6(a)(6)(A)

[11] See *http://www.arb.ca.gov/fuels/diesel/altdiesel/20141017_ADF_discussion_paper.pdf*

Growth Energy comments on the proposed ADF,[12] the currently proposed NOx mitigation provisions are inadequate and will result in increases in NOx emissions and associated adverse impacts on air quality in California. There is no legal basis for waiting until the end of 2019 for CARB staff to make that determination.

ADF B3-8 cont.

6. Authority Granted to the Executive Officer

Under the staff proposal, the Executive Officer, rather than the Board, would be authorized to make findings regarding the potential adverse environmental impacts of potential alternative diesel fuels other than biodiesel.[13] Under CEQA and the Board's implementing regulations, the duty to consider and assess, and to mitigate, potential adverse environmental impacts lies with the Board, not the Executive Officer. In the current rulemaking regarding biodiesel blends, CARB staff is establishing the precedent for the Board, rather than the Executive Officer, to make decisions regarding adverse environment impacts, and the same process must be followed for any future alternative diesel fuel.

ADF B3-9

7. Unfair Competitive Advantages

At present, producers and blenders of biodiesel used in California are allowed to profit from the sale of that fuel under the Low Carbon Fuel Standard (LCFS) regulation through the generation of LCFS credits, despite the fact that use of that fuel results in unmitigated increases in NOx emissions and adverse air quality impacts. Under the proposed ADF regulation, producers and blenders of other alternative diesel fuels would similarly be allowed to profit via the LCFS regulation during Stages 1, 2, and 3a, despite the fact that their products lead to adverse environmental impacts. Such an approach is unexplained and anticompetitive—CARB staff

ADF B3-10

[12] See Attachments A – D.

[13] See for example, proposed Sections 2293.5(b)(3), 2293.5(b)(6) 2293.5(c) and 2293.5(d).

should ensure that no ADF for which adverse environmental impacts have been established can generate LCFS credits ***before the producers of that ADF are required to mitigate those impacts***. For example, if CARB adopts the staff proposal that mitigation of biodiesel NOx impacts is not required until January 1, 2018, then no biodiesel sold in California before that time should be allowed to generate LCFS credits. If this issue is not addressed by CARB staff, producers and blenders of low carbon intensity fuels, such as ethanol, for which mitigation measures must be implemented will be disadvantaged, and producers and blenders of fuels such as biodiesel that are not required to mitigate adverse environmental impacts will be undeservedly rewarded.

ADF B3-10 cont.

Respectfully submitted,

GROWTH ENERGY

ATTACHMENT A

growth energy™
America's Ethanol Supporters

777 North Capitol Street, NE, Suite 805, Washington, D.C. 20002
PHONE 202.545.4000 FAX 202.545.4001 GrowthEnergy.org

December 12, 2013

By Electronic Mail

Clerk of the Board
California Air Resources Board
1001 I Street, 23rd Floor
Sacramento, California 95812

Re: Proposed Regulation to Govern Commercialization of New Alternative Diesel Fuels (2103 Cal. Reg. Notice Register 1646 (October 25, 2013)

Dear Madam:

Growth Energy, an association of the nation's leading ethanol manufacturers and other companies who serve the nation's need for alternative fuels, is submitting to you the enclosed materials in response to the October 15, 2013, notice of proposed regulatory action to establish rules to govern the commercialization of new alternative diesel fuels.

Growth Energy is a strong supporter of biodiesel fuels, which continue to play an important part in our nation's efforts to achieve energy independence with renewable sources and to address environmental concerns. While we applaud the effort to incentivize greater use of all renewable fuels, including biodiesel, we have several significant concerns about the CARB staff's current regulatory proposal and the regulatory process.

Growth Energy believes that significant but feasible changes must be made to the CARB staff's proposed regulations, because the staff's current proposal does not include all reasonable and feasible methods of mitigating potential increases in emissions of oxides of nitrogen ("NOx"), among other reasons. The required changes to the staff's proposal are explained in the enclosed comment and will facilitate the lawful commercialization and use of biodiesel in California in a manner that fully protects the environment. In addition, the CARB staff has not yet publicly released all the test data and analysis on which it is basing its proposal. The decision to postpone the public hearing until March 2014 affords time for the staff to make full disclosure of all the data and analysis. ADF B3-11

Please contact me or David Bearden, our General Counsel, at 605-965-2375 if you have any questions concerning this submission.

Sincerely,

Tom Buis

Tom Buis
CEO, Growth Energy

STATE OF CALIFORNIA

AIR RESOURCES BOARD

PROPOSED REGULATION TO GOVERN THE COMMERCIALIZATION OF NEW ALTERNATIVE DIESEL FUELS

GROWTH ENERGY'S RESPONSE TO THE NOTICE OF PUBLIC HEARING DATED OCTOBER 15, 2013 2013 CAL. REG. NOTICE REG. 1646 (OCTOBER 25, 2013)

DECEMBER 12, 2013

Executive Summary

These Comments by Growth Energy on the proposed regulation to govern the commercialization of alternative diesel fuels address two main issues: (1) the duty of the Air Resources Board to mitigate potential increases in exhaust emissions of oxides of nitrogen ("NOx") from engines operated on biodiesel fuels, and (2) the analytical and procedural obligations for this rulemaking under the governing statutes.

Growth Energy strongly supports the use of biodiesel to achieve the Nation's environmental and energy independence objectives. As with other elements of California's effort to participate in those national strategies, however, the proposed alternative diesel fuel regulation must avoid having unintended negative environmental consequences, and must be considered carefully and in a manner that permits full and effective public participation. The flaws in the current regulatory proposal for alternative diesel fuels can be readily addressed through feasible mitigation measures, which would put biodiesel in parity with other alternative fuels for which the Board has for many years required risk mitigation through regulation. ADF B3-12

As explained in these Comments, a detailed review of the Air Resources Board staff's analysis of the impacts of biodiesel use on NOx emissions, and a reanalysis of the data used by the staff made available to the public, shows that statistically significant increases in NOx emissions must be expected from the use of biodiesel blends of less than ten percent including blends of five percent and lower amounts of biodiesel. Applying the Board's normal precautionary principles, and consistent with the obligations of the California Environmental Quality Act and the Global Warming Solutions Act, the staff's proposed "Significance Level" of ten percent for biodiesel blends should instead be reduced to zero, because the use of biodiesel at any level can be expected to result in increased NOx emissions if not mitigated using reasonable and feasible measures. ADF B3-13

These Comments also show that the potential increases in NOx emissions caused by biodiesel use under the proposed regulation are far larger than the NOx levels considered significant enough to require costly mitigation or control measures in the State's two "extreme" areas for ozone nonattainment -- the South Coast Air Basin and the San Joaquin Valley Air Pollution Control District. It would counterproductive, and not consistent with the governing statutes, for the Board to commit itself to measures that will result in NOx emissions increases in order to implement the low-carbon fuel standard under the Global Warming Solutions Act, especially when those increases greatly exceed the levels for which the State's air quality districts currently require mitigation or control of those emissions when they come from other sources. ADF B3-14

These Comments also urge the Board to ensure that all comments and data received by the staff in connection with this rulemaking effort, or relied upon in formulating the proposed regulation, be placed in the public rulemaking file, and that sufficient time be allowed to review those materials before the Board considers regulatory action. If the Board directs the staff to address these important issues of public access and transparency -- which are governed by the Administrative Procedure Act -- this regulatory item can be completed in a timely manner. ADF B3-15

Table of Contents

Comments of Growth Energy on the Proposed Regulation To Govern the Commercialization of New Alternative Diesel Fuels

Growth Energy respectfully submits these comments on the California Air Resources Board's proposed regulation to govern the commercialization of new alternative diesel fuels (the "proposed ADF regulation"). As explained below, Growth Energy believes that the Board should direct the staff to make revisions in the proposed ADF regulation and cannot adopt the proposed ADF regulation in its current form. The proposed ADF regulation does not require the use of feasible measures that are necessary to mitigate adequately the potential adverse environmental impacts of increased use of biodiesel blends in California.

ADF B3-16

I. INTRODUCTION AND OVERVIEW

CARB's obligation to examine the impacts of widespread biodiesel usage, and to address potential adverse environmental impacts, have recently been clarified by the California Court of Appeal in *POET LLC, et al. v. California Air Resources Board*, (2013) 218 Cal. App. 4th 681. In that litigation, ARB claimed that it intended to "ensure" that there would be "no" increase in regulated pollutants from Diesel-powered engines in California as a result of the LCFS regulation, and in particular that there would be no increase in exhaust emissions of oxides of nitrogen ("NOx") resulting from the use of biodiesel fuel. 218 Cal. App. 4th at 732.

ADF B3-17

The CARB staff's proposed approach to the task of NOx mitigation in the proposed ADF regulation falls far short of the claimed metric: whatever the benefits of the proposed ADF regulation for other purposes, the staff's approach will not ***ensure*** that the implementation of the LCFS regulation can cause ***no*** increase in NOx emissions. These comments briefly outline, and the accompanying materials fully explain, the unnecessary environmental risks to the State's

efforts to control NOx emissions that the proposed ADF regulation fails to address.[1] Those risks are not based on unqualified speculation, or merely the opinion of Growth Energy; the risks can be demonstrated from the emissions data that the CARB staff has placed in the docket, when those data are evaluated using simple but appropriate statistical tools and methods.[2] Moreover, the increases in NOx emissions, which the CARB staff's data establish, are significant by any contemporary measure: the increases in NOx emissions that the increased use of biodiesel will cause as a result of the LCFS regulation are many times larger than the NOx increases that CARB and regional air quality authorities require to be mitigated. (*See* pp. 18-19 below.)

ADF B3-17 cont.

Addressing the problem of increased NOx emissions is a feasible task, as the Staff Report that accompanies the proposed ADF regulation concedes. Once the risk is established, and the methods of mitigation are determined to be feasible, CARB's task is clear: under the California Environmental Quality Act ("CEQA"), it must require mitigation before it can proceed with regulation.[3]

In this instance, mitigation may impose direct costs on the firms that choose to use biodiesel to comply with the LCFS regulation, and indirect costs on the operators of Diesel engines, but CARB decided nearly five years ago that the benefits of the LCFS regulation overall were worth the costs. In that respect, biodiesel should be treated no differently than the

[1] In addition to the materials cited below in notes 2 and 4, Growth Energy is also attaching to these comments for inclusion in the rulemaking file -- and for analysis and response by the Board -- its earlier comments on the CARB staff's ADF regulatory proposal, submitted on September 16, 2013. Those comments, and likely many other comments from other parties, were not placed in the rulemaking file when CARB issued its 45-day notice. *See* pp. 13-14 below (requirements of the California Administrative Procedure Act).

[2] *See* R. Crawford, "NOx Emissions Impact of Soy- and Animal-Based Biodiesel Fuels: A Re-Analysis" (Dec. 2013) (hereinafter "Crawford Report"), attached to these Comments as Exhibit A.

[3] *See POET*, 218 Cal. App. 4th at 731-742.

alternative fuels that the LCFS regulation requires for gasoline, which are ethanol, natural gas and electricity.

ADF B3-17 cont.

Instead of requiring the Diesel sector to bear its fair share of the costs of the LCFS regulation through proper environmental mitigation, however, the CARB staff's proposed approach deploys what the Staff Report calls an "Effective Blend Level" concept to exempt biodiesel fuel from any meaningful mitigation requirement.[4] Rather than following the precautionary principles that have constantly guided CARB rulemaking -- which in other contexts sometimes have inclined the Board to require extreme regulatory stringency based on scant evidence of actual harm -- in this one instance, the CARB staff appears intent on risking air quality rather than requiring feasible, if costly to some, mitigation measures. The CARB Staff Report suggests in one place that this deviation from the Board's longstanding regulatory strategy may be necessary to protect the growth of the biodiesel "market."[5] But the CARB staff cites no evidence to support its speculation that the biodiesel "market" is at risk, and there is no evidence of such a risk in the public rulemaking file. Even if such a private market risk existed, however, neither the California Global Warming Solutions Act nor the California Government Code allow CARB to consider factors extrinsic to the statutes in meeting the clean-air goals established by law.[6] The California statutes protect California citizens and air quality, not market entrepreneurs and arbitragers. It is not the proper purpose of any California regulation to

ADF B3-18

[4] *See* Declaration of James M. Lyons (hereinafter "Lyons Decl."), attached to these Comments as Exhibit B.

[5] *See* Staff Report at 63 (rejecting "immediate" mitigation because "this option has the potential to disrupt or even collapse the burgeoning ADF market by unnecessarily placing overly restrictive requirements that are not warranted by emissions testing"). Tellingly, that portion of the Staff Report has no citations to support the claim.

[6] In its current proposal, the CARB staff is engrafting onto the Global Warming Solutions Act a provision allowing it to avoid mitigation of environmental harm, in order to encourage particular industries or based on general economic preferences. CARB cannot proceed in that fashion. *Cf. Clean Air Constituency v. CARB*, (1974) 11 Cal.3d 801 (CARB lacks authority to establish criteria to govern its actions that are not found in its enabling statutes).

pick "winners" and "losers:" all fuels, including all alternative fuels, must have their environmental risks properly assessed, and when feasible mitigated in full.

ADF B3-18 cont.

The balance of these Comments is divided into two parts. The first part, in Section II below, summarizes the technical analyses contained in the accompanying report of Robert Crawford, a statistician with expertise in evaluation of emissions data, and in the Declaration of James M. Lyons, an expert in automotive air pollution who evaluates the "Effective Blend Level" concept as a method of addressing the risks of increased NOx emissions. Section II also summarizes the relevant portions of the Staff Report dealing with the available mitigation methods and their feasibility. The second part, in Section III below, explains the Board's legal obligations to mitigate the risks of increased NOx emissions presented by biodiesel fuel usage.

II. ENVIRONMENTAL ASSESSMENT OF THE PROPOSED REGULATION

Were the matter ever in any doubt, the Court of Appeal's *POET* decision, which the California Supreme Court has recently declined to review, makes it clear that the Board must take seriously the issue of NOx emissions increases from the increased use of biodiesel in order to comply with the LCFS regulation. CARB has recognized, first in the LCFS regulatory process and more recently in court, that the LCFS regulation will increase the use of biodiesel. The CARB staff now claims in the current ADF rulemaking, however, that emissions testing proves that the use of biodiesel blends containing less than 10 percent biodiesel will not increase NOx emissions. That claim is demonstrably wrong, as Mr. Crawford establishes in his analysis of the available emissions data. (*See* Exhibit A and Section A below.) Because the data do not support the CARB staff's claims that operation of engines on blends below 10 percent biodiesel will not increase NOx emissions, and in fact show the opposite, CARB has a duty to mitigate. The CARB staff's environmental analysis is also unsound in other respects as well, as demonstrated in Mr. Lyons' Declaration. (*See* Exhibit B and Section B below.)

ADF B3-19

A. Impact of the Proposed Regulation on Exhaust Emissions of Oxides of Nitrogen

Mr. Crawford's report carefully reviews each of the six studies cited in the CARB staff's literature review on biodiesel NOx emissions, as well as CARB's biodiesel characterization study ("Durbin 2011") and the data available from that study. It is important to note at the outset that not all the data from the CARB study has been made available to the public. CARB should publish all of the testing presented in Durbin 2011[7] and any future testing that it sponsors in a complete format that allows for reanalysis, and an opportunity to evaluate those materials prior to the deadline for submission of public comments or CARB's hearing on the approval of the proposed ADF regulation. ADF B3-20

Putting aside the CARB staff's failure to make a complete disclosure of the data reflected in Durbin 2011, it is clear that the data from Durbin and the other six studies do not support the CARB staff's conclusion and, indeed, the data refute the staff's conclusion in some instances. These are the salient points from Mr. Crawford's analysis:

- There is ***no evidence*** supporting the staff conclusion that NOx emissions do not increase until the B10 level is reached. Instead, there is consistent and strong evidence that biodiesel increases NOx emissions in proportion to the biodiesel blending percent. ADF B3-21
- There is ***clear and statistically significant evidence*** that biodiesel increases NOx emissions at the B5 level in at least some engines for both soy- and animal-based biodiesels. ADF B3-22

None of the six studies in the literature measured the NOx emissions impact from biodiesel at blending levels below B10. Only two studies tested a fuel at the B10 level. All

[7] The data should be published in a useable format, and should include (a) the measured emission values for each individual test replication; or (b) averages across all test replications, along with the number of replications and the standard error of the individual tests. The first format (individual test replications) is preferable because that would permit a full examination of the data including effects such as test cell drift over time.

other testing was at the B20 level or higher. Because none tested a B5 (or similar) fuel, the studies do not constitute substantial evidence that NOx emissions are not increased at B5 or other blending levels below B10. Those six studies therefore provide no data or evidence supporting the validity of the staff's claim that biodiesel below B10 does not increase NOx emissions. To the contrary, all of the studies are consistent with the contention that biodiesel increases NOx emissions in proportion to the blending percent. Indeed, two of those six studies present evidence and data that the NOx impact from biodiesel is a continuous effect that is present even at very low blending levels and will increase at higher levels in proportion to the blending percentage.

ADF B3-22 cont.

With regard to the CARB biodiesel characterization report, Mr. Crawford has uncovered the fact that for the three engines for which the CARB staff has published the emission values measured in engine dynamometer testing, all of the data demonstrate that biodiesel fuels significantly increase NOx emissions for both soy- and animal-based fuels by amounts that are proportional to the blending percent. That is true for on-road and off-road engines and for a range of test cycles. When B5 fuels were tested for those engines, NOx emissions were observed to increase. NOx emission increases are smaller at B5 than at higher blending levels and the observed increases for two engines were not statistically significant by themselves based on the pair-wise t-test employed in Durbin 2011. However, the testing for one of the engines (the 2007 MBE4000) showed statistically significant NOx emission increases at the B5 level for both soy- and animal-based blends. The data are sufficient to disprove the staff's contention that biodiesel blends at the B5 level will not increase NOx emissions.

ADF B3-23

In sum, based on examination of all of the studies cited by CARB as the basis for its proposal to exempt biodiesels below B10 from mitigation, it is clear that the available research

ADF B3-24

points to a very substantial risk, if not a certainty, that both soy- and animal-based biodiesel blends will increase NOx emissions in proportion to their biodiesel content, including at the B5 level. Based on data in the CARB Biodiesel Characterization Report, soy-based biodiesels will increase NOx emissions by about 1% at B5 and 2% at B10, while animal-based biodiesels will increase NOx emissions by about one-half as much: 0.45% at B5 and 0.9% at B10. All of the available research shows that the NOx increases are real and implementation of mitigation measures will be required to prevent increases in NOx emissions due to biodiesel use at blending levels below B10. The available research likewise demonstrates that, to the extent CARB is identifying B10 as a "threshold of significance" under CEQA, (1) the utilization of this threshold is unsupported by the evidence in the record. For the same reasons, and for the reasons discussed in Section III.B below, the utilization of B10 as a "threshold" is contrary to the Legislature's mandate that the regulations should "not interfere with … efforts to achieve and maintain federal and state ambient air quality standards." Cal Health & Safety Code § 38562(b)(4).

ADF B3-24 cont.

ADF B3-25

B. The "Effective Blend Level" Concept

Mr. Lyons' Declaration builds on the analysis performed by Mr. Crawford and demonstrates that the CARB staff's "effective blend level" concept will operate to exempt biodiesel from any meaningful mitigation, even if biodiesel is causing real-world increases in NOx exhaust emissions from Diesel engines operated in California. Mr. Lyons demonstrates, in particular, that "despite the forecast nine-fold increase in biodiesel use in California from 50 million to 450 million gallons from 2013 to 2023 … the forecast Effective Blend Level of biodiesel decreases to less than zero over virtually all of the period in question." (Lyons Decl. ¶ 14.)

ADF B3-26

If the fractional coefficients being applied in the "effective blend level" equation (*see* Lyons Decl. ¶¶ 11-12) are incorrect to any significant extent, the environment will not be protected. The CARB staff has apparently selected those coefficients without allowing for the possibility of errors that could understate NOx impacts -- a clear violation of CARB's precautionary norms. The adverse effects will be severe if there is error in the coefficients, because the CARB staff itself recites evidence that the biodiesel market will be concentrated in low-blend biodiesel. (*See* Lyons Decl. ¶¶ 15, 17.) Growth Energy is aware of no other regulatory concept in any CARB program in which mitigation measures required by CEQA depend on a formula that could err as easily as the "effective blend level" equation could.

ADF B3-27

The mischief in the "effective blend level" coefficients lies in their complexity and the risk of quantitative error. A much simpler but equally fatal analytical flaw, which also violates both sound regulatory policy and the requirements of CEQA, is the failure of the effective blend level calculation to ensure that any NOx increases that require mitigation will be addressed by the use of a mitigation measure in the ***same*** relevant location, and at the ***same*** time, as the NOx increases are occurring. If NOx mitigation does not occur in the same area and at the same time as biodiesel use that increases NOx emissions, the environmental harm presented by those increased NOx emissions will go unmitigated; the adverse impacts of NOx increases are defined by their location, and their severity is greatest at the time when the emissions occur.

ADF B3-28

As Mr. Lyons points out, the "effective blend level" concept does not fully protect, for example, Los Angeles residents, if NOx increases experienced in the summertime in Los Angeles can be offset by the biodiesel "market" in whole or part by practices that mitigate those emissions in a different season and in another place. (*See* Lyons Decl. ¶¶ 19-20.) The regulation, as proposed by the CARB staff, does nothing even to incentivize, much less require,

ADF B3-29

the biodiesel "market" to deliver mitigation at the time and place it is needed. That may be a result of the CARB staff's conclusion that, as they have written the mitigation rule, it is unlikely that mitigation will ever be required; if so, that simply underscores the weakness of the mitigation rule itself (*see*, *e.g.*, Lyons Decl. ¶¶ 8-10, 15-18). CEQA and its implementing guidelines must be read to require mitigation where and when the adverse effect would otherwise occur. By not accounting for that requirement, the "effective blend level" concept violates CEQA.

ADF B3-29 cont.

Mr. Lyons' Declaration identifies other flaws in the staff proposal that must be addressed. As his Declaration establishes, the data on which CARB relies for its assumption that "new-technology" diesel engines will have lower NOx emissions when operated on biodiesel is inadequate to support the weight it is given by the CARB staff (*see* Lyons Decl. ¶¶ 21-23); that data cannot be treated as substantial evidence to support a regulation that posits lower emissions from such engines. Each of the issues raised in Mr. Lyons' Declaration must be addressed by the Board.

ADF B3-30

C. Available Mitigation Measures

Mitigation of the risks of NOx increases from biodiesel usage is entirely feasible. The proposed ADF regulation can easily be modified to ensure that the use of biodiesel will not result in increased NOx emissions by setting the "Significance Level" for biodiesel blends at zero -- which is the level that the available data require -- so that mitigation would occur whenever and wherever it should. In addition, CARB must eliminate the use of annual statewide averages for determining the "effective blend levels" and instead use actual blend levels at the batch level. These two changes would require that mitigation be applied to all biodiesel blends in light of the actual amount of biodiesel present in each specific blend.

ADF B3-31

Appendix 1 to proposed Section 2293.5(c) specifies the three mitigation measures that CARB staff has identified for mitigation of increases in NOx emissions due to biodiesel use. They include (i) addition of di-tert-butyl peroxide to biodiesel blends at a level that varies with the amount of biodiesel in the blend and (ii) blending of low-NOx diesel fuel along with biodiesel into biodiesel blends. Under the staff's proposal, parties responsible for mitigation of increased NOx emissions from biodiesel can choose either of those approaches. They all could be easily applied to any blend containing ten percent or less biodiesel, as well as blends of more than ten percent, if appropriately modified to ensure that there would be no increase in NOx emissions associated with the use of biodiesel. The Staff Report and the rulemaking file contain no significant evidence that such approaches could not be applied at the batch level.

ADF B3-32

In addition to conceding the feasibility of the three identified mitigation measures by including them in the proposed ADF regulation, the Staff Report also provides cost estimates for the application of each measure.[8] Absorption of those estimated costs by entities or individuals choosing to use biodiesel is in no way inconsistent with the types of costs that have been imposed by CARB on other California businesses and residents in other regulatory programs. Indeed, the Global Warming Solutions Act gives CARB no choice but to require the regulated parties and their downstream customers to absorb those costs: the Legislature has specifically directed that CARB is to "ensure" that "activities undertaken pursuant to the regulations" adopted to implement the Act -- including the use of biodiesel to comply with the LCFS regulation -- "do not interfere with ... efforts to achieve and maintain federal and state ambient air quality standards." Cal. Health & Safety Code § 38562(b)(4).

ADF B3-33

[8] Those costs are $0.25 per gallon of biodiesel blended for di-tert-butyl peroxide, $1.20 per gallon of biodiesel blended for low-NOx diesel and a one-time expense of between $100,000 and $200,000 for the certification of a biodiesel blend that could then be sold in California in any volume. *See* Staff Report at 59 and *id.* App. C.

In addition to being technically feasible, consistent with costs required by other CARB regulations, the mitigation measures outlined in the Staff Report can be implemented. In some instances, regulated parties would simply have to ensure that steps have been taken to ensure their final blends meet the fuel property specifications associated with the certified blend. Mitigation using di-tert-butyl peroxide or low NOx diesel requires only knowing the amount of biodiesel in the blend and ensuring that the entity performing the blending also be responsible for adding di-tert-butyl peroxide or low NOx diesel to the blend. ADF B3-34

The Staff Report claims that "[i]t would be impractical to determine the individual blend level for each gallon of biodiesel blend being sold across the State." The Staff Report continues: "To do so would require the retailers and marketers of biodiesel blends (i.e., the diesel dispensing facilities) to continuously test and determine the biodiesel blend level for each of the approximately 3 billion gallons of on-road diesel fuel sold in California each year."[9] The Staff Report offers no support for that claim, however, and it is contradicted by the overall regulatory experience under the LCFS regulation as well as the data necessary to actually to employ the Effective Blend concept. The LCFS regulation already requires producers of biodiesel sold in California or other entities to which the fuel is transferred to report the volumes of biodiesel to CARB via the Low Carbon Fuel Standard Reporting Tool ("LRT") in order to receive greenhouse gas emission reduction credits. (*See* 17 C.C.R. § 95484(b)(B)(2).) Moreover, in order to employ the Effective Blend concept, data regarding the amount of biodiesel used in blends of five percent or less, as well as the type and volumes of biodiesel used in blends of more than five percent, would be required. Presumably, this data will also be derived from the LRT. The LRT is currently treated by CARB as an accurate source of data regarding biodiesel use in ADF B3-35

[9] Staff Report at 23.

California.[10] The CARB staff regularly publishes quarterly summaries of greenhouse gas credits generated from biodiesel and other fuels under the LCFS.[11]

ADF B3-35 cont.

Given that biodiesel producers must report both their production volumes and production pathways (*e.g.*, soy-based, animal-based, or other) to CARB via the LRT in order to generate greenhouse gas credits under the LCFS regulation, the implementation of NOx mitigation measures involving use of di-tert-butyl peroxide or low NOx diesel under the ADF regulation would be simple and straightforward. All that CARB would have to do is to require entities earning greenhouse gas credits under the LCFS for non-certified biodiesel blends to also report to CARB via the LRT how, when, and where mitigation of the NOx emissions associated with the use of that biodiesel via di-tert-butyl peroxide or low NOx diesel was achieved. Recordkeeping requirements analogous to those that already apply to data reported via the LRT would also apply to mitigation of biodiesel NOx impacts.

ADF B3-36

By following that approach, CARB staff can both ensure that there are no NOx increases associated with the use of biodiesel in California while simultaneously avoiding any need to involve retailers and marketers of biodiesel in the "impractical" activity described in the Staff Report unless those same retailers and marketers of biodiesel were earning greenhouse gas reduction credits from biodiesel under the LCFS. If the CARB Executive Officer or the staff disagrees with Growth Energy on this point, it is incumbent upon them to explain why and for the Board to give the public an opportunity to respond before CARB weighs the evidence and arguments, because this is an issue involving available and practical mitigation measures under CEQA.

ADF B3-37

[10] *See, e.g.*, Staff Report at 30.

[11] The most recent summary for the second quarter of 2013 is available at http://www.arb.ca.gov/fuels/lcfs/20130930_q2datasummary.pdf.

III. THE BOARD'S LEGAL OBLIGATIONS

The Court of Appeal clarified in *POET* that CARB is subject, among other provisions, to sections 15004 and 15352 of the CEQA Guidelines. The Court of Appeal also gave clear instructions about the need to comply with the rulemaking-file requirements of the Administrative Procedure Act. Perhaps most importantly, the Court of Appeal made plain the Board's duty to mitigate, in particular with respect to the subject of NOx exhaust emissions from engines operated on biodiesel. This final section of Growth Energy's comments summarizes the steps that CARB must take to meet its obligations under the governing statutes as clarified by the Court in *POET*, with primary emphasis on the duty to mitigate under CEQA.

A. Procedural and Structural Rulemaking Requirements

CARB must recognize that *any* communications it has received of a factual nature, or data that it has acquired in connection with regulatory action, are not exempt from the requirement to disclose those communications in the public rulemaking file under Gov't Code § 11347.3 (absent a valid and complete demonstration of privilege). *See POET*, 218 Cal. App. 4th at 741-754. At present, the rulemaking file for the ADF proposal cannot possibly be claimed to include all material required for the rulemaking file: Growth Energy knows this, because its own comments of September 16, 2013 (*see* Exhibit C) have not been placed in that file. As noted above, CARB has apparently not made full disclosure of all data relevant to the Durbin emissions study. (*See* p. 5 above.) Likewise, the Staff Report claims that the proposed ADF regulation "is based upon feedback from nearly every corner of the regulated industry as well as other impacted organizations and individuals that are impacted by actions concerning or that regulate the fuels industry."[12] The rulemaking file, when last checked in the week of

ADF B3-38

ADF B3-39

[12] Staff Report at 3-4.

December 2, 2013, did not contain any written comments reflecting that "feedback;" those materials should have been in the rulemaking file no later than October 15, 2013, when the public hearing on the proposed ADF regulation was announced. *See* Cal. Gov't Code § 11347.3(a), (b)(6), (7).

ADF B3-39 cont.

Accordingly, one of the first steps that CARB must take in the current proceeding is to ensure compliance with section 11347.3 of the Government Code, and re-issue a notice of proposed rulemaking to allow 45 days of comment prior to a public hearing at which it would take action on a proposed ADF regulation. If CARB takes this action quickly, there will be no delay in program objections, including reconsideration of the LCFS standards during 2014.

ADF B3-40

It is also clear from *POET* that, as CEQA and the guidelines direct, there are other reasons why CARB cannot take action with respect to the proposed ADF regulation. *See POET*, 218 Cal. App. 4th at 717-731. If CARB is the decision-maker with respect to the proposed ADF regulation, it must evaluate the environmental issues presented by the staff proposal for itself, and complete the environmental review process required under CEQA and CARB regulations, *before* the Board commits CARB to the proposed ADF regulation. Likewise, the opportunity to participate in the environmental analysis must be adequate -- which in this instance, it is not, in part because not all the relevant data has been publicly released. A comment deadline scarcely 45 days after the staff analysis has been released, when all relevant data have not been provided, will not permit an adequate environmental assessment.

ADF B3-41

To comply with the procedural requirements of CEQA as confirmed in *POET*, CARB should direct the staff to complete the environmental review process (including full disclosure of the basis for its proposal); prepare a complete rulemaking file; respond to public comment; and publish a Final Statement of Reasons, before considering the proposed ADF regulation on its

ADF B3-42

merits at a subsequent hearing. At that hearing, interested parties should be allowed all the time required to present and to respond to legitimate technical, empirically-based analysis of the environmental issues presented by the proposed ADF regulation. CARB can neither approve the proposed ADF regulation with the record in its current status and at the type of hearing planned for this week, nor defer the environmental assessment to a point after it has committed itself to the proposed regulation, nor delegate any of its CEQA responsibilities identified by the Court of Appeal in *POET*.

ADF B3-42 cont.

B. The Duty to Analyze Potential Impacts and Mitigate Significant Impacts

The importance of NOx emissions control for California air quality is well known and is illustrated, for example, by a June 2012 CARB Report entitled "Vision for Clean Air: A Framework for Air Quality and Climate Planning," prepared in conjunction with the South Coast Air Quality Management District and the San Joaquin Valley Unified Air Pollution Control District.[13] That report addressed potential control strategies that will be required to bring the only two areas of the country designated as being in extreme nonattainment of the National Ambient Air Quality Standard ("NAAQS") for ozone[14] into attainment. In working to identify potential control strategies, these three agencies chose to focus on ways to reduce NOx emissions (and not hydrocarbon emissions) because "NOx is the most critical pollutant for reducing regional ozone and fine particulate matter."[15] The report also identifies diesel-powered heavy-duty vehicles as the largest source of NOx emissions in California, and classifies diesel-powered

ADF B3-43

[13] *See* CARB, Vision for Clean Air: A Framework for Air Quality and Climate Planning (June 27, 2012) (available at http://www.arb.ca.gov/planning/vision/docs/vision_for_clean_air_public_review_draft.pdf).

[14] *See* http://www.epa.gov/airquality/ozonepollution/designations/2008standards/final/region9f.htm.

[15] *See* Vision for Clean Air at 10.

construction, mining and agricultural equipment as other significant sources of NOx emissions in California.

ADF B3-43 cont.

As indicated above, CEQA requires that mitigation measures must be implemented locally and must be contemporaneous with the emissions events of concern; the type of statewide mitigation concept contained in the Staff Report, unbounded to relevant time intervals, does not comply with CEQA. It is therefore relevant to consider, by way of example, the heavy-duty diesel vehicle NOx emissions inventory for the South Coast and San Joaquin Valley areas during calendar years 2015 and 2020. On-road heavy-duty diesel emission estimates were developed using CARB's latest emission factor modeling software EMFAC2011.[16] The model estimates regional emissions, in tons/day, by vehicle class and model year. Emission estimates were computed for both older vehicles as well as vehicles using what CARB would consider to be NTDEs -- which in this case were assumed to be 2010 and later model-year vehicles. Emissions from off-road construction equipment were estimated using CARB's 2011 In-Use Inventory model.[17] Emissions from agricultural equipment were developed using CARB's OFFROAD2007 model because CARB's regulatory in-use inventory model is still under development for this sector.[18] For construction and agricultural equipment, NTDE vehicles were assumed to be those with engines certified to Tier 4 emission standards. It was assumed Tier 4 engines are used in 2013-and-later model year engines rated at or below 50 HP, 2014-and-later model year engines between 51 and 750 HP, and to 2015-and-later model years for engines

ADF B3-44 cont.

[16] For more information on EMFAC2011 and to download modeling materials, *see* http://www.arb.ca.gov/msei/modeling.htm.

[17] For more information on CARB's off-road model, *see* http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles.

[18] Information about OFFROAD2007 and the pending in-use agricultural sector model can also be found at http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles.

above 750 HP. The resulting inventories are presented in Tables 1 and 2 for calendar years 2015 and 2020, respectively.

Table 1

2015 Heavy-Duty NOx Emission Inventories for the South Coast and San Joaquin Valley Air Basins (tons per day)

Air Basin	On-Road		Construction		Agricultural		Total
	Older	NTDE	Older	NTDE	Older	NTDE	
South Coast	117.27	14.91	24.04	0.42	3.92	0.26	160.82
San Joaquin	83.07	15.44	11.85	0.21	26.73	1.86	139.16

Table 2

2020 Heavy-Duty NOx Emission Inventories for the South Coast and San Joaquin Valley Air Basins (tons per day)

Air Basin	On-Road		Construction		Agricultural		Total
	Older	NTDE	Older	NTDE	Older	NTDE	
South Coast	66.53	28.44	20.0	1.8	2.2	0.5	119.47
San Joaquin	32.13	30.33	11.5	1.0	15.0	3.8	93.76

ADF B3-44 cont.

Tables 1 and 2 show that vehicles with NTDEs account for only about 10% of NOx emissions in 2015 and between 25% and 40% of NOx emissions in 2020. Therefore, even if the CARB staff's assertion that biodiesel does not increase emissions from NTDEs were correct, the majority of NOx emissions would still be coming from older engines where, it has been clearly demonstrated, NOx emissions increase with the use of higher biodiesel blends. Applying the estimated NOx increases developed from the available emissions data analyzed by CARB staff (*see* Lyons Decl. ¶ 9, Table 1), and assuming more realistically and conservatively (as CEQA requires) that NTDEs will be affected by biodiesel in the same way as other engines, the overall increases in NOx emissions caused by biodiesel use will be (i) between 0.7 and 1.6 tons per day

in 2015 and between 0.5 and 1.2 tons per day in 2020 in the South Coast, and (ii) between 0.6 and 1.4 tons per day in 2015 and between 0.4 and 0.9 tons per day in 2020 in the San Joaquin Valley.

ADF B3-44 cont.

One way to put the magnitude of these potential increases in NOx emissions into context is to compare them with the air quality significance thresholds applied by the South Coast Air Quality Management District[19] and the San Joaquin Valley Air Pollution Control District[20] when evaluating the potential emission impacts of proposed projects in their jurisdictions. In the San Joaquin Valley Air Pollution Control District, the threshold is 10 tons per year while in the South Coast basin, the threshold is 0.0275 tons per day which equals 10 tons per year if daily emissions occurring over the course of the year are equal. The potential 2015 emission increases from the use of five percent biodiesel blends in the South Coast and the San Joaquin Valley are ***25 to 60 times higher*** than the 10-ton-per-year threshold. Even with reductions in diesel NOx emissions by 2020, the potential NOx increases due to biodiesel remains ***15 to 40 times higher*** than the 10-ton-per-year threshold. Potential increases of NOx emissions on such a scale require mitigation at the time and in the place where they will occur. *See POET*, 218 Cal. App. 4th at 740 (under CEQA, "ARB must adopt mitigation measures that minimize the adverse impact" of a potential increase in NOx emissions). Moreover, despite the fact that increases of NOx emissions resulting from the proposed ADF regulation would significantly exceed thresholds adopted by the South Coast Air Quality Management District and the San Joaquin Valley Air Pollution Control District, the ISOR fails to analyze whether the proposed ADF regulation has the potential to conflict with, or obstruct, applicable air quality plans.

ADF B3-45

[19] *See* http://www.aqmd.gov/ceqa/handbook/signthres.pdf.

[20] *See* http://www.valleyair.org/transportation/CEQA%20Rules/GAMAQI%20Jan%202002%20Rev.pdf.

There is no question that an increase in biodiesel usage will occur as a result of the LCFS regulation, a measure adopted under the Global Warming Solutions Act. *See POET*, 218 Cal. App. 4th at 700-01. Consequently, under not only CEQA, but also the Global Warming Solutions Act, CARB cannot permit emissions increases from biodiesel of such a magnitude when both the South Coast Air Quality Management District's 2012 Air Quality Management Plan[21] and the San Joaquin Valley's 2013 One Hour Ozone Plan[22] contain control measures intended to reduce NOx emissions by amounts of about the same magnitude as the potential emission increases resulting from biodiesel use at the five percent level. *See* Cal Health & Safety Code § 38562(b)(4) (greenhouse gas control measures such as the LCFS regulation are not to "interfere with ... efforts to achieve and maintain federal and state ambient air quality standards.").

ADF B3-45

IV. CONCLUSION

For the reasons explained above and in the reports and analyses accompanying these Comments, CARB cannot lawfully approve the proposed ADF regulation at this week's public hearing. CARB cannot commit itself now to the proposed ADF regulation and adjourn the important task of environmental assessment to a post hoc process. The available emissions data do not support, and indeed refute, the CARB staff's claim that low-level biodiesel blends are benign. Mitigation is required, and is required at the time and in the places where the NOx emissions increases can be expected to occur. If CARB directs the staff to make straightforward changes in the proposed ADF regulation in a timely manner that will require feasible mitigation

ADF B3-46

[21] *See* South Coast Air Quality Management District, 2012 Air Quality Management Plan, 2012 AQMP CARB/EPA/SIP Submittal (Dec. 2012) (available at http://www.aqmd.gov/aqmp/2012aqmp/Final/index.htmI).

[22] *See* http://www.valleyair.org/Air_Quality_Plans/Ozone-OneHourPlan-2013.htm.

measures, there will be no jeopardy to any program objective of the Global Warming Solutions Act or any other CARB project.

Respectfully submitted,

GROWTH ENERGY

EXHIBIT A

NOx Emissions Impact of Soy- and Animal-based Biodiesel Fuels: A Re-Analysis

December 10, 2013

Prepared for:

Sierra Research
1801 J Street
Sacramento, CA 95811

Prepared by:

Robert Crawford
Rincon Ranch Consulting
2853 South Quail Trail
Tucson, AZ 85730-5627
Tel 520-546-1490

NOX EMISSIONS IMPACT OF SOY- AND ANIMAL-BASED BIODIESEL FUELS: A RE-ANALYSIS

prepared for:

Sierra Research, Inc.

December 10, 2013

prepared by:

Robert Crawford
Rincon Ranch Consulting
2853 South Quail Trail
Tucson, AZ 85730-5627
Tel 520-546-1490

NOX IMPACT OF SOY- AND ANIMAL-BASED BIODIESEL FUELS: A RE-ANALYSIS

Table of Contents

List of Tables

List of Figures

1. EXECUTIVE SUMMARY

1.1 Background on the Proposed Rule

The California Air Resources Board (CARB) has proposed regulations on the commercialization of alternative diesel fuel (ADF) that were to be heard at the December 2013 meeting of the Board. The proposed regulations seek to "... create a streamlined legal framework that protects California's residents and environment while allowing innovative ADFs to enter the commercial market as efficiently is possible."[1] In this context ADF refers to biodiesel fuel blends. Biodiesel fuels are generally recognized to have the potential to decrease emissions of several pollutants, including hydrocarbons (HC), carbon monoxide (CO), and particulate matter (PM), but are also recognized to have the potential to increase oxides of nitrogen (NOx) unless mitigated in some way. NOx emissions are an important precursor to smog and have historically been subject to stringent emission standards and mitigation programs to prevent growth in emissions over time. A crucial issue with respect to biodiesel is how to "... safeguard against potential increases in oxides of nitrogen (NOx) emissions."[2]

The proposed regulations are presented in the Staff Report: Initial Statement of Reasons (ISOR) for the Proposed Regulation on the Commercialization of New Alternative Diesel Fuels[3] (referenced as ISOR). Chapter 5 of the document describes the proposed regulations, which exempt diesel blends with less than 10 percent biodiesel (B10) from requirements to mitigate NOx emissions:

> There are two distinct blend levels relative to biodiesel that have been identified as important for this analysis. Based on our analysis to date, we have found that diesel blends with less than 10 percent biodiesel by volume (<B10) have no significant increase in any of the pollutants of concern and therefore will be regulated at Stage 3B (Commercial Sales not Subject to Mitigation). However, we have found that biodiesel blends of 10 percent and above (≥B10) have potentially significant increases in NOx emissions, in the absence of any mitigating factors, and therefore those higher blend levels will be regulated under Stage 3A (Commercial Sales Subject to Mitigation).[4]

---

[1] "Notice of Public Hearing to Consider Proposed Regulation on the Commercialization of New Alternative Diesel Fuels." California Air Resources Board, p. 3. http://www.arb.ca.gov/regact/2013/adf2013/adf2013notice.pdf.

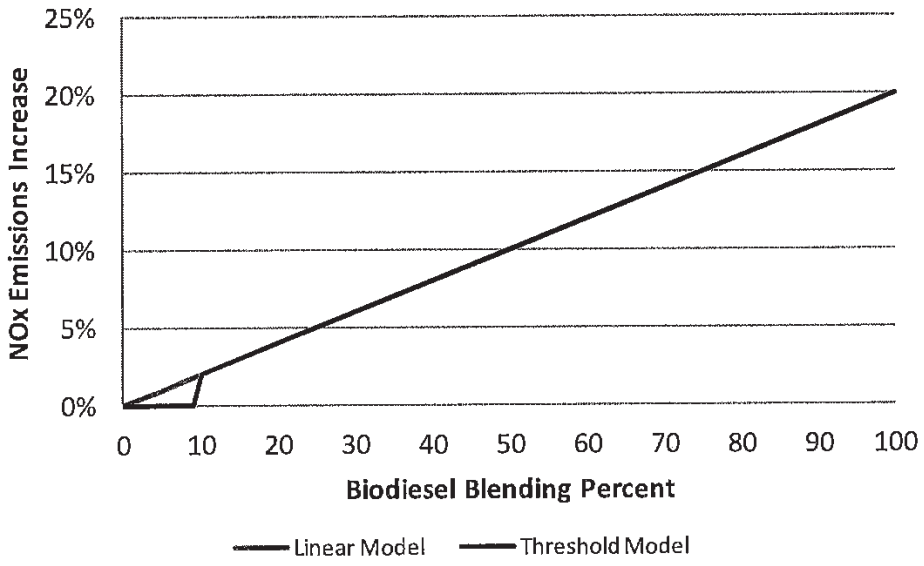
[2] Ibid. p. 3.

[3] "Proposed Regulation on the Commercialization of New Alternative Diesel Fuels. Staff Report: Initial Statement of Reason." California Air Resources Board, Stationary Source Division, Alternative Fuels Branch. October 23, 2013. http://www.arb.ca.gov/regact/2013/adf2013/adf2013isor.pdf.

[4] Ibid, p. 22.

Existing research on the NOx emission effects of biodiesel has consistently been conducted under the hypothesis that the emission effect will be linearly proportional to the blending percent of neat biodiesel (B100) with the base diesel fuel. The Linear Model that has been accepted by researchers is shown as the blue line in Figure 1-1. The Staff position cited above is that biodiesel fuels do not increase NOx emissions until the fuel blend reaches 10% biodiesel. This so-called Staff Threshold Model departs from the Linear Model that underlies past and current biodiesel research by claiming that NOx emissions do not increase until the biodiesel content reaches 10 percent.

Figure 1-1
Linear and Staff Threshold Models for Biodiesel NOx Impacts



The Staff Threshold model is justified by the statement: "Based on our analysis to date, we have found that diesel blends with less than 10 percent biodiesel by volume (<B10) have no significant increase in any of the pollutants of concern." Other portions of the ISOR state that Staff will track "... the effective blend level on an annual statewide average basis until the effective blend level reaches 9.5 percent. At that point, the biodiesel producers, importers, blenders, and other suppliers are put on notice that the effective blend-level trigger of 9.5 percent is approaching and mitigation measures will be required once the trigger is reached."[5] Until such time, NOx emission increases from biodiesel blends below B10 will not require mitigation.

ADF B3-46 cont.

Section 6 of the ISOR presents a Technology Assessment that includes a literature search the Staff conducted to obtain past studies on the NOx impact of biodiesel in heavy-duty

ADF B3-47

[5] Ibid, p. 24.

engines using California diesel (or other high-cetane diesel) as a base fuel. Section 6.d presents the results of the literature search with additional technical information provided in Appendix B. The past studies include the Biodiesel Characterization and NOx Mitigation Study[6] sponsored by CARB (referenced as Durbin 2011).

The results of the Staff literature search are summarized in Table 1-1, which has been reproduced from Table 6.1 of the ISOR. For B5 and B20, the data represent averages for a mix of soy- and animal-based biodiesels, which tend to have different impacts on NOx emissions (animal-based biodiesels increase NOx to a lesser extent). For B10, the data represent an average for soy-based biodiesels only. Staff uses the +0.3% average NOx increase at B5 in comparison to the 1.3% standard deviation to conclude:

> Overall, the testing indicates different NOx impacts at different biodiesel percentages. Staff analysis shows there is a wide statistical variance in NOx emissions at biodiesel levels of B5, providing no demonstrable NOxemissions impact at this level and below. Atbiodiesel levels of B10 and above, multiple studies demonstrate statistically significant NOx increases, without additional mitigation.[7]

Table 1-1
Results of Literature Search Analysis

Biodiesel Blend Level	NOx Difference	Standard Deviation
B5	0.3%	1.3%
B10[a]	2.7%	0.2%
B20	3.2%	2.3%

Source: Table 6.1 of Durbin 2011
Notes:
[a] Represents data using biodiesel from soy feedstocks.

ADF B3-47 cont.

The Staff conclusion is erroneous because it relies upon an apples-to-oranges comparison among the blending levels. Each of the B5, B10, and B20 levels include data from a different mix of studies, involving different fuels (soy- and/or animal-based), different test engines, and different test cycles. The B5 values come solely from the CARB Biodiesel Characterization study, while the B10 values come solely from other studies. The B20 values are a mix of data from the CARB and other studies. The results seen in the table above are the product of the uncontrolled aggregation of different studies that produces incomparable estimates of the NOx emission impact at the three blending levels.

[6] "CARB Assessment of the Emissions from the Use of Biodiesel as a Motor Vehicle Fuel in California: Biodiesel Characterization and NOx Mitigation Study." Prepared by Thomas D. Durbin, J. Wayne Miller and others. Prepared for Robert Okamoto and Alexander Mitchell, California Air Resources Board. October 2011.
[7] ISOR, p. 32.

As will be demonstrated in this report, the Staff conclusion drawn from the data in Table 1-1 is not supported by past or current biodiesel research, including the recent testing program sponsored by CARB. In fact, past and current studies indicate that biodiesel blends at any level will increase NOx emissions in proportion to the blending percent unless specifically mitigated by additives or other measures.

ADF B3-47 cont.

1.2 Summary and Conclusions

The following sections of this report examine the studies cited by CARB one-by-one. As evidenced from this review, it is clear that the data do not support the Staff conclusion and, indeed, the data refute the Staff conclusion in some instances. Specifically:

- There is no evidence supporting the Staff conclusion that NOx emissions do not increase until the B10 level is reached. Instead, there is consistent and strong evidence that biodiesel increases NOx emissions in proportion to the biodiesel blending percent.

ADF B3-48

- There is clear and statistically significant evidence that biodiesel increases NOx emissions at the B5 level in at least some engines for both soy- and animal-based biodiesels.

ADF B3-49

Considering each of the six past studies obtained from the technical literature and their data on high-cetane biodiesels comparable to California fuels, we find the following:

1. None of the six studies measured the NOx emissions impact from biodiesel at blending levels below B10. Only two studies tested a fuel at the B10 level. All other testing was at the B20 level or higher. Because none tested a B5 (or similar) fuel, none of them can provide direct evidence that NOx emissions are not increased at B5 or other blending levels below B10.

ADF B3-50

2. These studies provide no data or evidence supporting the validity of the Staff's Threshold Model that biodiesel below B10 does not increase NOx emissions. In fact, all of the studies are consistent with the contention that biodiesel increases NOx emissions in proportion to the blending percent.

ADF B3-51

3. Two of the studies present evidence and arguments that the NOx impact from biodiesel is a continuous effect that is present even at very low blending levels and will increase at higher levels in proportion to the blending percentage.

ADF B3-52

Considering the CARB Biodiesel Characterization report, we find that:

4. For the three engines where CARB has published the emission values measured in engine dynamometer testing, all of the data demonstrate that biodiesel fuels significantly increase NOx emissions for both soy- and animal-based fuels by amounts that are proportional to the blending percent. This is true for on-road and off-road engines and for a range of test cycles.

ADF B3-53

5. Where B5 fuels were tested for these engines, NOx emissions were observed to increase. NOx emission increases are smaller at B5 than at higher blending levels and the observed increases for two engines were not statistically significant by themselves based on the pair-wise t-test employed in Durbin 2011.[8] However, the testing for one of the engines (the 2007 MBE4000) showed statistically significant NOx emission increases at the B5 level for both soy- and animal-based blends.

ADF B3-54

By itself, the latter result is sufficient to disprove the Staff's contention that biodiesel blends at the B5 level will not increase NOx emissions.

Based on examination of all of the studies cited by CARB as the basis for its proposal to exempt biodiesels below B10 from mitigation, it is clear that the available research points to the expectation that both soy- and animal-based biodiesel blends will increase NOx emissions in proportion to their biodiesel content, including at the B5 level. CARB's own test data demonstrate that B5 will significantly increase NOx emissions in at least some engines.

ADF B3-55

Based on data in the CARB Biodiesel Characterization report, soy-based biodiesels will increase NOx emissions by about 1% at B5 (and 2% at B10), while animal-based biodiesels will increase NOx emissions by about one-half as much: 0.45% at B5 (and 0.9% at B10). All of the available research says that the NOx increases are real and implementation of mitigation measures will be required to prevent increases in NOx emissions due to biodiesel use at blending levels below B10.

ADF B3-56

Finally, we note that CARB has not published fully the biodiesel testing data that it relied on in support of the Proposed Rule and thereby has failed to adequately serve the interest of full public disclosure in this matter. The CARB-sponsored testing reported in Durbin 2011 is the sole source of B5 testing cited by CARB as support for the Proposed Rule. Durbin 2011 publishes only portions of the measured emissions data in a form that permits re-analysis; it does not publish any of the B5 data in such a form. It has not been possible to obtain the remaining data through a personal request to Durbin or an official public records request to CARB and, to the best of our knowledge, the data are not otherwise available online or through another source.

ADF B3-57

CARB should publish all of the testing presented in Durbin 2011 and any future testing that it sponsors in a complete format that allows for re-analysis. Such a format would be (a) the measured emission values for each individual test replication; or (b) averages across all test replications, along with the number of replications and the standard error of the individual tests. The first format (individual test replications) is preferable because that would permit a full examination of the data including effects such as test cell drift over time. Such publication is necessary to assure that full public disclosure is achieved and that future proposed rules are fully and adequately informed by the data.

ADF B3-58

[8] As discussed in Section 3.3, the pair-wise t-test is not the preferred method for demonstrating statistical significance.

1.3 Review of 2013 CARB B5 Emission Testing

In December 2013, after the release of the ISOR and in response to an earlier Public Records Act request, CARB released a copy of new CARB-sponsored emission testing conducted by Durbin and others at the University of California CE-CERT[9]. The purpose of the study was "... to evaluate different B5 blends as potential emissions equivalent biodiesel fuel formulations for California."[10] Three B5 blends derived from soy, waste vegetable oil (WVO), and animal biodiesel stocks were tested on one 2006 Cummins ISM 370 engine using the hot-start EPA heavy-duty engine dynamometer cycle. A preliminary round of testing was conducted for all three fuels followed by emissions-equivalent certification testing per 13 CCR 2282(g) for two of the fuels. As noted by Durbin: "[t]he emissions equivalent diesel certification procedure is robust in that it requires at least twenty replicate tests on the reference and candidate fuels, providing the ability to differentiate small differences in emissions."[11]

Soy and WVO B5 Biodiesel

The B5-soy and B5-WVO fuels were blended from biodiesel stocks that were generally similar to the soy-based stock used in the earlier CARB Biodiesel Characterization Study (Durbin 2011) with respect to API gravity and cetane number. In the preliminary testing, the two fuels "...showed 1.2-1.3% statistically significant [NOx emissions] increases with the B5-soy and B5-WVO biodiesel blends compared to the CARB reference fuel."[12] The B5-WVO fuel caused the smaller NOx increase (1.2%) and was selected for the certification phase of the testing. There, it "... showed a statistically significant 1.0% increase in NOx compared to the CARB reference fuel"[13] and failed the emissions-equivalent certification due to NOx emissions.

ADF B3-59

Animal B5 Biodiesel

The B5-animal derived fuel was blended from an animal tallow derived biodiesel that was substantially different from the animal based biodiesel used in the earlier Durbin study, and was higher in both API gravity and cetane number. The blending response for cetane number was also surprising, in that blending 5 percent by volume of a B100 stock (cetane number 61.1) with 95% of CARB ULSD (cetane number 53.1) produced a B5 fuel blend with cetane number 61.

ADF B3-60

In preliminary testing, the B5-animal fuel showed a small NOx increase which was not statistically significant, causing it to be judged the best candidate for emissions-equivalent certification. In the certification testing, it "...showed a statistically

ADF B3-61

[9] "CARBB5 Biodiesel Preliminary and Certification Testing." Prepared by Thomas D. Durbin, G. Karavalakis and others. Prepared for Alexander Mitchell, California Air Resources Board. July 2013. This study is not referenced in the ISOR, nor was it included in the rule making file when the hearing notice for the ADF regulation was published in October 2013.
[10] Ibid, p. vi.
[11] Ibid, p. viii.
[12] Ibid, p. 8.
[13] Ibid, p. 9.

significant 0.5% reduction in NOx compared to the CARB reference fuel"[13] and passed the emissions-equivalent certification. The NOx emission reduction for this fuel blend appears to be real for this engine, but given the differences between the blendstock and the animal based biodiesel blendstock used in the earlier Durbin study it is unclear that it is representative for animal-based biodiesels in general..

ADF B3-61 cont.

Summary

The conclusions drawn in the preceding section are not changed by the consideration of these new emission testing results. For plant-based biodiesels (soy- and WVO-based), the new testing provides additional and statistically significant evidence that B5 blends will increase NOx emissions at the B5 level. The result of decreased NOx for the B5 animal-based blend stands out from the general trend of research results reviewed in this report. However:

- The same result – reduced NOx emissions for some fuels and engines – has sometimes been observed in past research, as evidenced by the emissions data considered by CARB staff in ISOR Figure B.3 (reproduced in Figure 2.1 below). As shown, some animal-based B5 and B20 fuels reduced NOx emissions while others increased NOx emissions with the overall conclusion being that NOx emissions increase in direct proportion to biodiesel content of the blends and that there is no emissions threshold.

- Increasing cetane is known to generally reduce NOx emissions and has already been proposed by CARB as a mitigation strategy for increased NOx emissions from biodiesel[14]. The unusual cetane number response in the blending and the high cetane number of the B5-animal fuel may account for the results presented in the recently released study.

ADF B3-62 cont.

Considering the broad range of plant- and animal-based biodiesel stocks that will be used in biodiesel fuels, we conclude that the available research (including the recently released CARB test results) indicates that unrestricted biodiesel use at the B5 level will cause real increases in NOx emissions and that countermeasures may be required to prevent increases in NOx emissions due to biodiesel use at blending levels below B10.

###

[14] For example, see Durbin 2011 Section 7.0 for a discussion of NOx mitigation results through blending of cetane improvers and other measures.

2. CARB LITERA TURE REVIEW

The Staff ISOR explains that the Appendix B Technology Assessment is the basis for CARB's conclusion that biodiesels below B10 have no significant impact on NOx emissions. The assessment is based on data from seven studies (identified in Table 2-1) that tested high-cetane diesel fuels. The first study (Durbin 2011) is the Biodiesel Characterization Study that was conducted for CARB, while the others were obtained through a literature search.

Tab le 2-1
List of Studies f rom High-Cetane Liter ature Sear ch

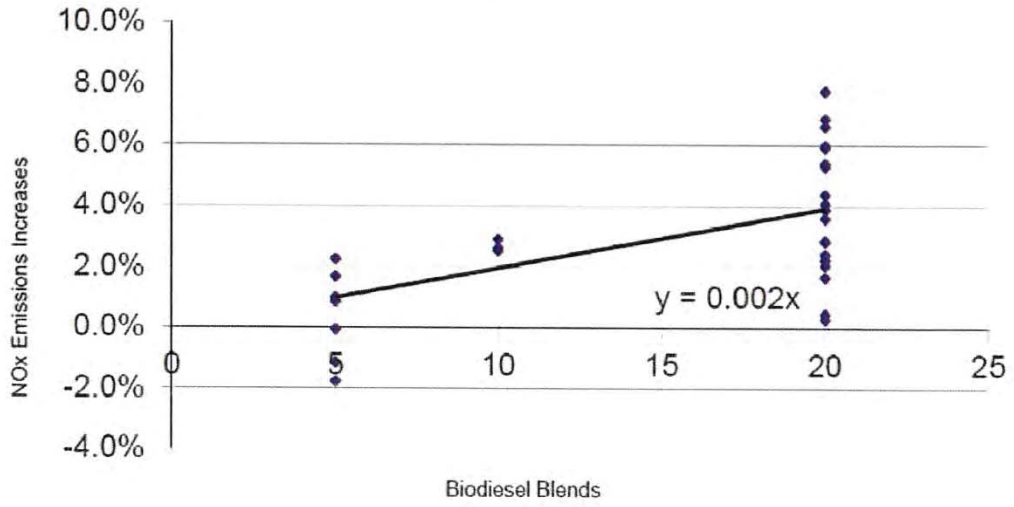
Primary Author	Title	Published	Year
Durbin	Biodiesel Mitigation Study	Final Report Prepared for Robert Okamoto, M.S. and Alexander Mitchell, CARB	2011
Clark	Transient Emissions Comparisons of Alternative Compression Ignition Fuel	SAE 1999-01-1117	1999
Eckerle	Effects of Methyl Ester Biodiesel Blends on NOx Emissions	SAE 2008-01-0078	2008
McCormick	Fuel Additive and Blending Approaches to Reducing NOx Emissions from Biodiesel	SAE 2002-01-1658	2002
McCormick	Regulated Emissions from Biodiesel Tested in Heavy-Duty Engines Meeting 2004 Emissions	SAE 2005-01-2200	2005
Nuszkowski	Evaluation of the NOx emissions from heavy duty diesel engines with the addition of cetane improvers	Proc. I Mech E Vol. 223 Part D: J. Automobile Engineering, 223, 1049-1060	2009
Thompson	Neat fuel influence on biodiesel blend emissions	Int J Engine Res Vol. 11, 61-77.	2010

Source: Table B.2 of Durbin 2011

Figure 2-1 reproduces two exhibits from Appendix B that show increasing trends for NOx emissions with the biodiesel blending level. Based on the slopes of the trend lines,

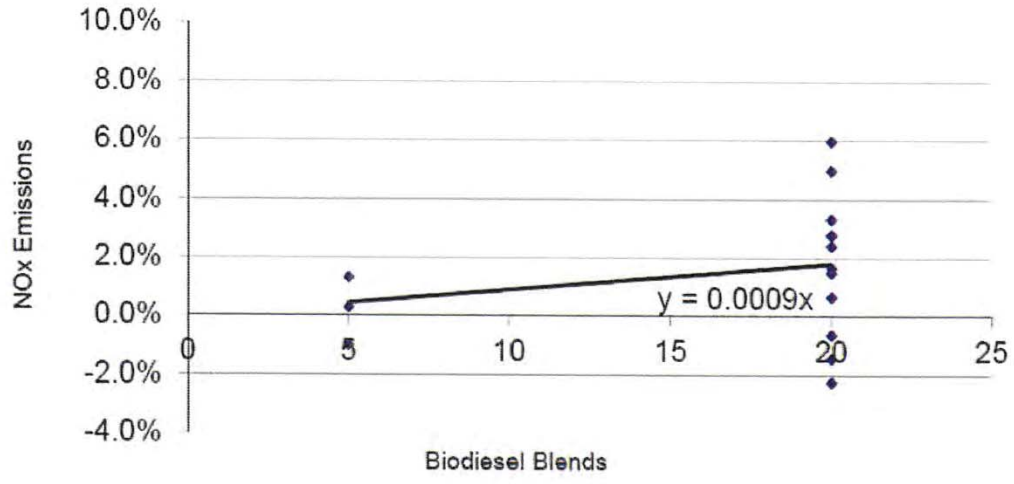
Figure 2-1
NOx Emission Increases Observed in Biodiesel Research Cited in Staff ISOR

Figure B.2: NOx Impact of Soy Biodiesel Blended in High Cetane Base Fuel



ADF B3-63

Figure B.3: NOx Impact of Animal Biodiesel Blended in High Cetane Base Fuel



Source: Figures B.2 and B.3 of Appendix B: Technology Assessment

soy-based biodiesels are shown to increase NOx emissions by approximately 1% at B5, 2% at B10, and 4% at B20. Animal-based biodiesels are shown to increase NOx emissions by about one-half as much: 0.45% at B5, 0.9% at B10, and 1.8% at B20. Although there is substantial scatter in the results, these data do not appear to support the Staff Threshold Model that biodiesel does not increase NOx emissions at B5 but does so at B10.

ADF B3-63 cont.

We will examine the Durbin 2011 study at some length in Section 3. In this section, we look at each of the other studies cited by the Staff to find out what the studies say about NOx emissions impacts at and below B10.

2.1 Review of Literature Cited in the ISOR

The Staff literature search sought and selected testing that used fuels with cetane levels comparable to California diesel fuels; the Staff does not, however, list those fuels or provide the data that support the tables and figures in Appendix B of the ISOR. Therefore, we have necessarily made our own selection of high-cetane fuels in the course of reviewing the studies. The key testing and findings of each study are summarized below, with a specific focus on what they tell us about NOx emission impacts at B10 and below.

2.1.1 Clark 1999

This study tested a variety of fuels on a 1994 7.3L Navistar T444E engine. Of the high-cetane base fuels, one base fuel (Diesel A, off-road LSD) was blended and tested at levels of B20, B50, and B100. NOx emissions were significantly increased for all of the blends. The other base fuel (CA Diesel) was tested only as a base fuel. Its NOx emissions were 12% below that of Diesel A, making it is unclear whether Diesel A is representative of fuels in CA. This study conducted no testing of the NOx emissions impact from biodiesels at the B10 level or below.

2.1.2 Eckerle 2008

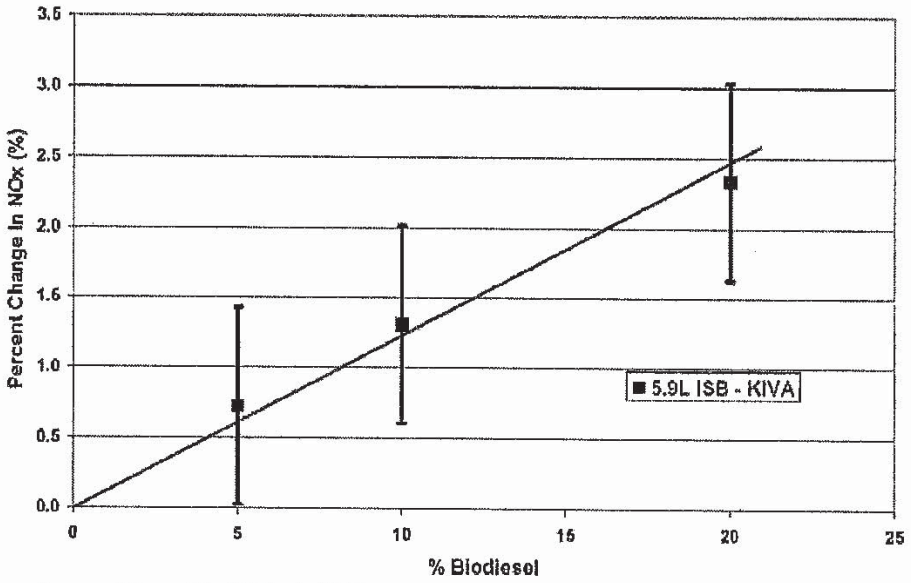
This study tested low and mid/high-cetane base fuels alone and blended with soy-based biodiesel at the B20 level. The Cummins single-cylinder test engine facility was used in a configuration representative of modern diesel technology, including cooled EGR. Testing was conducted under a variety of engine speed and load conditions. FTP cycle emissions were then calculated from the speed/load data points. The test results show that B20 blends increase NOx emissions compared to both low- and high-cetane base fuels. This study conducted no testing of the NOx emissions impact from biodiesels at the B10 level or below.

ADF B3-64

The study notes that two other studies "show that NOx emissions increase nearly linearly with the increase in the percentage of biodiesel added to diesel fuel." Eckerle's Figure 21 (reproduced below as Figure 2-2) indicates a NOx emissions increase at B5, which is the basis for the statement in the abstract that "Results also show that for biodiesel blends containing less than 20% biodiesel, the NOx impact over the FTP cycle is proportional to

the blend percentage of biodiesel." The authors clearly believe that biodiesel fuels have NOx emission impacts proportional to the blending percent at all levels including B5.

Figure 2-2
Impact of Biodiesel Blends on Percent NOx Change for the 5.9L ISB Engine Operation Over the FTP Cycle



Source: Figure 21 of Eckerle 2008

ADF B3-64 cont.

2.1.3 McCormick 2002

This study tested low- and mid-cetane base fuels alone and blended with soy- and animal-based biodiesel at the B20 level. The testing was conducted on a 1991 DDC Series 60 engine using the hot-start U.S. heavy-duty FTP. NOx emission increases were observed for both fuels at the B20 level. Mitigation of NOx impacts was investigated by blending a Fisher-Tropsch fuel, a 10% aromatics fuel and fuel additives. This study conducted no testing of the NOx emissions impact from commercial biodiesels at the B10 level or below.

This study also tested a Fisher-Tropsch (FT) base fuel blended at the B1, B20, and B80 levels. Although the very high cetane number (≥75) takes it out of the range of commercial diesel fuels, it is interesting to note that the study measured higher NOx emissions at the B1 level than it did on the FT base fuel and substantially higher NOx emissions at the B20 and B80 levels. While the B1 increase was not statistically significant given the uncertainties in the emission measurements (averages of three test runs), it is clear that increased NOx emissions have been observed at very low blending levels.

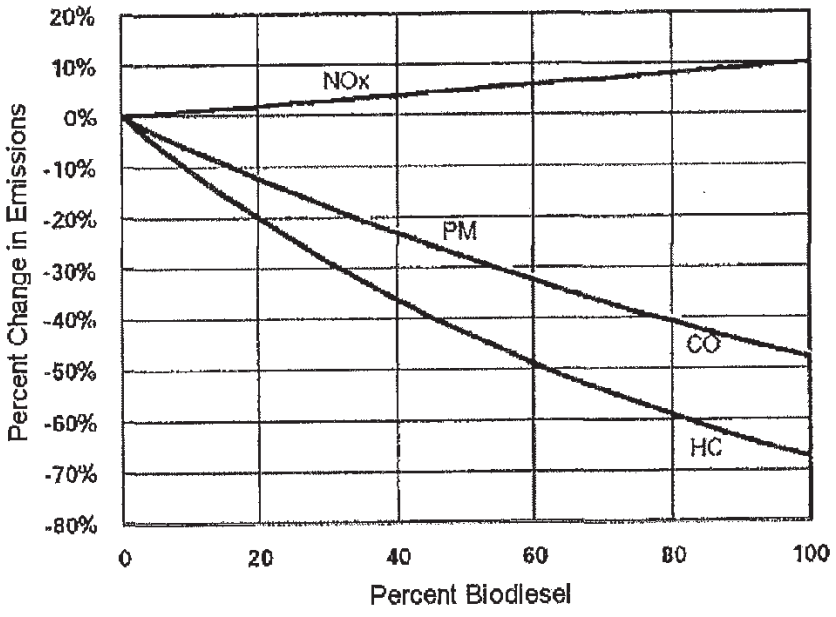
ADF B3-65

2.1.4 McCormick 2005

This study tested blends of soy- and animal-based biodiesels with a high-cetane ULSD base fuel at B10 levels and higher. Two engines were tested – a 2002 Cummins ISB and a 2003 DDC Series 60, both with cooled EGR. The hot-start U.S. heavy-duty FTP test cycle was used. The majority of testing was at the B20 level with additional testing at the B50 and B100 levels. One soy-based fuel was tested at B10. The study showed NOx emission increases at B10, B20, and higher levels. The study also investigated mitigation of NOx increases. This study conducted no testing of the NOx emissions impact from biodiesels below the B10 level.

The authors present a figure (reproduced as Figure 2-3) in their introduction that shows their summary of biodiesel emission impacts based on an EPA review of heavy-duty engine testing. It shows NOx emissions increasing linearly with the biodiesel blend percentage.

Figure 2-3
Trend in HC, CO, NOx and PM Emissions with Biodiesel Percent



Source: McCormick 2005

ADF B3-66

2.1.5 Nuszkowski 2009

This study tested five different diesel engines: one 1991 DDC Series 60, two 1992 DDC Series 60, one 1999 Cummins ISM, and one 2004 Cummins ISM. Only the 2004 Cummins ISM was equipped with EGR. All testing was done using the hot-start U.S. heavy-duty FTP test cycle. The testing was designed to test emissions from fuels with and without cetane-improving additives. Although a total of five engines were tested, the base diesel and B20 fuels were tested on only two engines (one Cummins and one DDC Series 60) because there was a limited supply of fuel available. NOx emissions increased on the B20 fuel for both engines. A third engine (Cummins) was tested on B20 and B20 blended with cetane improvers to examine mitigation of NOx emissions. This study conducted no testing of the NOx emissions impact from biodiesels at the B10 level or below.

ADF B3-67

2.1.6 Thompson 2010

This study examined the emissions impacts of soy-based biodiesel at the B10 and B20 levels relative to low-cetane (42), mid-cetane (49), and high-cetane (63) base fuels using one 1992 DDC Series 60 engine. The emissions results were measured on the hot-start U.S. heavy-duty FTP cycle. The study found that NOx emissions were unchanged (observed differences were not statistically significant) at B10 and B20 levels for the low- and mid-cetane fuels. NOx emissions increased significantly at B10 and B20 levels for the high-cetane fuels. This study conducted no testing of the NOx emissions impact from biodiesels at levels below B10.

ADF B3-68

2.2 Conclusions Based on Studies Obtained in Literature Search

From the foregoing summary of the studies cited by Staff, we reach the conclusions given below.

1. None of the six studies measured the NOx emissions impact from commercial-grade biodiesel at blending levels below B10, and only two studies tested a fuel at the B10 level. All other testing was at the B20 level or higher. Because none tested a B5 (or similar) fuel, none is capable of providing direct evidence regarding NOx emissions at B5 or other blending levels below B10.

ADF B3-69

2. These studies provide no data or evidence supporting the validity of Staff's Threshold Model that biodiesel below B10 does not increase NOx emissions. In fact, all of the studies are consistent with the contention that biodiesel increases NOx emissions in proportion to the blending percent.

ADF B3-70

3. Two of the studies present evidence and arguments that the NOx impact from biodiesel is a continuous effect that is present even at very low blending levels and will increase at higher levels in proportion to the blending percentage. One study tested a Fischer-Tropsch biodiesel blend at B1 and observed NOx emissions to increase (but not by a statistically significant amount).

ADF B3-71

###

3. CARB BIODIESEL CHARACTERIZATION STUDY

3.1 Background

CARB sponsored a comprehensive study of biodiesel and other alternative diesel blends in order "... to better characterize the emissions impacts of renewable fuels under a variety of conditions."[15] The study was designed to test eight different heavy- duty engines or vehicles, including both highway and off-road engines using engine or chassis dynamometer testing. Five different test cycles were used: the Urban Dynamometer Driving Schedule (UDDS), the Federal Test Procedure (FTP), and 40 mph and 50 mph CARB heavy-heavy-duty diesel truck (HHDDT) cruise cycles, and the ISO 8178 (8 mode) cycle. Table 3-1 (reproduced from Table ES-1 of Durbin 2011) documents the scope of the test program. Because the Staff relied only on engine dynamometer testing in its Technology Assessment, only the data for the first four engines (shaded) are considered here.

Table 3-1
A Breakdown of the Test Engines for the Different Categories of Testing

2006 Cummins ISM[a]	Heavy-duty on-highway	Engine dynamometer	
2007 MBE4000	Heavy-duty on-highway	Engine dynamometer	
1998, 2.2 liter, Kubota V2203-DIB	Off-road	Engine dynamometer	
2009 John Deere 4.5 L	Off-road	Engine dynamometer	
2000 Caterpillar C-15	Heavy-duty on-highway	Chassis dynamometer	Freightliner chassis
2006 Cummins ISM	Heavy-duty on-highway	Chassis dynamometer	International chassis
2007 BME4000	Heavy-duty on-highway	Chassis dynamometer	Freightliner chassis
2010 Cummins ISX15	Heavy-duty on-highway	Chassis dynamometer	Kenworth chassis

Source: Table ES-1 of Durbin 2011, page xxvi
Notes:
[a] Data for the first four engines (shaded) are considered in this report.

[15] Durbin 2011, p. xxiv.

The original goal of this report was to subject all of the NOx emission testing in Durbin 2011 to a fresh re-analysis. However, it was discovered that Durbin 2011 did not report all of the data that were obtained during the program and are discussed in the report. The chassis dynamometer testing was conducted at the CARB Los Angeles facility. Emission results for the chassis dynamometer testing are presented in tabular and graphical form, but the report does not contain the actual emissions test data. For the engine dynamometer testing, some of the measured emission values are not reported even though the emission results are reported in tabulated or graphical form. Requests for the missing data were directed to Durbin in a personal request and to CARB through an official records request. No information has been provided in response and we have not been able to obtain the missing data from online or other sources.

ADF B3-72

For this report, we have worked with the data in the forms that are provided in Durbin 2011 as being the best-available record of the results of the CARB study. Because Staff used only data obtained in engine dynamometer testing, the analysis presented in this report has done the same. Nevertheless, the results of the chassis dynamometer testing are generally supportive of the results and conclusions presented here. Durbin 2011 notes:

> "... The NOx emissions showed a consistent trend of increasing emissions with increasing biodiesel blend level. These differences were statistically significant or marginally significant for nearly all of the test sequences for the B50 and B100 fuels, and for a subset of the tests on the B20 blends."[16]

Durbin notes that emissions variability was greater in the chassis dynamometer testing, which leads to the sometimes lower levels of statistical significance. There was also a noticeable drift over time in NOx emissions that complicated the results for one engine.

3.2 Data and Methodology

Table 3-2 compiles descriptive information on the engine dynamometer testing performed in Durbin 2011. The experimental matrix involves four engines, two types of biodiesel fuels (soy- and animal-based), and up to four test cycles per engine. However, the matrix is not completely filled with all fuels tested on all engines on all applicable test cycles. The most complete testing is for the ULSD base fuel and B20, B50, and B100 blends. There is less testing for the B5 blend, and B5 is tested using only a subset of cycles. For this reason, we first examine the testing for ULSD, B20, B50, and B100 fuels to determine the overall impact of biodiesels on NOx emissions. We then examine the more limited testing for B5 to determine the extent to which it impacts NOx emissions.

This examination is limited by the form in which emissions test information is reported in Durbin 2011. A complete statistical analysis can be conducted only for the two on-road engines for which Appendices G and H of Durbin 2011 provide measured emissions, and for a portion of the testing of the Kubota off-road engine for which Appendix I provides

[16] Durbin 2011, p. 126.

Table 3-2 Experimental Matrix for Heavy-Duty Engine Dynamometer Testing Reported in Durbin 2011				
Engine	Biodiesel Type	Fuels Tested	Test Cycles	Notes
On-Road Engines				
2006 Cummins ISM	Soy	ULSD, B20, B50, B100, B5	UDDS, FTP, 40 mph, 50 mph	B5 tested on 40 mph and 50 mph cruise cycles
	Animal	ULSD, B20, B50, B100, B5	UDDS, FTP, 50 mph	B5 tested only on FTP.
2007 MBE4000	Soy	ULSD, B20, B50, B100, B5	UDDS, FTP, 50 mph	B5 tested only on FTP.
	Animal	ULSD, B20, B50, B100, B5		B5 tested only on FTP.
Off-Road Engines				
1998 Kubota V2203-DIB	Soy	ULSD, B20, B50, B100, B5	ISO 8178 (8 Mode)	none
	Animal	Not tested		
2009 John Deere	Soy	ULSD, B20, B50, B100	ISO 8178 (8 Mode)	B5 not tested
	Animal	ULSD, B20, B5		none

measured emissions. The data needed to support a full re-analysis consist of measured emissions on each fuel in gm/hp-hr terms, which are stated in Durbin 2011 as averages across all test replications along with the number of replications and the standard error of the individual tests. With this information, the dependence of NOx emissions on biodiesel blending percent can be determined as accurately as if the individual test values had been reported and the appropriate statistical tests for the significance of results can be performed.

Regression analysis is used as the primary method of analysis. For each engine and test cycle, the emission averages for each fuel are regressed against the biodiesel blending percent to determine a straight line. The regression weights each data point in inverse proportion to the square of its standard error to account for differences in the number and reliability of emission measurements that make up each average. The resulting regression line will pass through the mean value estimated from the data (i.e., the average NOx emission level at the average blending percent), while the emission averages for each fuel may scatter above and below the regression line due to uncertainties in their measurement. The slope of the line estimates the dependence of NOx emissions on the blending percentage.

Where the data points closely follow a straight line and the slope is determined to be statistically significant, one can conclude that blending biodiesel with a base fuel will increase NOx emissions in proportion to the blending percent. The regression line can then be used to estimate the predicted emissions increase for a given blending percent. The predicted emissions increase is the value one would expect on average over many measurements and is comparable to the average emissions increase one would expect in a fleet of vehicles.

The same level of analysis is not possible for the testing on B5 fuel, which is reported as a simple average for the on-road engines and is not reported at all for the off-road engines. For the B5 fuel, Durbin 2011 presents emission test results in a tabulated form where the percentage change in NOx emissions has been computed compared to ULSD base fuel. This form supports the presentation of results graphically, but it does not permit a proper statistical analysis to be performed. Specifically, the computation of percentage emission changes will perturb the error distribution of the data, by mixing the uncertainty in measured emissions on the base fuel with the uncertainties in measured emissions on each biodiesel blend, and it can introduce bias as a result of the mixing. Further statistical analysis of the computed percent values should be avoided because of these problems. Therefore, a more limited trend analysis of the NOx emissions data for B5 and the John Deere engine is conducted.

3.3 2006 Cummins Engine (Engine Dynamometer Testing)

Table 3-3 shows the NOx emission results for the 2006 model-year Cummins heavy-duty diesel engine based on a re-analysis of the data for this report. As indicated by highlighting in the table, the relationship between increasing biodiesel content and increased NOx emissions for soy-based biodiesel is statistically significant at >95% confidence level[17] in all cases. For the animal-based biodiesel, the relationship is statistically significant at the 92% confidence level for the UDDS cycle, the 94% confidence level for the 50 mph cruise, and the >99% confidence level for the FTP cycle.

For the soy-based fuels, the R^2 statistics show that the emissions effect of biodiesel is almost perfectly linear with increasing biodiesel content over the range B20, B50, and B100. Although not as high for the animal-based fuels (because the emissions effect is smaller and measurement errors are relatively larger in comparison to the trend), the R^2 statistics nevertheless establish a linear increase in NOx emissions with increasing biodiesel content over the same range. The linearity of the response with blending percent is well supported by the many NOx emissions graphs contained in Durbin 2011.

The table also gives the estimated NOx emission increases for B5 and B10 as predicted by the regression lines. For soy-based fuels, the values are 1% for B5 (range 0.8% to 1.3% depending on the cycle) and 2% for B10 (range 1.6% to 2.6% depending on cycle).

[17] A result is said to be statistically significant at the 95% confidence level when the p value is reported as $p \leq 0.05$. At the $p \leq 0.01$ level, a result is said to be statistically significant at the 99% confidence level, and so forth.

Table 3-3
Re-Analysis for 2006 Cummins Engine (Engine Dynamometer Testing)
Model: NOx = A + B · BioPct
Using ULSD, B20, B50, and B100 fuels

Biodiesel Type	Test Cycle	R^2	Intercept A	BioPct Slope B		Predicted NOx Increase for B5	Predicted NOx Increase for B10
			Value	Value	p value	Pct Change	Pct Change
Soy-based							
	UDDS	0.997	5.896	0.0100 [a]	0.001	0.8%	1.7%
	FTP	0.995	2.024	0.0052	0.003	1.3%	2.6%
	40 mph	1.000	2.030	0.0037	<0.0001	0.9%	1.8%
	50 mph	0.969	1.733	0.0028	0.016	0.8%	1.6%
Animal-based							
	UDDS	0.847	5.911	0.0021 [b]	0.080	0.2%	0.4%
	FTP	0.981	2.067	0.0031	0.001	0.7%	1.4%
	50 mph	0.887	1.768	0.0011	0.058	0.3%	0.6%

Notes:
[a] Blue highlight indicates result is statistically significant at the 95% confidence level or better.
[b] Orange highlight indicates result is statistically significant at the 90% confidence level or better.

For animal-based fuels, the values are approximately one-half as large: 0.4% for B5 (range 0.2% to 0.7%) and 0.8% for B10 (range 0.4% to 1.4%). These predicted increases are statistically significant to the same degree as the slope of the regression line from which they are estimated. That is, the NOx increases predicted by the regression line for soy-based fuels are statistically significant at the 95% confidence level (or better) on all cycles and the predicted NOx increases for animal-based fuels are statistically significant at the 90% confidence level (or better) on all cycles and at the >99% confidence level for the FTP.

Because the limited data on B5 were not used to develop the regression lines for each cycle, and no test data on B10 are available, use of the lines to make predictions for B5 and B10 depends on their linearity over the range between ULSD and B20. Based on the R^2 statistics and the graphs in Durbin 2011, the slopes observed between ULSD and B20 are the same as the slopes observed between B20 and B100 for each of the test cycles. We believe that the linearity of the response with blending percent for values over the range ULSD to B100 would be accepted by the large majority of researchers in the field, as would the use of regression analysis to make predictions for B5 and B10.

ADF B3-73

The Durbin 2011 report takes a different approach for determining the statistical significance of NOx emission increases for each fuel. For each fuel tested, it computes a percentage change in emissions for NOx (and other pollutants) relative to the ULSD base fuel. It then determines the statistical significance of each observed change using a conventional t-test for the difference of two mean values (2-tailed, 2 sample equal

variance t-test). The t-test is conducted on the measured emission values before the percentage emission change is computed.

The t-test would be the appropriate approach for determining statistical significance if only two fuels were tested. However, it is a simplistic approach when three or more fuels are tested because it is applied on a pair-wise basis (B5 vs. ULSD, B20 vs. ULSD, etc.) and does not make use of all of the data that is available. It will have less power than the regression approach to detect emission changes that are real. This limitation is in one direction, however, in that the test is too weak when 3 or more data points are available, but a finding of statistical significance is valid when it occurs. As long as the linear hypothesis is valid, the regression approach should be the preferred method for analysis and for the determination of whether biodiesel blending significantly increases NOx emissions.

ADF B3-74

Because emission changes will be smallest for B5 (because of the low blending volume), the pair-wise t-test is most likely to fail to find statistical significance at the B5 level. In cases where the pair-wise t-test for B5 says that the emission change vs. ULSD is not statistically significant – but slope of the regression line is statistically significant – the proper conclusion is that additional B5 testing (to improve the precision of the emission averages) would likely lead to the detection of a statistically significant B5 emissions change using the t-test. In this case, the failure to find statistical significance using the t-test is not evidence that B5 does not increase NOx emissions.

For this engine, soy-based B5 was tested on the 40 mph and 50 mph cruise cycles and animal-based B5 was tested on the FTP. To examine this matter further, Table 3-4 reproduces NOx emission results reported in Tables ES-2 and ES-3 of Durbin 2011. Soy-based B5 was shown to increase NOx emissions on the 40 mph cruise cycle, but not on the 50 mph cruise cycle. Animal-based B5 was shown to increase NOx emissions on the FTP. Durbin 2011 noted (p. xxxii) that "[t]he 50 mph cruise results were obscured, however, by changes in the engine operation and control strategy that occurred over a segment of this cycle." Therefore, we discount the 50 mph cruise results and do not consider them further. Neither of the remaining B5 NOx emission increases (for the 40 mph Cruise and FTP cycles) were found to be statistically significant using the t-test, although the 40 mph cruise result for soy-based fuels comes close to being marginally significant (it would be statistically significant at an 86.5% level). The NOx emission increases at higher blending levels were found have high statistical significance (>99% confidence level).

ADF B3-75

This format, used throughout Durbin 2011 to report emission test data and to show the effect of biodiesel on emissions, is subject to an important statistical caveat. The percent changes are computed by dividing the biodiesel emission values by the emissions measured for the ULSD base fuel. Therefore, measurement errors in the ULSD measurement are blended with the measurement errors for each of the biodiesel fuels. The blending of errors in each computed percent change can bias the apparent trend of emissions with increasing biodiesel content. As will be shown in Section 3.3.2, we can see this problem in the animal-based B5 test data for this engine.

Table 3-4 Percentage Change in NOx Emissions for Biodiesel Blends Relative to ULSD: 2006 Cummins Engine (Engine Dynamometer Testing)						
	Soy-based Biodiesel				Animal-based Biodiesel	
	40 mph Cruise		50 mph Cruise		FTP	
	NOx % Diff	p value	NOx % Diff	p value	NOx % Diff	p value
B5	1.7%	0.135	-1.1%	0.588	0.3%	0.298
B20	3.9%[a]	0.000	0.5%	0.800	1.5%	0.000
B50	9.1%	0.000	6.3%	0.001	6.4%	0.000
B100	20.9%	0.000	18.3%	0.000	14.1%	0.000

Source: Table ES-2 and ES-3 of Durbin 2011, p. xxviii
Notes:
[a] Blue highlight indicates result is statistically significant at the 95% confidence level or better based on the pair-wise t-test.

3.3.1 NOx Impact of Soy-based Biodiesel at the B5 Level

Figures 3-1a and 3-1b display the trend of NOx emissions with blending percent for the soy-based biodiesel on the 40 mph cruise cycle. Figure 3-1a plots the percentage increases as reported by Durbin 2011 in contrast to two different analytical models for the relationship:

- The Linear Model shown by the blue line; and
- The Staff Threshold model (black line), in which the NOx emission change is zero through B9 and then increases abruptly to join the linear model.

In Figure 3-1a, the linear model is an Excel trendline for the computed percent changes. While the data violate a key assumption for the proper use of regression analysis, this approach is the only way to establish a trendline given the form in which Durbin 2011 tabulates the data and presents the results of its testing.

Figure 3-1b plots the actual measured emission values in g/bhp-hr terms in contrast to the same two analytical models. Here, the linear model line is determined through a proper use of regression analysis, in which each emission average in g/bhp-hr terms is weighted inversely by the square of its standard error, using the data for ULSD, B20, B50 and B100 (i.e., excluding the B5 data point). In the case of this engine and biodiesel fuel, both forms of assessment show generally the same trend for NOx emissions as a function of blending percent. Although the NOx emission increases for B5 may fail the t-test for significance, emissions are increased at B5 and the B5 data point is fully consistent with the Linear Model. The Threshold model is clearly a less-satisfactory representation of the test data.

ADF B3-76

Figure 3-1a
Durbin 2011 Assessment: 40 mph Cruise Cycle NOx Emissions Increases for Soy-Biodiesel Blends (2006 Cummins Engine)

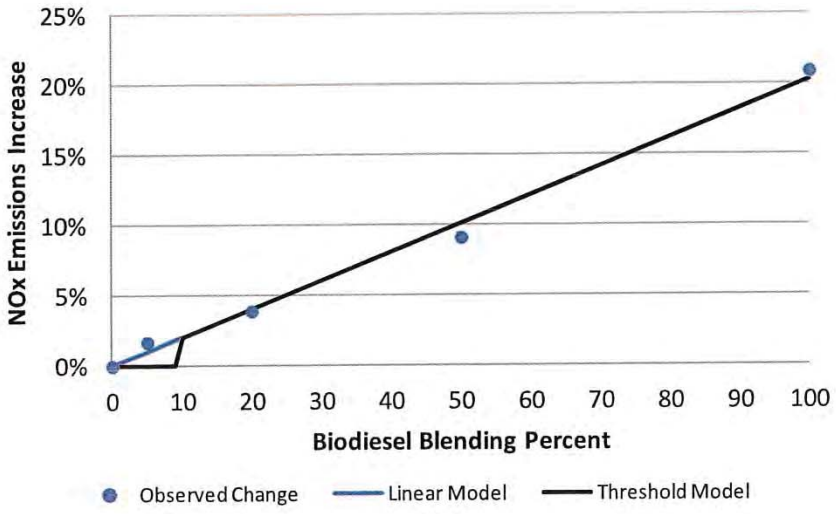
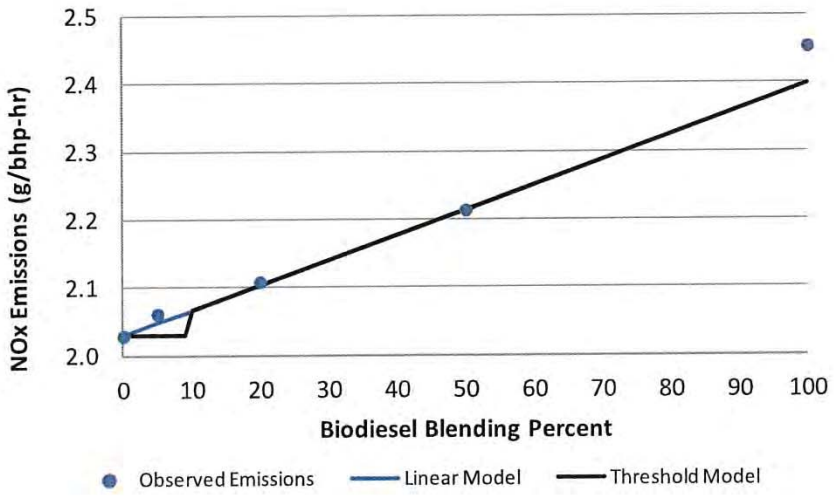


Figure 3-1b
Re-assessment of 40 mph Cruise Cycle NOx Emissions Increases for Soy-Biodiesel Blends (2006 Cummins Engine)



Note that the slope of the trendline (Figure 3-1a) is greater than the slope of the regression line (Figure 3-1b). In the latter figure, the B100 data point stands above the regression line, which passes below it. The regression line (but not the trendline) is fit in

a manner that accounts for the uncertainties in each data point, so that the line will pass closer to points that have smaller uncertainties and farther from points that have greater uncertainties. For these data, the B100 data point has the largest uncertainty (±0.026 g/bhp-hr) followed by the B20 data point (±0.025 g/bhp-hr). The other three data points (ULSD, B5, and B50) have uncertainties less than ±0.001 g/bhp-hr. The B20 data point happens to fall on the line, but the B100 data point is found to diverge above. Because the regression analysis can account for the relative uncertainties of the data points, it provides a more accurate and reliable assessment of the impact on NOx emissions.

ADF B3-77

3.3.2 NOx Impact of Animal-based Biodiesel at the B5 level

Figures 3-2a and 3-2b display the trend of NOx emissions with blending percent for the animal-based biodiesel on the FTP test cycle as reported by Durbin 2011 and as re-assessed in this report using regression analysis, respectively. As Figure 3-2a shows, the NOx percent change values reported by Durbin 2011 appear to follow the Staff Threshold model in that NOx emissions are not materially increased at B5, but are increased significantly at B20 and above. As a result, the blue trendline in the figure (fit from the B20, B50 and B100 data points) has a negative intercept.

Figure 3-2b paints a very different picture from the data. Here, the ULSD and B5 data points stand above the weighted regression line (blue) developed from the data for ULSD, B20, B50 and B100. In the data used to fit the regression line, the ULSD data point has the largest uncertainty (±0.013 g/bhp-hr) while the other three data points (B20, B50, and B100) have uncertainties of ±0.002 g/bhp-hr (one case) and ±0.001 g/bhp-hr (two cases). Considering all of the data, the B5 data point has the second highest uncertainty (±0.007 g/bhp-hr). The regression line closely follows a linear model with a high R^2 (0.981) considering the weighted errors, while the ULSD and B5 points lie above it.

ADF B3-78

Because the ULSD data point is subject to more uncertainty and appears to be biased high compared to the regression line, the NOx percent changes computed by Durbin 2011 are themselves biased. The trendline result in Figure 3-2a that appeared to be supportive of the Staff Threshold model now appears to be the result of biases in the ULSD and B5 emission averages.

Two important conclusions can be drawn from the foregoing:

1. Accurate and reliable conclusions regarding the impact of B5 on NOx emissions cannot be drawn from the computed percent changes that are reported in Durbin 2011. Nor can accurate and reliable conclusions be drawn from visual inspection of graphs that present such data. Weighted regression analysis of the measured emission values (g/bhp-hr terms) must be performed so that the uncertainties in emissions measurements can be fully accounted for.

ADF B3-79

2. When a weighted regression analysis is performed using the testing for this engine, there is no evidence that supports the conclusion that B5 blends will not increase NOx emissions. In fact, the data are consistent with the conclusion that biodiesel increases NOx emissions in proportion to the blending percent.

ADF B3-80

Figure 3-2a
Durbin 2011 Assessment: FTP NOx Emissions Increases for Animal-based Biodiesel Blends (2006 Cummins Engine)

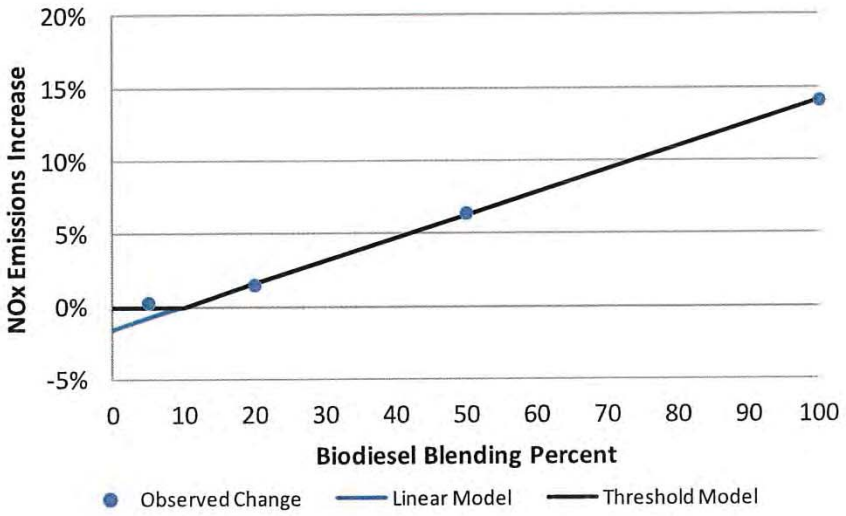
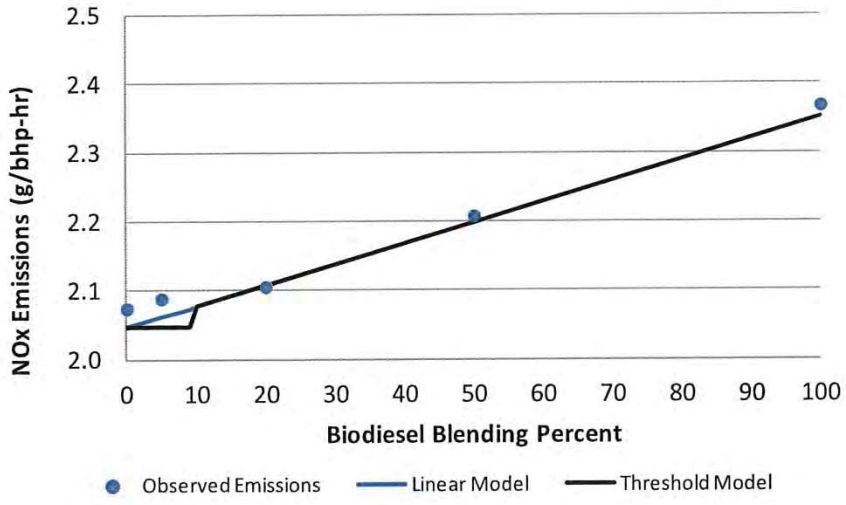


Figure 3-2b
Re-assessment of FTP NOx Emissions Increases for Animal-based Biodiesel Blends (2006 Cummins Engine)



3.4 2007 MBE4000 Engine (Engine Dynamometer Testing)

To analyze the data for the 2007 MBE4000 engine, it has proved necessary to remove two data points, one for the soy-based B20 fuel on the 50 mpg cruise cycle and one for the animal-based B50 fuel on the FTP test cycle:

- Appendix H reports the 50 mph cruise emission average for soy-based B20 to be 0.014 ± 0.020 g/bhp-hr. This value is implausible and wholly inconsistent with the NOx emission change of +6.9% reported in Table ES-4 of Durbin 2011, which would imply a NOx emission average of 1.21*1.069 = 1.30 g/bhp-hr.

- Appendix H reports the FTP emission average for the animal-based B50 fuel to be 2.592 ± 0.028 g/bhp-hr, which stands well above the other test data on animal-based biodiesel. This value is also inconsistent with the NOx emission change of +12.1% reported in Table ES-4 of Durbin 2011, which would imply a NOx emission average of 1.29*1.121 = 1.45 g/bhp-hr.

We believe these reported values are affected by typographical errors and have deleted them from the dataset used here.

With these corrections, Table 3-5 shows the results of the NOx emissions analysis for the 2007 model-year MBE4000 heavy-duty diesel engine. As indicated by highlighting in the table, the relationship between increasing biodiesel content and increased NOx emissions is statistically significant at >99% confidence level in two cases for soy-based biodiesel (the UDDS and FTP cycles) and at the 90% confidence level in one case (the 50 mph cycle). For the animal-based biodiesel, the relationship is statistically significant at the 96% confidence level for the UDDS cycle, the 98% confidence level for the FTP cycle, and >99% confidence level for the 50 mph cycle.

ADF B3-81

Durbin 2011 again notes a problem with the 50 mph cruise test results, saying (p. xxxii) that "[the NOx] trend was obscured, however, by the differences in engine operation that were observed for the 50 mph cruise cycle." Therefore, we will focus the discussion on the UDDS and FTP results.

For the soy-based fuels, the R^2 statistics show that the emissions effect of biodiesel is almost perfectly linear with increasing biodiesel content over the range from ULSD to B20, B50, and B100 for all cycles (including the 50 mph cruise). That is, the NOx emissions increase between ULSD and B20 shares the same slope as the NOx emissions increase between B20 and B100. For the animal-based biodiesel, the R^2 statistics also establish a linear increase in NOx emissions with increasing biodiesel content over the same range. The linearity of the response with blending percent is also well supported by the many NOx emissions graphs contained in Durbin 2011.

Table 3-5 Re-Analysis for 2007 MBE4000 Engine (Engine Dynamometer Testing) Model: NOx = A + B · BioPct Using ULSD, B20, B50, and B100 fuels							
Biodiesel Type	Test Cycle	R^2	Intercept A	BioPct Slope B		Predicted NOx Increase for B5	Predicted NOx Increase for B10
			Value	Value	p value	Pct Change	Pct Change
Soy-based							
	UDDS	0.989	2.319	0.0090 [a]	0.005	4.6%	9.1%
	FTP	0.998	1.268	0.0049	0.006	2.5%	5.0%
	50 mph	0.979	1.198	0.0054 [b]	0.092	2.7%	5.5%
Animal-based							
	UDDS	0.913	2.441	0.0036	0.044	2.0%	4.0%
	FTP	0.999	1.288	0.0038	0.020	2.5%	5.0%
	50 mph	0.994	1.205	0.0049	0.003	2.5%	5.0%

Notes:
[a] Blue highlight indicates result is statistically significant at the 95% confidence level or better.
[b] Orange highlight indicates result is statistically significant at the 90% confidence level or better.

The table also gives the estimated NOx emission increases for B5 and B10 as predicted by the regression lines. For soy-based fuels, the values are ~3.5% for B5 (range 2.5% to 4.6% depending on the cycle) and ~7.5% for B10 (range 5.0% to 9.1% depending on cycle). For animal-based fuels, the values are approximately two-thirds as large: ~2.3% for B5 (range 2.0% to 2.5%) and ~4.5% for B10 (range 4.0% to 5.0%). The predicted increases are statistically significant to the same degree as the slope of the regression line from which they are estimated. That is, the predicted NOx increases are statistically significant at the >99% confidence level for soy-based fuels on the UDDS and FTP cycles and at the >95% confidence level for animal-based fuels on all cycles. The predicted NOx increase is statistically significant at the 90% confidence level for soy-based fuels on the 50 mph cruise cycle.

ADF B3-82

For this engine, soy- and animal-based B5 were tested on the FTP. Table 3-6 reproduces the NOx emission results reported in Tables ES-4 and ES-5 of Durbin 2011. While there are caveats on use of the pair-wise t-test, the FTP test data for this engine show NOx emissions at the B5 level for both soy- and animal-based fuels that are statistically significant at the 99% confidence level (or better) in this case. That is, the test data for this engine as reported by Durbin 2011 refute the Staff Threshold Model that biodiesel blends below B10 do not increase NOx emissions.

Table 3-6 Percentage Change in NOx Emissions for Biodiesel Blends Relative to ULSD: 2007 MBE4000 Engine (Engine Dynamometer Testing)				
	Soy-Based Biodiesel FTP		Animal-Based Biodiesel FTP	
	NOx % Diff	p value	NOx % Diff	p value
B5	0.9% [a]	0.007	1.3%	0.000
B20	5.9%	0.000	5%	0.000
B50	15.3%	0.000	12.1	0.000
B100	38.1%	0.000	29%	0.000

Source: Table ES-4/5 of Durbin 2011, p. xxix
Notes:
[a] Blue highlight indicates result is statistically significant at the 95% confidence level or better based on pair-wise t-test.

Figures 3-3a and 3-3b below compare the FTP data for this engine to the regression line representing the linear model (blue) and the Staff Threshold model (black) for both soy- and animal-based biodiesel. In both cases, the regression line was developed using the data for ULSD, B20, B50, and B100 (i.e., excluding the B5 data point). For both soy- and animal-based biodiesels, the data point for B5 falls on the established line, while the Staff Threshold model is inconsistent with the data. For this engine, it is clear that soy- and animal-based biodiesels increase NOx emissions at all blending levels.

ADF B3-83

Figure 3-3a
Re-assessment of FTP Cycle NOx Emissions Increases for Soy-based Biodiesel Blends (2007 MBE4000 Engine)

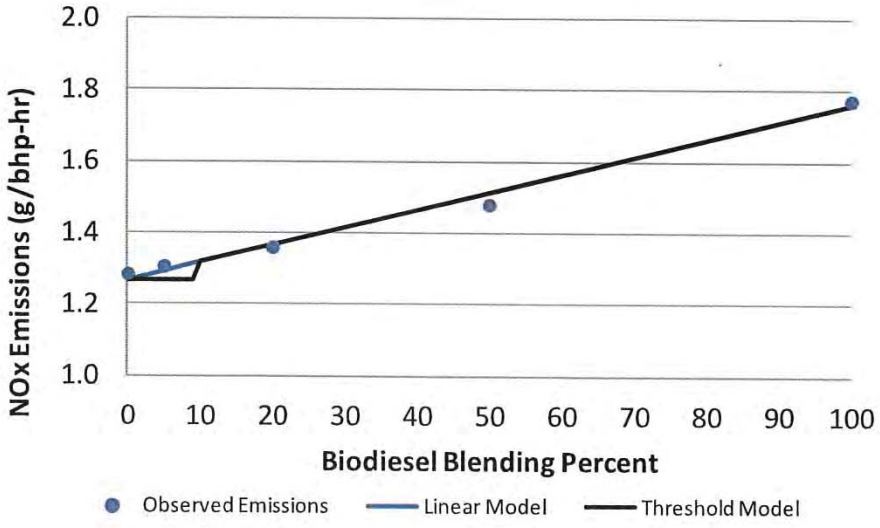
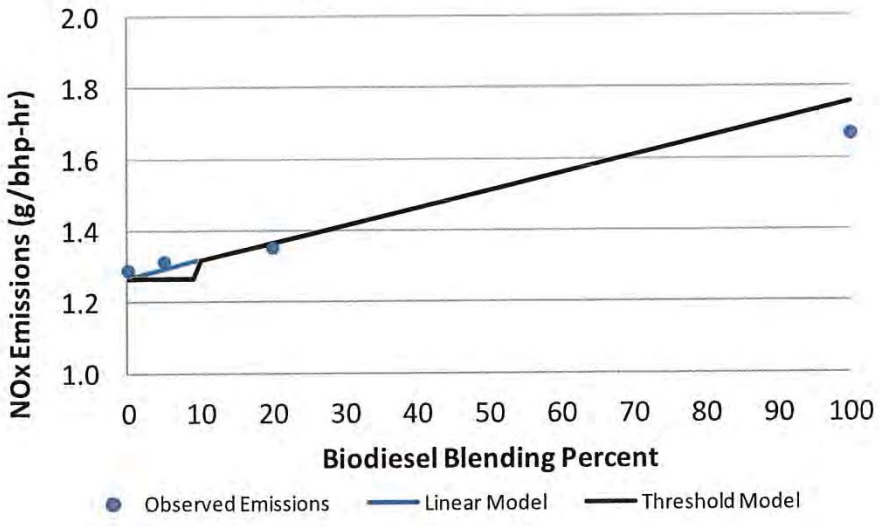


Figure 3-3b
Re-assessment of FTP Cycle NOx Emissions Increases for Animal-based Biodiesel Blends (2007 MBE4000 Engine)



3.5 1998 Kubota TRU Engine (Engine Dynamometer Testing)

The 1998 Kubota V2203-DIB off-road engine was tested on the base fuel (ULSD) and soy-based biodiesel at four blending levels (B5, B20, B50, B100) in two different series using the ISO 8178 (8-mode) test cycle. Appendix I reports the measured emissions data only for the first series (ULSD, B50, B100). Using this subset of data, Table 3-7 summarizes the results of the re-analysis for this engine.

As for the other engines, the results of the analysis demonstrate the following:

- The high R^2 statistic shows that the emissions effect of biodiesel is almost perfectly linear over the range B50 and B100. That is, the slope from ULSD to B50 is the same as the slope from B50 to B100. The slope of the regression line is statistically significant at the 99% confidence level.

- NOx emissions are estimated to increase by 1.0% at the B5 level and by 2.1% at the B10 level. These estimated NOx emission increases are statistically significant to the same high degree as the regression slope on which they are based.

ADF B3-84

Table 3-7 Re-Analysis for 1998 Kubota V2203-DIB Engine (Engine Dynamometer Testing) Model: NOx = A + B · BioPct Using ULSD, B50, and B100 fuels							
Biodiesel Type	Test Cycle	R^2	Intercept A	BioPct Slope B		Predicted NOx Increase for B5	Predicted NOx Increase for B10
			Value	Value	p value	Pct Change	Pct Change
Soy-based	ISO 8178	0.999	12.19	0.0256 [a]	0.01	1.0%	2.1%

Notes:
[a] Blue highlight indicates result is statistically significant at the 95% confidence level or better.

The second test series involved ULSD, B5, B20, and B100 fuels. Measured emissions data are not given in Appendix I, so we must work with the calculated percent changes in NOx emissions tabulated in Durbin 2011. Table 3-8 reproduces the NOx emission results reported in Table ES-8 of Durbin 2011 for the two test series. For the second test series, biodiesel at the B5 level increased NOx emissions, but the result fails the pair-wise t-test for statistical significance. The NOx emission increase at the B20 level was statistically significant at the 90% confidence level, and the increase at the B100 level was statistically significant at the >99% confidence level. The significance determinations use the pair-wise t-test, which is subject to caveats, but this is the only method available to gauge significance because re-analysis of the computed percentage changes is not possible.

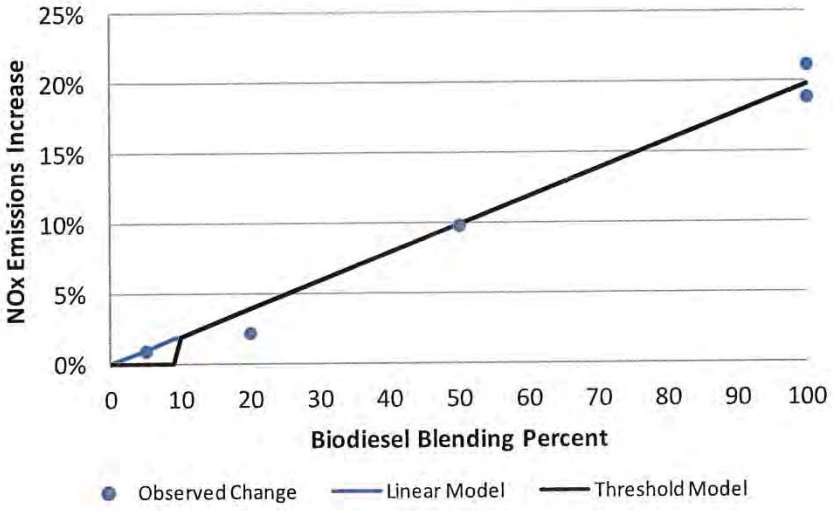
ADF B3-85

Table 3-8 Percentage Change in NOx Emissions for Biodiesel Blends Relative to ULSD: 1998 Kubota TRU Engine (Engine Dynamometer Testing)				
	Soy-Based Biodiesel Series 1 ISO 8178		Soy-Based Biodiesel Series 2 ISO 8178	
	NOx % Diff	p value	NOx % Diff	p value
B5	Not tested		0.97%	0.412
B20	Not tested		2.25% [a]	0.086
B50	7.63% [b]	0.000	Not tested	
B100	13.76%	0.000	18.89%	0.000

Source: Table ES-8 of Durbin 2011, p. xxxviii
Notes:
[a] Orange highlight indicates result is statistically significant at the 90% confidence level or better based on pair-wise t-test.
[b] Blue highlight indicates result is statistically significant at the 95% confidence level or better based on pair-wise t-test

Figure 3-4 displays the trend of NOx emissions with blending percent for the first and second test series combined. As the figure shows, the available data points scatter around the trendline determined from the emission change percentages (not from regression analysis). The B20 data point falls below the trend line while the two B100 data points bracket the trend line. It is not possible to explain the divergence of the B20 data point

Figure 3-4
Durbin 2011 Assessment: ISO 8178 Cycle NOx Emissions Increases for Soy-based Biodiesel Blends (1998 Kubota Engine, Test Series 1 and 2 Combined)



ADF B3-86

because the emissions data for the second test series are not published in Durbin 2011. The B5 data point clearly supports the Linear Model and is inconsistent with the Staff Threshold Model.

3.6 2009 John Deere Off-Road Engine (Engine Dynamometer Testing)

ADF B3-87

The only information on the 2009 John Deere off-road engine comes from the tabulation of calculated percentage emission changes. Table 3-9 reproduces these data from Table ES-7 of Durbin 2011. For the soy-based biodiesel, NOx emissions are significantly increased at the B20 and higher blend levels. The increase for B20 is statistically significant at the 90% confidence level and the increases for B50 and B100 are statistically significant at the >99% confidence level based on the pair-wise t-test. A soy-based B5 fuel was not tested.

Table 3-9 Percentage Change in NOx Emissions for Biodiesel Blends Relative to ULSD: 2009 John Deere Engine (Engine Dynamometer Testing)				
	Soy-Based Biodiesel ISO 8178		Animal-Based Biodiesel ISO 8178	
	NOx % Diff	p value	NOx % Diff	p value
B5	Not tested		-3.82	0.318
B20	2.82%[a]	0.021	-2.20	0.528
B50	7.63%	0.000	Not tested	
B100	13.76%	0.000	4.57	0.000

Source: Table ES-7 of Durbin 2011, p. xxxviii
Notes:
[a] Blue highlight indicates result is statistically significant at the 95% confidence level or better based on pair-wise t-test.

For animal-based biodiesel, the testing shows the unusual result that B5 and B20 appear to decrease NOx emissions, while B100 increases NOx. The B5 and B20 decreases are not statistically significant, while the B100 increase is statistically significant at the >99% confidence level. Durbin 2011 concludes:

> The animal-based biodiesel also did not show as great a tendency to increase NOx emissions compared to the soy-based biodiesel for the John Deere engine, with only the B100 animal-based biodiesel showing statistically significant increases in NOx emissions.[18]

Durbin 2011 does not discuss these results further and does not note any problems in the testing, making further interpretation of the results difficult. Figure 8-1 of Durbin 2011 presents the NOx results for this engine with error bars. First, we note that the figure appears to suggest that NOx emissions were increased on the B20 fuel in contradiction to the table above. Second, it is clear that the error bars are large enough that no difference in NOx emissions can be detected among ULSD, B5, and B20 fuels. Overall, this result could be consistent with the Staff Threshold Model through B5, but the failure to detect a NOx emission increase at B20 is not. Without further information, it is not possible to determine whether the result seen here is a unique response of the John Deere engine to animal-based biodiesel or is the result of a statistical fluctuation or an artifact in the emissions data.

ADF B3-87 cont.

3.7 Conclusions

The Biodiesel Characterization report prepared by Durbin et al. for CARB is an important source of information on the NOx emissions impact of biodiesel fuels in heavy-duty engines. It is the sole source of information on the NOx impact of B5 blends cited in the ISOR. When the engine dynamometer test data are examined for

ADF B3-88 cont.

[18] Durbin 2011, p. xx.

the three engines for which emissions test data have been published, we find clear evidence that biodiesel increases NOx emissions in proportion to the blending percent. Where B5 fuels were tested for these engines, NOx emissions are found to increase above ULSD for both soy- and animal-based blends in all three engines and by statistically significant amounts in one engine.

ADF B3-88 cont.

Specifically, a re-analysis of the NOx emissions test data demonstrates the following:

1. For the 2006 Cummins engine, biodiesel fuels are found to significantly increase NOx emissions for both soy- and animal-based blends by amounts that are proportional to the blending percent. This result indicates that biodiesels will increase NOx emissions at blending levels below B10. When B5 fuels were tested, NOx emissions were observed to increase but by amounts that fail to reach statistical significance according to the pair-wise test.[19] Graphical analysis demonstrates that NOx emissions measured for B5 fuels are consistent with the Linear Model, but not the Staff Threshold Model.

ADF B3-89

2. For the 2007 MBD4000 engine, biodiesel fuels are found to significantly increase NOx emissions for both soy- and animal-based blends by amounts that are proportional to the blending percent. This result indicates that biodiesels will increase NOx emissions at blending levels below B10. When B5 fuels were tested, NOx emissions were observed to increase and by amounts that are found to be statistically significant using the pair-wise t-test.[13] This result alone is sufficient to disprove the Staff Threshold Model. Graphical analysis demonstrates that NOx emissions measured for B5 fuels are consistent with the Linear Model, but not the Staff Threshold Model.

ADF B3-90

3. For the 1998 Kubota TRU (off-road) engine, soy-based biodiesel fuels are found to significantly increase NOx missions. Animal-based biodiesel was not tested. When a soy-based B5 fuel was tested, NOx emissions were observed to increase but by amounts that fail to reach statistical significance according to the pair-wise test.[13] Graphical analysis demonstrates that NOx emissions measured for B5 fuels are consistent with the Linear Model, but not the Staff Threshold Model.

ADF B3-91

The measured emissions test data for the other off-road engine (2009 John Deere) are not contained in the Durbin 2011 report and CARB has not made them publicly available. Thus, a re-analysis was not possible. Based on the tables and figures in Durbin 2011, soy-based biodiesel fuels were shown to significantly increase NOx emissions at B20 levels and higher, but B5 was not tested. Testing of animal-based blends shows no change in NOx emissions at B5 and B20 levels, but B100 is shown to significantly increase NOx emissions. Durbin 2011 discusses this result only briefly, and it is unclear what conclusions can be drawn from it.

ADF B3-92

###

[19] As discussed in Section 3.3, the pair-wise t-test is not the preferred method for demonstrating statistical significance.

EXHIBIT B

BEFORE THE
CALIFORNIA AIR RESOURCES BOARD

In re:	)
	)
Proposed Regulation on the Commercialization of Alternative Diesel Fuels (Public Hearing Scheduled for March 20, 2014)	)
	)

Declaration of James M. Lyons

I, James M. Lyons, declare and state as follows:

1. I am an engineer with training and expertise in motor vehicle fuels, automotive emissions control, and automotive air pollution. I am a Senior Partner of Sierra Research, Inc. ("Sierra"), an environmental consulting firm located at 1801 J Street, Sacramento, California. Sierra specializes in research and regulatory matters pertaining to air pollution control, and does work for both governmental and private sector clients. I have been employed at Sierra Research since 1991. I received a B.S. degree in Chemistry from the University of California, Irvine, and a M.S. Degree in Chemical Engineering from the University of California, Los Angeles. Before joining Sierra in 1991, I was employed by the State of California in the Mobile Source Division of the California Air Resources Board ("CARB").

I. Introduction, Qualifications, and Materials Considered

2. I have prepared this Declaration and the analysis it contains for Growth Energy. I hold the opinions expressed in this Declaration with a reasonable degree of engineering and scientific certainty. I plan to request an opportunity to testify before CARB at the public hearing scheduled for this matter, so that I may answer any questions concerning my opinions and the analysis and sources on which I have based those opinions. I also request that CARB review and

respond to each part of the analysis and opinions presented in this Declaration before deciding what action to take on the CARB staff's proposed alternative diesel fuel ("ADF") regulation.

3. During my career, I have worked on many projects related to the following areas: (1) the assessment of emissions from on- and non-road mobile sources, including ships and locomotives; (2) analyses of the unintended consequences of regulatory actions; and (3) the feasibility of compliance with air quality regulations. I have also studied how the use of biodiesel fuels can influence exhaust emissions of oxides of nitrogen ("NOx") when used in vehicles and engines operated in California, and I have prepared and filed declarations regarding that issue in *POET LLC et al. v. California Air Resources Board*, an action in which I was a co-petitioner.

4. I have testified as an expert under state and federal court rules in cases involving CARB regulations for gasoline, Stage II vapor recovery systems and their design, combustion chamber system design, and issues related to emissions from heavy-duty vehicles and engines. While at Sierra I have acted as a consultant on automobile air pollution control matters for CARB and other governmental organizations. I am a member of the American Chemical Society and the Society of Automotive Engineers and have co-authored nine peer-reviewed monographs concerned with automotive emissions, including greenhouse gases and their control. In addition, over the course of my career, I have conducted peer-reviews of numerous papers related to a wide variety of issues associated with pollutant emissions and air quality. My résumé is attached as Attachment A.

5. I have reviewed a report being filed along with this Declaration by Growth Energy that has been prepared by Mr. Robert Crawford of Rincon Ranch Consulting, entitled *NOx Emissions Impact of Soy- and Animal-based Biodiesel Fuels: A Re-Analysis* (December

2013). I have also studied the CARB Initial Statement of Reasons ("ISOR" or "Staff Report") released to support the proposed ADF regulation, and the studies cited in the ISOR that are pertinent to Mr. Crawford's analysis. The additional materials I have considered to prepare this Declaration are identified as references.

6. Mr. Crawford's report examines the empirical basis for the CARB staff's claims that the use of biodiesel in California is unlikely to warrant environmental mitigation, and that the use of biodiesel blends below the ten percent blend level (B10) in California pursuant to the proposed ADF regulation will not result in increases in NOx emissions.

7. Mr. Crawford's report applies generally accepted methods of data analysis and demonstrates expertise in the subject-matter of the report; Mr. Crawford is an expert in the field in which he opines in his report; and his report is the type of analysis on which experts in the field of automotive emissions control rely.

II. Analysis and Opinions

A. Increases in NOx Emissions from Biodiesel Blends Below B10

8. As explained in detail in Mr. Crawford's report, a proper statistical analysis of the available emissions data relied upon by CARB staff in developing the proposed ADF regulation demonstrates that statistically significant increases in NOx emissions will result from biodiesel blends that contain less than ten percent biodiesel, including at the five percent level (B5) and below. In addition, Mr. Crawford's report demonstrates that NOx emissions increase in direct proportion of the amount of biodiesel in a blend and there is not, as CARB staff claims, a "threshold" below which biodiesel use in a blend will not increase NOx emissions. Given this, as I explain below in more detail, CARB staff should be proposing a Significance Level of zero, rather than ten percent, for biodiesel. Given the issues identified with the CARB staff analysis of

ADF B3-93

biodiesel impacts on NOx emissions by Mr. Crawford, CARB has no credible scientific basis upon which to adopt the ADF regulation as proposed with the biodiesel Significance Level set at ten percent.

ADF B3-93 cont.

9. CARB staff presents, in Figures B.2 and B.3 of the ISOR, regressions of all the available emissions data considered by CARB staff in developing the proposed ADF regulation. Based on Mr. Crawford's findings, the slopes of these regression lines can be used to calculate the increases in NOx emissions expected from the use of soy- and animal-based biodiesel as a function of biodiesel content in the blend. The values calculated for soy- and animal-based biodiesel at selected blends levels over the range from one percent to twenty percent are shown in Table 1.

ADF B3-94

Table 1
Expected Increases In NOx Emissions from Biodiesel
Use Based on Available Emissions Data Considered by CARB Staff

	Percentage Increase in NOx Emissions	
Biodiesel Blend Level %	Soy-Based	Animal-Based
1	0.2	0.09
2	0.4	0.18
3	0.6	0.27
4	0.8	0.36
5	1	0.45
10	2	0.90
20	4	1.80

10. As shown in Table 1, the magnitude of the NOx increase for animal-based biodiesel is approximately half that observed for soy-based biodiesel. As also shown in Table 1, the emissions data considered by CARB show that increases in NOx emissions between about one and two percent occur at the proposed B10 significance threshold.

ADF B3-95

B. The "Effective Blend Level" Concept Provides No Assurance Against Increases in NOx Emissions Due to Biodiesel Use

11. The proposed ADF regulation relies on a concept called the "Effective Blend Level" (EB) for biodiesel to determine when mitigation would be required. The formula proposed by CARB staff for calculating the Effective Blend Level for biodiesel is found in proposed Section 2293.6(a) and is reproduced below.

$$EB = 100 \times \left[\frac{NBV - 0.5LN - 0.73RD - VM - 0.55AB}{TCV}\right]$$

As specified in Section 2293.6(a), the above formula is to be used to compute an annual average statewide value for the Effective Blend Level relative to the total volume of fuel used in compression ignition engines excluding alternative fuels such as natural gas and liquefied petroleum gas ("TCV") in the state during that year.

12. The calculation begins with establishing the net volume of biodiesel of all types used in California *excluding biodiesel used in blends of five percent or less* (NBV) — a step that has no scientific basis, as demonstrated by Mr. Crawford's analysis, and that, on its own, completely invalidates the use of the EB metric for the intended purpose. The NBV value is then further reduced by subtracting 50% of the volume of low NOx Diesel (LN) used statewide and 73% of the volume of renewable Diesel used statewide. The remainder is then further reduced by subtracting the volume of biodiesel of all types used in blends where steps have been taken to voluntarily mitigate NOx increases (VM) and then again by subtracting 55% of the volume of animal-based biodiesel (AB) to account for the smaller magnitude of the NOx emission increases observed with that fuel.[1] The final value is then divided by TCV (i.e., the total volume of fuel

[1] Those voluntary mitigation measures are assumed to have been taken before the so-called "Significance Level" is reached and mitigation would be required under the staff's proposal. *See* ¶ 13.

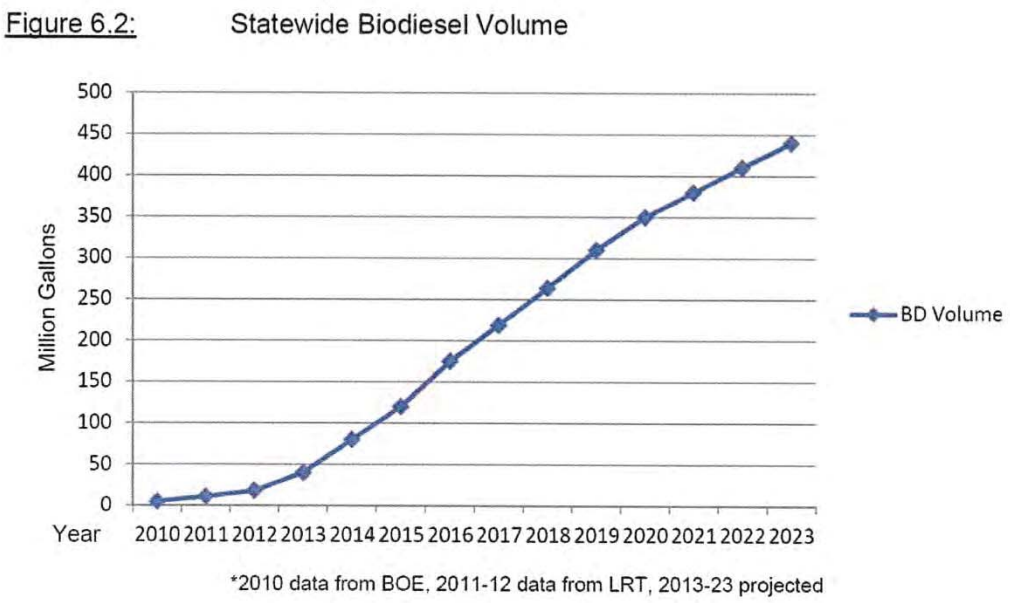
used in compression ignition engines excluding alternative fuels such as natural gas and liquefied petroleum gas in the state during that year) and multiplied by 100 to yield the Effective Blend Level on a percentage basis.

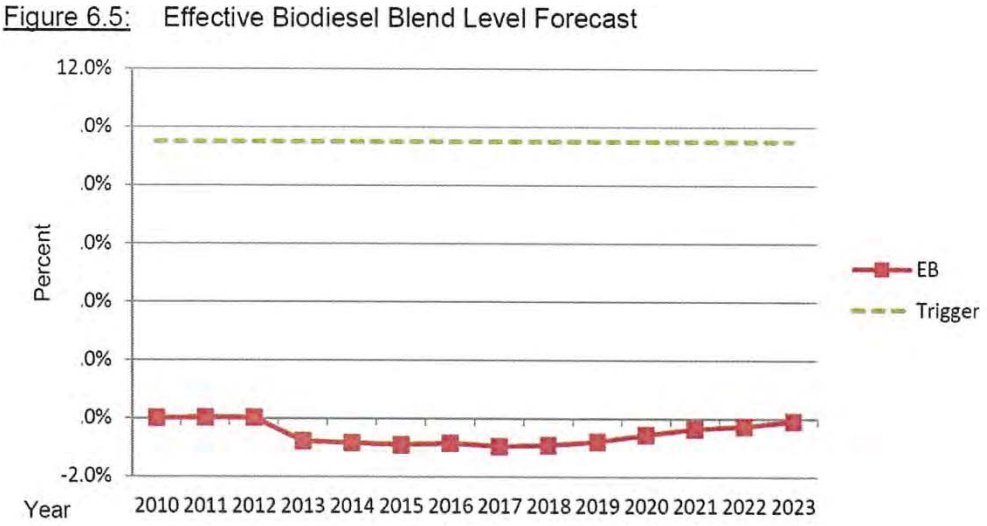
13. As specified in proposed Section 2293.5(c)(4), mitigation of NOx increases associated with biodiesel would be required only when the value of EB reaches 9.5 percent, which is 95% of the 10% Significance Level proposed for biodiesel.

14. There are a number of specific problems with the concept and calculation of the predicted Effective Blend Level that create the potential for significant increases in NOx emissions to result from the use of biodiesel in California; these are explained in detail below and should be addressed by CARB. As an initial matter, however, the overall problem with the EB concept will allow massive increases in the amount of biodiesel used in California without requiring any mitigation of the associated increase in NOx emissions. This can be seen readily by comparing CARB staff's projections of biodiesel use in California (Figure 6.2 of the ISOR) with CARB staff's projections regarding the Effective Blend Level for biodiesel (Figure 6.5 of the ISOR). Those two figures are reproduced below in Figure 1. As can been seen, despite the forecast nine-fold increase in annual biodiesel use in California from 50 million to 450 million gallons from 2013 to 2023 shown in Figure 6.2 of the ISOR, the forecast Effective Blend Level of biodiesel **decreases** to less than zero over virtually all of the period in question — meaning that, under the CARB staff's proposal, no mitigation of the increase in NOx emissions in California from biodiesel use will ever occur. CARB needs to confront and eliminate the EB concept from the staff's proposal, in light of this very simple demonstration of why the EB concept will not protect the environment against increases in NOx emissions.

ADF B3-96

Figure 1. CARB Biodiesel Forecasts





Source: CARB Initial Statement of Reasons. Note that Figure 6.5 is reproduced directly from the ISOR, which is missing some increments on the y-axis.

15. Next, CARB needs to modify the proposed ADF regulation in order to address CARB staff's faulty assumption that biodiesel blends of up to five percent will have no impact on NOx emissions. With respect to five percent blends, CARB staff states on page ES-3 of the Staff

ADF B3-97

Report that "biodiesel used in blends at B9 or below, including the B5 (B0 to B5) in predominant use today, does not increase NOx." The Staff Report also attempts to justify the exclusion of five percent blends from the EB calculation by arbitrarily excluding these blends from the ADF regulation. That assertion is undercut by the Staff Report's frank and correct admission on page 51 that "[g]iven the significant price premium for higher biodiesel blends such as B20 or B100, it is highly unlikely that operators of heavy-duty, legacy diesel fleets would opt to use the more expensive, higher biodiesel blends when comparable, lower cost conventional CARB diesel or B5 blends are readily available."

ADF B3-97 cont.

16. As noted above, Mr. Crawford's analysis demonstrates that statistically significant increases in NOx emissions will occur from the use of five percent biodiesel blends and, as Table 1 shows, the available emissions data relied upon by CARB staff indicate that at the five percent blend level, biodiesel use is expected to increase NOx emission by between about 0.5 and one percent. There is no doubt that unmitigated NOx emission increases of this magnitude have the potential to create significant adverse environmental impacts in areas of California with severe air quality problems.

ADF B3-98

17. It is also important for CARB to understand the import of the staff's prediction that biodiesel blends of five percent or less will be the primary means by which biodiesel will be used in California. As the Staff Report states on page 30:

> Staff has communicated with many of the stations that sell biodiesel as well as the major terminal operators in the state, and has found that the vast majority of the biodiesel currently being sold in California and expected to be sold in the future is sold as blends of B5 or less.

ADF B3-99

The fact that most biodiesel used in California will be sold as blends of five percent biodiesel or less, coupled with the fact that – as Mr. Crawford has explained – the available data show statistically significant increases in NOx emissions from such blends, means that biodiesel use in

California under the proposed ADF regulation will result in unmitigated increases in NOx emissions. Again, the critical nature of the CARB staff's invalid assumption about the NOx impacts of blends at or below five percent simply cannot be ignored by CARB.

ADF B3-99 cont.

18. Even if it were correct that blends of B5 and less have no impact on NOx emissions, the EB calculation double-counts for the supposedly benign effect of those blends, and therefore makes mitigation even more unlikely. This can be illustrated by noting that CARB staff estimates that 450 million gallons per year of biodiesel will be used in California in 2023. (See Figure 6.2 of the Staff Report.) A recent California Energy Commission forecast[2] for total Diesel use in California in 2023 is about 4 billion gallons. On that basis, and without discounting for low NOx, renewable Diesel, or voluntary mitigation, the actual Effective Blend Level would be 11.25 percent and mitigation would be required for at least some biodiesel blends under the proposed ADF. Under CARB staff's approach, however, if a substantial portion of that biodiesel — for example, 50 percent — is five percent or lower blends, the Effective Blend Level drops to 5.6 percent and no mitigation of any kind is required for any biodiesel blends. That result is clearly incorrect, and the EB calculation must be modified to include, rather than exclude, B5 blends.

ADF B3-100

19. Another fundamental problem with the proposed EB calculation is that it is based on annual statewide average fuel use. NOx emissions have local and immediate impacts on air quality, with the questions of when and where they occur in the state being of critical importance with respect to the significance of those impacts. It follows directly that mitigation of NOx increases associated with biodiesel use must occur in the same area at the same time if air quality

ADF B3-101

[2] See *http://www.energy.ca.gov/2011publications/CEC-600-2011-007/CEC-600-2011-007-SD.pdf*.

impacts are to be avoided. However, the EB completely fails to provide this assurance because CARB staff has either (1) ignored that reductions in NOx emissions from mitigation must take place at the same time and in the same area as NOx increases from biodiesel use, or (2) without support from anything in the rulemaking file, assumed that mitigation will occur in the same area and at the same time as the increases in NOx emissions.

ADF B3-101 cont.

20. To illustrate the problems the EB creates for mitigation, consider, for example, that under the proposed ADF regulation, increases in NOx emissions could occur from trucks operating on biodiesel in Los Angeles during August and exacerbate already high ambient ozone levels in that area. In turn, this increase in NOx emissions could be "mitigated" by reductions in NOx emissions from trucks operating on renewable diesel in the San Francisco area during December, when high ozone levels are not a problem. In this example, the EB concept would allow residents of Los Angeles to suffer adverse environmental impacts while the residents of San Francisco would realize no environmental benefit. Clearly the approach to mitigation designed into the EB concept by CARB staff makes no sense.

ADF B3-102

C. CARB Staff's Assumption that Biodiesel Use Will not Increase Emissions from New Technology Diesel Engines Is Not Adequately Supported

21. In the Staff Report, CARB staff makes frequent statements regarding the impact of biodiesel on NOx emissions from "new technology diesel engines" (or "NTDEs"). For example, on page ES-3 of the ISOR, the staff states categorically that "use of biodiesel in 2010-compliant engines and other so-called 'New Technology Diesel Engines' does not increase NOx, regardless of the biodiesel blend level." Only one reference, Lammert et al.,[3] is provided in the staff report

ADF B3-103

[3] Lammert, M., McCormick, R., Sindler, P. and Williams, A., "Effect of B20 and Low Aromatic Diesel on Transit Bus NOx Emissions Over Driving Cycles with a Range of Kinetic Intensity," *SAE Int. J. Fuels Lubr.* 5(3):2012,

(Continued...)

to support this and other, analogous, statements by CARB staff. As CARB staff acknowledges, this single study involved chassis dynamometer testing of only two urban buses with NTDEs, with both engines being the same model produced by the same manufacturer. The extrapolation of that limited testing to the entire population of heavy-duty Diesel vehicles with NTDEs used in different applications and with different engine designs produced by a number of different manufacturers is simply not credible or reliable.

ADF B3-103 cont.

22. In addition, the CARB staff fails to acknowledge the following statement made by the authors of the Lammert study about the measurement of NOx emissions: "For much of the cycle[,] NOx would be at or near the detection limit of the laboratory equipment which resulted in a 95 percent confidence interval that was high relative to the value of the cycle emissions." That effect, which can be clearly seen in Figures 10 and 11 of the Lammert study, renders the claim that there was no statistically significant increase in NOx emissions observed from the use of biodiesel in NTDEs an artifact attributable to the lack of sensitivity of the NOx measurement instrumentation used in the study.

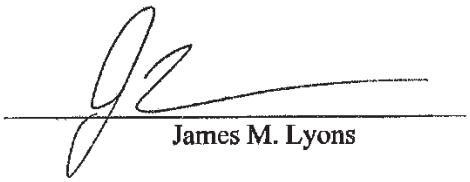
ADF B3-104

23. In sum, the CARB staff's unequivocal statements regarding the impact of biodiesel on NOx emissions from all vehicles with NTDEs is simply not reasonable based on data from (1) a single study that (2) that tested only two urban buses equipped with the same engine and (3) used instrumentation that was, at best, barely able to measure NOx emissions from the test vehicles in general, and clearly was not sensitive enough to reliably detect changes in NOx emissions due to use of different fuels. Nothing else in the rulemaking file supports the CARB staff's claim that there will not be increased NOx emissions from the use of biodiesel in NTDEs.

ADF B3-105

I declare under penalty of perjury under the laws of California that the foregoing is true and correct to the best of my knowledge and belief.

Executed this 12th day of December 2013 at Sacramento, California.



James M. Lyons

growth energy
America's Ethanol Supporters

777 North Capitol Street, NE, Suite 805, Washington, D.C. 20002
PHONE 202.545.4000 FAX 202.545.4001 GrowthEnergy.org

September 16, 2013

By Electronic Mail

Alexander Mitchell
Floyd Vergara
California Air Resources Board
Stationary Source Division
1001 I Street
Sacramento, California 95812

Re: Comments Regarding CARB's Alternative Diesel Fuels Rulemaking

Dear Sirs:

Growth Energy, an organization of ethanol producers and supporters, has a number of concerns with the Alternative Diesel Fuels (ADF) Regulations currently under development by the staff of the California Air Resources Board (CARB) which were the subject of a September 5th workshop held in Sacramento. These concerns, which are described in detail below, focus on the treatment of biodiesel and biodiesel blends currently being proposed by CARB staff. Overall, the provisions of the proposed ADF regulations would allow for the widespread use of biodiesel and biodiesel blends in California without adequately mitigating the resulting increases in emissions of oxides of nitrogen (NOx). The treatment being proposed by CARB staff for biodiesel and biodiesel blends is unacceptable in that it will result in adverse air quality impacts and violates several of the "underlying principles" in the February 15, 2013, CARB White Paper concerning its conceptual approach to the regulation of alternative diesel fuels, including:[1]

1. Protection of public health;

2. Preservation or improvement of air quality; and

3. Reliance on the best scientific knowledge available.

Given the above, Growth Energy urges CARB staff to revise the proposed ADF regulations to eliminate the potential for biodiesel use in California to result in increased emissions, degraded air quality and adverse impacts on public health.

[1] See page 3 of CARB's White Paper "Discussion of Conceptual Approach to Regulation of Alternative Diesel Fuels", February 15, 2013 which is available at http://www.arb.ca.gov/fuels/diesel/altdiesel/20130212ADFRegConcept.pdf

1. The Proposed ADF Regulation Incorrectly Ignores Increases in NOx Emissions Associated with Use of Biodiesel Blends

As currently drafted, the proposed ADF regulation fails to require any mitigation for increases in NOx emissions associated with the use of biodiesel until total biodiesel usage in the state amounts to at least 10% of all fuel used in diesel engines in California on an annual basis.[2] While the potential for increased NOx emissions due to this arbitrarily established "significance level" for biodiesel use is discussed in Section 2 below, its basic premise appears to be an assumption that there are no NOx emissions associated with the use of biodiesel blends at or below the B10 level. In support of the inaccurate assumption that there is some threshold level below which biodiesel use will not increase emissions, CARB cites its White Paper, which states:[1]

> *Furthermore, for purposes of this rulemaking B5 blends will be considered a legal California diesel fuel with no emissions mitigation required.*

This arbitrary threshold is not supported by any data or analysis, and we are unaware of any published analysis of emissions test data that supports the assumptions that there are no increases in NOx emissions at either the B5 or up to the B10 levels.

ADF B3-106

In contrast, a preliminary analysis of data from CARB's most recently funded biodiesel testing program[3] demonstrates that NOx emissions would increase significantly at the B5 and B10 levels in at least some engines and for some biodiesel types. Here, the term "significant" means both that the NOx increase is statistically significant and that it is large enough to be of concern. Although the fact that CARB has not made all of the emissions data from this testing program publically available makes analysis difficult, results of a preliminary analysis are shown in Table 1 below for a 2006 model-year Cummins heavy-duty diesel engine. As shown, the relationship between increasing biodiesel content and increased NOx emissions is statistically significant at the 95% confidence level in all cases for soy-based biodiesel and at the 90% confidence level or better for animal-based biodiesel.

ADF B3-107

Further, the R^2 statistics for soy-based fuels show that the emissions effect of biodiesel is almost perfectly linear with increasing biodiesel content. Although not as high because the emissions effect is smaller and measurement errors are relatively larger in comparison to the trend, the R^2 statistics for the animal-based fuels also clearly establish a linear increase in NOx emissions with increasing biodiesel content. Because the slope or the regression equations are statistically significant in all cases and the R^2 statistics are high, there is no evidence in the data for the Cummins engine of the "threshold effect" that CARB staff claims which purports that biodiesel content has to reach the B5 or B10 level before NOx emissions begin to increase.

---

[2] See slide 18 of the staff presentation for the September 5th workshop which is available at http://www.arb.ca.gov/fuels/diesel/altdiesel/20130905ADFWorkshopPresentation.pdf

[3] Available at http://www.arb.ca.gov/fuels/diesel/altdiesel/20111013_CARB%20Final%20Biodiesel%20Report.pdf

PRELIMINARY ANALYSIS SUBJECT TO REVISON

Table 1. 2006 Cummins Engine (Dynamometer Testing)

Model: NOx = A + B · BioPct

(Note: Dataset does not yet include the data on B5.)

Bright yellow highlight indicates result is statistically significant at 95% confidence level or better.
Light yellow highlight indicates result is statistically significant at the 90% confidence level or better.

Biodiesel Type	Test Cycle	R^2	Intercept A	BioPct Slope B		Predicted NOx Increase for B5	Predicted NOx Increase for B10
			Value	Value	p value	% Change	Pct Change
Soy-based							
	UDDS	0.997	5.896	0.0100	0.001	0.8%	1.7%
	FTP	0.995	2.024	0.0052	0.003	1.3%	2.6%
	40 mph	1.000	2.030	0.0037	<0.0001	0.9%	1.8%
	50 mph	0.969	1.733	0.0028	0.016	0.8%	1.6%
Animal-based							
	UDDS	0.847	5.911	0.0021	0.080	0.2%	0.4%
	FTP	0.981	2.067	0.0031	0.001	0.7%	1.4%
	50 mph	0.887	1.768	0.0011	0.058	0.3%	0.6%

Turning to the importance of the magnitude of the NOx increases, the South Coast Air Quality Management District (SCAQMD) Final 2012 Air Quality Management Plan estimates 2014 NOx emissions from on-road and non-road diesel vehicles to be approximately 190 tons per day.[4] This means that the approximately 1% increase in NOx emissions due to B5 blends translates to an increase of about 2 tons per day in NOx emissions in the South Coast Air Basin alone, while an approximately 2% increase at B10 equals 4 tons per day within that basin. Continuing to B20 the impact would be 8 tons per day. That these are significant increases is clearly evidenced by the fact that both CARB and SCAQMD have adopted numerous emission control measures targeting NOx that have achieved reductions that are similar to or smaller than these values.

Instead of acknowledging emissions testing data CARB itself generated that show increases in NOx emissions associated with B5 and B10 blends, CARB staff instead claims that more research is necessary before it can consider mitigation of B5 impacts: [5]

> *Staff is currently contracting with the University of California at Riverside to develop data to determine whether there are significant adverse air-related impacts from the use of B5 blends sufficient to warrant mitigation in the future.*

ADF B3-108

[4] See Figure 3-9 available at http://www.aqmd.gov/aqmp/2012aqmp/Final-February2013/MainDoc.pdf
[5] See page 4 of CARB's White Paper "Discussion of Conceptual Approach to Regulation of Alternative Diesel Fuels", February 15, 2013 which is available at http://www.arb.ca.gov/fuels/diesel/altdiesel/20130212ADFRegConcept.pdf

This represents an impermissible deferral of analysis and mitigation of significant impacts under CEQA. Moreover, as participants in the process that lead to the adoption of CARB's Low Carbon Fuel Standard (LCFS) regulation in 2009 where CARB adopted indirect land use change (ILUC) values based on preliminary and unsubstantiated modeling results claiming a need to rely on the best available science, Growth Energy finds CARB staff's current position that ignores actual data showing NOx increases from low level biodiesel blends to be unsupported.

ADF B3-108 cont.

2. The Proposed "Significance Threshold" for Biodiesel would Allow Significant Increases in NOx Emissions to Occur in the South Coast and San Joaquin Valley Air Basins Exacerbating Existing Air Quality Problems

In addition to CARB staff's failure to analyze low-level biodiesel blends, the "significance threshold" proposed by CARB staff for biodiesel use in California would allow significant increases in NOx emissions due to biodiesel use to occur in the South Coast and San Joaquin Valley air basins that experience the worst air quality problems in the state.

According to CARB staff's presentation for the September workshop,[6] staff is proposing to evaluate the significance of NOx increases due to biodiesel use on a statewide rather than a regional basis. Given the proposed use of a statewide average biodiesel level and the B10 significance threshold, the potential exists for significant quantities of B20 or even higher levels of biodiesel blends to be used without mitigation in areas of the state with significant air quality problems, such as the South Coast and/or San Joaquin Valley air basins. At this point, even CARB staff acknowledges that use of B20 blends results in significant NOx increases and as noted above based on CARB's own test data B20 use in the South Coast Air Basin could increase NOx emissions by as much as 8 tons per day in 2014.

ADF B3-109

Given the severe air quality problems that exist in the South Coast and San Joaquin Valley air basins, CARB must modify the proposed ADF regulation so that it guarantees that increased NOx emissions related to biodiesel use would not occur in these areas. The reduction of NOx emissions is important, particularly in light of CARB's "Vision for Clean Air,"[7] which demands the elimination of NOx emissions from diesel engines in both air basins as a perquisite for achieving the state's air quality goals.

3. The Proposed Transfer of Credit for Reductions in NOx Emissions Generated by Low NOx Diesel Producers to Offset Increases in NOx Emissions Generated by Biodiesel Producers is Not Equitable

[6] See slide 18 of the staff presentation for the September 5th workshop which is available at http://www.arb.ca.gov/fuels/diesel/altdiesel/20130905ADFWorkshopPresentation.pdf

[7] See http://www.arb.ca.gov/planning/vision/docs/vision_for_clean_air_public_review_draft.pdf

According to CARB staff's presentation at the September workshop,[8] staff is proposing to directly offset increases in NOx emissions resulting from the use of biodiesel with reductions in emissions due to the use of "low NOx" diesel fuels, which are defined by specific properties as shown in the staff presentation for the September 5th workshop.[9] To date, however, we are unaware of any information or explanation from CARB staff as to why producers of low NOx diesel fuels should be forced by CARB regulations to surrender credit for the NOx emission reductions their fuels achieve in order to benefit the producers of biodiesel fuels which increase NOx emissions.

Given that the production of low NOx diesel fuel is not currently mandated by any existing CARB regulation, the resulting emission benefits should be considered "surplus," and could presumably be used to generate Mobile Source Emission Reduction Credits under CARB regulations.[10] Further, the use of such fuels by fleets or distribution of such fuels by fuel providers could potentially be considered to be projects that qualify for incentive funding under the Carl Moyer Program.[11]

ADF B3-110

Instead of forcing producers of low NOx diesel fuels to transfer the credit for the NOx reductions attributable to their products without compensation to producers of biodiesel fuels that increase NOx emissions, CARB should establish a market mechanism to incentivize the production of low NOx fuels and to disincentivize the production of NOx-increasing biodiesel fuels. The most logical approach to accomplish this would seem to be providing NOx reduction credits to producers of low NOx fuels under the LCFS regulation while assigning NOx emission debits to producers of biodiesel and then requiring the latter to purchase and surrender credits sufficient to offset the increases in NOx emissions associated with their products.

4. The Proposed Treatment of Biodiesel and Biodiesel Blends Used in "New Technology Diesel Engines" (NTDEs) is Not Equitable With CARB's Treatment of Other Fuels

In addition to defects with the proposed ADF regulations described above, we are unaware of any published analysis or supporting data that the use of biodiesel at any concentration in NTDE's would not result in increased NOx emissions. The rationale for this treatment appears to be an assumption that the advanced emission control systems found on NTDEs eliminate any impact of fuel composition on emissions of NOx and potentially other pollutants.

ADF B3-111

Our primary concern with this proposal is that CARB staff has not provided any supporting data or analysis. In addition, if NTDEs are truly insensitive to fuel composition impacts, CARB should make changes similar to those proposed by biodiesel for other fuels. More specifically, if CARB staff's assumption that NTDE emissions are not sensitive to fuel composition is in fact correct, it follows that there is no longer any need to use CARB diesel fuel in NTDEs instead of less expensive federal diesel fuels which could be substituted without any adverse emission impacts.

---

[8] See slide 19 of the staff presentation for the September 5th workshop which is available at http://www.arb.ca.gov/fuels/diesel/altdiesel/20130905ADFWorkshopPresentation.pdf

[9] See slide 24 of the staff presentation for the September 5th workshop which is available at http://www.arb.ca.gov/fuels/diesel/altdiesel/20130905ADFWorkshopPresentation.pdf

[10] See http://www.arb.ca.gov/msprog/mserc/mserc.htm

[11] See http://www.arb.ca.gov/msprog/moyer/moyer.htm

Clearly, CARB could develop a "significance threshold" for the sale of federal diesel fuel in California similar to that proposed for biodiesel which would achieve this objective while providing the benefit of reduced diesel costs without adverse air quality impacts. Growth Energy therefore encourages CARB staff to revise the ADF to avoid these impacts.

ADF B3-111 cont.

Sincerely,

David Bearden
General Counsel

ATTACHMENT B

VIA EMAIL

February 18, 2014

sierra research

1801 J Street
Sacramento, CA 95811
Tel: (916) 444-6666
Fax: (916) 444-8373

Ann Arbor, MI
Tel: (734) 761-6666
Fax: (734) 761-6755

Jim Aguila, Manager
Substance Evaluation Section
Stationary Source Division
California Air Resources Board
1001 I Street
Sacramento, CA 95812

Dear Mr. Aguila:

This letter transmits comments regarding the workshop held on February 13, 2014, concerning the Alternative Diesel Fuels (ADF) regulations proposed by the staff on October 15, 2013. The scope of the comments presented here was constrained by the fact that there were only five calendar days and only two business days provided between the date of the workshop and the February 18th deadline for comments announced by CARB staff at the workshop.

As explained below, the modified ADF regulations discussed at the workshop would allow for the widespread use of biodiesel and biodiesel blends in California without adequately mitigating the resulting increases in emissions of oxides of nitrogen (NOx). The workshop proceedings also confirm concerns expressed during the 45-day comment period for the ADF regulations last year that CARB is not providing adequate and prompt public access to relevant documents and information that are in the agency's possession.

ADF B3-112

Sincerely,

Jim Lyons
Senior Partner

Attachments

ADF Regulation Comments
Submitted by James M. Lyons, Sierra Research
February 18, 2014

1. **CARB Has Not Published the Comments from the South Coast Air Quality Management District That Underlie Staff's Proposed Modifications for Extreme Ozone Non-Attainment Areas.**

In the January 31, 2014 workshop notice,[1] CARB states:

> *During the 45-day public review process, staff received comments and proposed alternatives to the noticed regulation that staff would like to more fully consider and evaluate. Staff will be preparing modifications to the original proposal and make the modifications available for public review during a supplemental 15-day public comment period.*

Furthermore, CARB staff notes on slide 8 of the workshop presentation[2] with respect to "45-day rulemaking comments" that:

> *SCAQMD comment requested additional protections for extreme ozone non-attainment areas (South Coast Air Basin, Jan Joaquin Valley).*

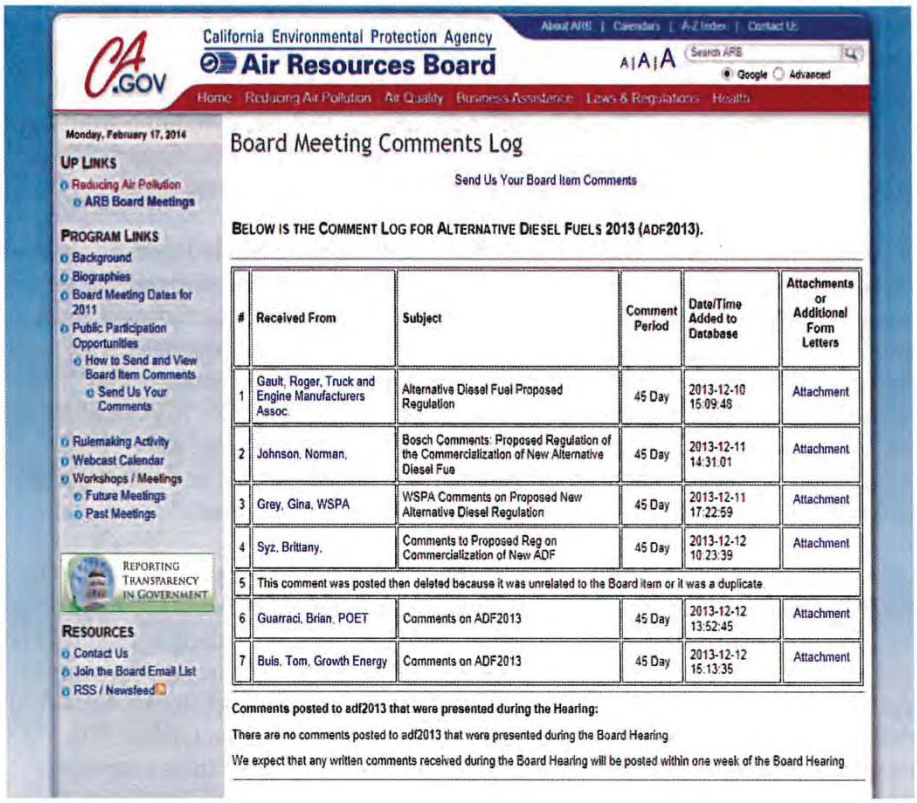
ADF B3-113

However, the relevant comment document from the South Coast Air Quality Management District ("SCAQMD") does not appear as part of the comments submitted during the 45-day comment period posted on the CARB website as shown in the screen shot taken on February 17, 2014, and presented as Figure 1 below. In addition, since there was no public hearing on the proposed regulations held on December 12 or 13, 2013, no comment document could have been provided in that venue.

Because the SCAQMD comments have not been made available to the public, it is impossible for any stakeholder to understand or comment on either the scope of the SCAQMD request or the responsiveness of the modifications proposed by CARB staff at the workshop. CARB staff should make all documents and correspondence related to the SCAQMD comments publicly available and include them in the rulemaking file.

[1] *http://www.arb.ca.gov/fuels/diesel/altdiesel/ADFmtgnotice_021314.pdf*
[2] *http://www.arb.ca.gov/fuels/diesel/altdiesel/021314_PublicMeetingPres.pdf*

Figure 1
Screen Shot From CARB Website on February 17, 2014



California Environmental Protection Agency
Air Resources Board

Home | Reducing Air Pollution | Air Quality | Business Assistance | Laws & Regulations | Health

Monday, February 17, 2014

UP LINKS
- Reducing Air Pollution
- ARB Board Meetings

PROGRAM LINKS
- Background
- Biographies
- Board Meeting Dates for 2011
- Public Participation Opportunities
  - How to Send and View Board Item Comments
    - Send Us Your Comments
- Rulemaking Activity
- Webcast Calendar
- Workshops / Meetings
  - Future Meetings
  - Past Meetings

RESOURCES
- Contact Us
- Join the Board Email List
- RSS / Newsfeed

Board Meeting Comments Log

Send Us Your Board Item Comments

BELOW IS THE COMMENT LOG FOR ALTERNATIVE DIESEL FUELS 2013 (ADF2013).

#	Received From	Subject	Comment Period	Date/Time Added to Database	Attachments or Additional Form Letters
1	Gault, Roger, Truck and Engine Manufacturers Assoc.	Alternative Diesel Fuel Proposed Regulation	45 Day	2013-12-10 15:09:48	Attachment
2	Johnson, Norman,	Bosch Comments: Proposed Regulation of the Commercialization of New Alternative Diesel Fue	45 Day	2013-12-11 14:31:01	Attachment
3	Grey, Gina, WSPA	WSPA Comments on Proposed New Alternative Diesel Regulation	45 Day	2013-12-11 17:22:59	Attachment
4	Syz, Brittany,	Comments to Proposed Reg on Commercialization of New ADF	45 Day	2013-12-12 10:23:39	Attachment
5	This comment was posted then deleted because it was unrelated to the Board item or it was a duplicate				
6	Guarraci, Brian, POET	Comments on ADF2013	45 Day	2013-12-12 13:52:45	Attachment
7	Buis, Tom, Growth Energy	Comments on ADF2013	45 Day	2013-12-12 15:13:35	Attachment

Comments posted to adf2013 that were presented during the Hearing:

There are no comments posted to adf2013 that were presented during the Board Hearing.

We expect that any written comments received during the Board Hearing will be posted within one week of the Board Hearing.

2. CARB Staff Has Failed to Include Results from On-Going CARB-Sponsored Research Regarding the Impacts of Biodiesel on NOx Emissions in the Rulemaking Process.

During last week's workshop, a representative of the SCAQMD commented that increases in NOx emissions due to biodiesel use at levels as low as five percent biodiesel ("B5") remained a concern to his agency based on emission test results from an ongoing CARB-sponsored study being conducted by the University of California, Riverside ("UCR"). The SCAQMD representative stated that the UCR data showed statistically significant increases in NOx emissions for some types of B5 blends compared to conventional diesel fuel. CARB staff's response to this comment was that the study was still "on-going" and that no conclusions can be drawn from the emission testing until the study is completed. In response to questioning, CARB staff indicated that the contract for the project expires in July 2014 and suggested that all work related to the study would be complete by that date. As stakeholders have previously commented, CARB staff must include all available emission data regarding biodiesel impacts on emissions of NOx and other pollutants in the file for this rulemaking.

ADF B3-114

It should be noted that, even if some members of the CARB staff consider the UCR work to be incomplete, other members of the CARB staff evidently consider the UCR data to be complete enough to warrant use in public meetings. Direct evidence supporting the assertion made by the SCAQMD representative at the workshop is provided by a presentation made by Georgios Karavalakis of UCR on April 10, 2013, at the 23rd Coordinating Research Council (CRC) Real World Emission Workshop, which lists among the coauthors two CARB staff members and acknowledges funding from CARB contract No. 10-417. A copy of this presentation and documentation demonstrating that it was presented at the April 2013 workshop is attached to these comments. ADF B3-115

In the section of the presentation labelled "CARB HD Engine Study Results," data are presented from preliminary emissions testing of B5 blends of both soy and waste vegetable oil ("WVO") based biodiesels using procedures similar to those set forth in Appendix A of the Initial Statement of Reasons ("ISOR") for the proposed ADF regulations. Based on these data, the authors conclude in the presentation that "NOx emissions showed slight but statistically significant, increase for B5-WVO and B5-soy blends." The authors conclude with respect to "certification testing" that "NOx emissions showed a statistically significant increase for B5-WVO" and that "The B5-WVO failed the statistical certification test, based on NOx emissions." ADF B3-116

This presentation raises a number of issues that CARB staff must address. First, the presentation provides evidence that directly contradicts the assertion made by CARB staff in the ISOR that there is no evidence of increased NOx emissions at biodiesel levels below B10—an assertion that is the foundation for the CARB environmental impact analysis presented in the ISOR. Second, these data directly support Robert Crawford's conclusions[3] that biodiesel use at levels below B10 will result in increased NOx emissions. Mr. Crawford's work was included by Growth Energy in its comments submitted to CARB staff during the 45-day comment period. Third, given that these data were available at least as early as April 2013, CARB staff should explain why they were not included in the staff's analysis of NOx impacts published in the ISOR nor in the rulemaking file for the ADF regulation. ADF B3-117

Again, CARB staff must include in the rulemaking file for this proceeding all emission test data currently available from this B5 testing program and any other biodiesel testing programs that the agency is sponsoring or otherwise participating in. This is particularly important here as the test data being excluded do not support the staff's assumption in the ISOR that there is no increase in NOx emissions until biodiesel blends reach the B10 level. ADF B3-118

3. The Proposed Modifications to the ADF Regulation Affecting Extreme Ozone Non-Attainment Areas Will Not Prevent Significant Increases in NOx Emissions from Biodiesel Use.

As presented by CARB staff at last week's workshop, the modifications to the proposed ADF regulation that would impose different requirements for extreme ozone non-attainment areas would be limited to the following: ADF B3-119

[3] Crawford, R., "NOx emission Impact of Soy- and Animal-based Biodiesel fuels: A Re-Analysis", December 10, 2013.

1. Establishment of "effective blend" (EB) requirements for biodiesel producers and importers;

2. Requirements for biodiesel producers and importers to submit compliance plans demonstrating how NOx emission increases will be mitigated once their EB level reaches five percent; and

3. Implementation of NOx mitigation measures once their EB level reaches seven and a half percent.

Presumably CARB staff has proposed these changes because they recognize that the originally proposed ADF regulation could lead to unacceptable increases in NOx emissions in the South Coast and San Joaquin Valley Air Basins. Nevertheless, the changes do nothing to ensure that increased NOx emissions due to biodiesel use will not actually occur.

ADF B3-119 cont.

The basic problem with the staff's proposed modifications is their continued reliance on the flawed effective blend (or EB) concept which, as pointed out in comments provided during the 45-day comment period, virtually ensures that the use of biodiesel in California will result in unmitigated increases in NOx emissions. As stakeholders indicated during the 45-day comment period, the only way to ensure that there are no increases in NOx emissions is for CARB staff to abandon the EB concept and to impose appropriate mitigation requirements based on the **actual** biodiesel content of all biodiesel blends. Furthermore, by appropriately mitigating the increases in the NOx emissions associated with biodiesel use, areas like the South Coast and San Joaquin Valley Air Basins will also realize the benefits of any NOx reductions associated with the use of "Low NOx diesel."

4. The Proposed ADF Regulation Should Be Modified to Require Determination and Reporting of the Biodiesel Content of All Biodiesel Blends Prior to Their Sale to Ultimate Consumers.

During last week's workshop, it became clear that the proposed ADF regulation will not ensure that the biodiesel content of blends sold in California will be accurately known or reported to CARB. As indicated by workshop participants, at present CARB has no requirement for determining the biodiesel content of diesel fuels being imported or distributed in the state that contain biodiesel up to the B5 level. Given this, a party interested in blending 5% biodiesel into a "diesel" fuel may be unaware of the fact that the "diesel" fuel could already contain up to 5% biodiesel and that the resulting blend would therefore be B10, not B5. Similarly, a party interested in blending 20% biodiesel into a "diesel" could in fact produce a B25 blend, instead of the intended B20 blend. Obviously, both circumstances have substantial ramifications with respect to potential NOx increases associated with the use of biodiesel in California.

ADF B3-120

Given the above, CARB must modify as necessary its existing diesel fuel regulations as well as the proposed ADF regulations to ensure that the biodiesel content of all blends of

biodiesel and diesel sold in California is accurately known and reported to both CARB as well as the Division of Measurement Standards. This could easily be accomplished by requiring that all "diesel" fuels used in biodiesel blends be tested before blending for Fatty Acid Methyl Ester (FAME) content using appropriate test procedures such as the EN14103:2011 procedure already referenced in the proposed ADF Regulations or the ASTM D7371 procedure. Alternatively, CARB could require testing of final blends for FAME content. Again, failure by CARB to require accurate measurement and reporting of the biodiesel content of biodiesel-diesel blends will lead to unmitigated increases in NOx emissions along with other potential issues, including violations of pump labeling and vehicle manufacturer warranty requirements.

ADF B3-120 cont.

5. **CARB Staff Must Publish an Analysis of All Alternatives to the Proposed ADF Regulation Raised During the 45-Day Comment Period.**

The "Analysis of Alternatives" presented on pages 62 and 63 of the ISOR states:

> *Specifically for biodiesel, we considered two alternatives to the proposal: business as usual (i.e., no proposed regulation), and requiring implementation of the mitigation measures for all biodiesel blends above B10 immediately without the proposed phase in process.*

ADF B3-121

CARB staff must perform an expanded analysis of alternatives that includes not only the modifications to the original proposal discussed at the workshop but also all alternatives recommended during the 45-day comment period. No such analysis was presented at last week's workshop. Clearly CARB staff should perform this analysis and consider the results, including public comment, before formally proposing modifications to the ADF regulation.

ATTACHMENT C

Comments of Growth Energy on the Air Resources Board Staff Presentations at a Public Consultation Meeting on Regulations for Commercialization of Alternative Diesel Fuels

These comments respond to the CARB staff's request for comments on the staff's presentations at the April 17, 2014 public consultation meeting on the proposed adoption of regulations to govern commercialization of alternative diesel fuels, including as part of compliance strategies for the California low-carbon fuel standard ("LCFS") regulation.

1. CARB-Sponsored and Related Emissions Testing and Research

During the April 17th meeting, CARB staff indicated that the agency had an "ongoing" study of the emission impacts of B5 and B10 blends underway and that data from that study would be released to the public and incorporated into the rulemaking process. Incorporation of this data into the rulemaking process is essential in order to comply with the Global Warming Solutions Act of 2006 and other statutes that apply to CARB's implementation of the 2006 Act.[1] CARB must provide not only a full report on that study, but also all data that it has obtained in connection with the study and related materials. Nearly four weeks have passed since the April 17th public meeting and, to Growth Energy's knowledge, the CARB staff has not met its commitments.[2] Growth Energy and other stakeholders will need sufficient time to review the data and related materials in order to participate effectively in the ADF and LCFS rulemakings. Also during the course of the workshop, CARB staff indicated that two other agency-sponsored studies of biodiesel blends had been conducted but not yet released to the public. Again, all

ADF B3-122

[1] *See, e.g.*, Cal. Health & Safety Code § 38562(e) ("The state board shall rely upon the best available ... scientific information ... when adopting regulations required by this section."); *see also id.* § 38563(b)(4) (regulations to implement the 2006 Act must not "interfere with[] efforts to achieve and maintain federal and state ambient air quality standards."). The California Environmental Quality Act's requirements likewise cannot be met unless CARB considers all relevant data on the potential of biodiesel usage to increase NOx emissions.

[2] Much of the data from this study and related materials may also be responsive to a Public Records Act request that Growth Energy has filed with CARB, but no data and very few related materials have been released to date.

reports as well as underlying data and other relevant materials must be made publicly available. All these materials, from each study, must be placed in a public rulemaking file without further delay, pursuant to subsections 6 and 7 of section 11347.3(a) of the Government Code.

ADF B3-122 cont.

2. Methodology to Establish a Significance Threshold and Related Issues

To date, CARB staff has indicated that it has attempted to identify a significance threshold for biodiesel blends by comparing emissions results when engines are tested on nominally specific biodiesel blends, and when the same engines are tested in similar ways on fuel containing no diesel. The defect in such a method is that it does not permit assessment of emissions when engines are operated on biodiesel blends other than those tested, including, for example, biodiesel blends below B5. The appropriate method to determine the significance threshold is contained in an analysis prepared for Growth Energy by Mr. Robert Crawford and placed in the rulemaking file last year.[3] After evaluating the linearity and statistical significance of the relationship between NOx emissions and biodiesel content, Mr. Crawford demonstrates that use of biodiesel even at levels below B5 will result in increased NOx emissions. CARB should adopt Mr. Crawford's approach to establishing the significance threshold for biodiesel, or explain in full any reasons for not doing so.

ADF B3-123

Despite the fact that CARB staff has correctly chosen to propose mitigation of biodiesel NOx impacts on a per-gallon basis in extreme ozone non-attainment areas, this issue is important because the use of the current methodology for establishing the significance level will not prevent significant increases in NOx emissions in these areas.

ADF B3-124

[3] Crawford, R., "NOx Emission Impact of Soy- and Animal-based Biodiesel Fuels: A Re-Analysis," December 10, 2013.

3. Protection of the Environment on a Statewide Basis

Based on the presentation at the recent public consultation meeting, CARB staff continues to propose the highly flawed "effective blend" approach for determining the point at which mitigation of biodiesel NOx impacts would be required under the proposed ADF regulation. Instead, CARB staff should also require the per-gallon mitigation concept proposed for extreme ozone nonattainment areas and the appropriate significance threshold to be used in all other areas of the state.

ADF B3-125

4. Minimum Requirements to Determine and Report Blend Levels

The CARB staff's presentation at the recent meeting did not clarify how the proposed ADF regulation will ensure that the biodiesel content of blends sold in California will be accurately known to fuel purchasers or reported to CARB. At present, CARB appears to have no requirement for determining the biodiesel content of diesel fuels being imported or distributed in the state that contain biodiesel up to the B5 level. Given this, a party interested in blending 5% biodiesel into a "diesel" fuel may be unaware of the fact that the "diesel" fuel could already contain up to 5% biodiesel and that the resulting blend would therefore be B10, not B5. Similarly, a party interested in blending 20% biodiesel into a "diesel" could in fact produce a B25 blend, instead of the intended B20 blend. Obviously, both circumstances have substantial ramifications with respect to potential NOx increases associated with the use of biodiesel in California.

ADF B3-126

Given the above, CARB must modify as necessary its existing diesel fuel regulations as well as the proposed ADF regulations to ensure that the biodiesel content of all blends of biodiesel and diesel sold in California is accurately known and reported to both CARB as well as the Division of Measurement Standards. This could easily be accomplished by requiring that all

ADF B3-127

"diesel" fuels used in biodiesel blends be tested before blending for Fatty Acid Methyl Ester ("FAME") content using appropriate test procedures such as the EN14103:2011 procedure already referenced in the proposed ADF regulations or the ASTM D7371 procedure. Alternatively, CARB could require testing of final blends for FAME content. Again, failure by CARB to require accurate measurement and reporting of the biodiesel content of biodiesel-diesel blends will lead to unmitigated increases in NOx emissions along with other potential issues, including violations of pump labeling and vehicle manufacturer warranty requirements.

ADF B3-127 cont.

Respectfully submitted,

GROWTH ENERGY

ATTACHMENT D

growth energy™
America's Ethanol Supporters

777 North Capitol Street, NE, Suite 805, Washington, D.C. 20002
PHONE 202.545.4000 FAX 202.545.4001 GrowthEnergy.org

August 15, 2014

Via Electronic Mail

Mr. Alexander Mitchel
Transportation Fuels Branch
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: Alternative Diesel Fuel Rulemaking

Dear Mr. Mitchell:

Please find attached the comments of Growth Energy in response to the staff's request for public input on alternatives to the 2013 regulatory proposal for the Alternative Diesel Fuel regulation. Growth Energy hopes to make a further submission regarding regulatory alternatives following the public consultation meeting to discuss biodiesel emissions testing sponsored by the Board.

Please place this letter and its attachments in the public docket that I understand the staff is establishing for materials it receives in connection with this rulemaking effort.

ADF B3-128

Sincerely,

David Bearden
General Counsel and Secretary

cc: Dr. Irena Asmundson (via Electronic Mail)
Mr. Michael S. Waugh (via Electronic Mail)

STATE OF CALIFORNIA

AIR RESOURCES BOARD

RESPONSE TO REQUEST FOR PUBLIC INPUT ON REGULATION OF ALTERNATIVE DIESEL FUEL

GROWTH ENERGY

AUGUST 15, 2014

Growth Energy's Response to Request for Public Input
On Regulation of Alternative Diesel Fuel

Growth Energy respectfully submits this response to the request by the staff of the California Air Resources Board ("CARB") for public input on alternatives to the staff's currently proposed method for regulating the use of alternative diesel fuel ("ADF") as part of compliance with the low-carbon fuel standard ("LCFS") regulation. The CARB staff presented its request for public comment in a notice dated July 29, 2014, and has established today as the deadline for that input. In these brief comments, Growth Energy assumes CARB's familiarity with and incorporates by reference its June 23, 2014 submission in response to a similar staff request concerning the LCFS regulation itself, as well as Growth Energy's submissions in an earlier phase of the ADF rulemaking in 2013.

I. Introduction and Background

The stated purpose of the July 29 notice is to seek input on regulatory alternatives pursuant to the 2011 amendments to the Government Code contained in SB 617. The proposed ADF regulation is intended to provide a legal pathway for new emerging diesel fuel substitutes to enter the commercial market in California, while managing and minimizing environmental and public health impacts, and to preserve the emission benefits derived from the CARB motor vehicle diesel regulations.[1] In light of that goal, the current ADF rulemaking as most recently described by CARB staff would establish:

ADF B3-129

- A general process governing the commercialization of new ADF formulations in California, and
- Specific requirements for biodiesel and biodiesel blends that are consistent with the general ADF process and that would mitigate increases in emissions of oxides

[1] *See* "Initial Statement of Reasons, Proposed Regulation on the Commercialization of New Alternative Diesel Fuel," October 23, 2013 available at http://www.arb.ca.gov/regact/2013/adf2013/adf2013isor.pdf.

> of nitrogen (NOx) from diesel engines and vehicles that have been identified to occur relative to conventional California diesel fuel from the use of biodiesel and biodiesel blends. [2]

There are no specific compositional requirements proposed for ADFs other than "biodiesel," inasmuch as none have yet sought to be commercialized in California.

CARB has a duty to mitigate any potential significant environmental impacts that could result from commercialization of biodiesel. Mitigation strategies will drive the costs and affect the benefits of the ADF regulation, and so the first step in the SB 617 process for the ADF regulation should be to develop a range of potential mitigation strategies. CARB has sponsored, but has not yet fully digested, a body of tests using biodiesel fuels. The CARB staff, for its part, has recently asserted that those tests have informed several major findings about mitigation strategies; nevertheless, the staff also acknowledges that some of its major findings are preliminary and subject to change because the data upon which they are based has only recently made available to the public. Nor has the CARB staff fully developed and explained its findings. Once the staff does so, it should then seek better-informed public input under SB 617.

ADF B3-129 cont.

Based on its current analysis, the CARB staff has indicated that it expects that the yet unpublished proposed ADF regulation will require NOx mitigation for biodiesel blends containing more than five percent of an animal-based biodiesel or more than one percent of soy-based or other types of biodiesel blends. Staff also indicates that it expects to propose an exemption for all biodiesel blends when used in vehicle fleets containing more than 95% "new technology diesel engines (NTDEs)"[3] from NOx mitigation requirements and a sunset clause

ADF B3-130

---

[2] *See* "Preliminary Rulemaking Proposal for Biodiesel Use as an Alternative Diesel Fuel," July 29, 2014 available at http://www.arb.ca.gov/fuels/diesel/altdiesel/20140729ADF_SRIA_Proposal.pdf.

[3] In the October 23, 2013 Initial Statement Reasons, CARB staff defined NTDEs as meaning:

eliminating all NOx mitigation requirements "once NTDEs represent 95 percent of the heavy duty diesel engines in California."

The CARB staff's approach appears to rest on two beliefs: (i) no NOx increases occur in blends containing five percent or less of animal-based biodiesel or one percent or less of soy-based or other biodiesel; and (ii) there are no NOx increases from biodiesel use in NTDEs.

Turning first to the need to mitigate NOx emissions for animal-based biodiesel blends below five percent and below one percent for soy-based and other biodiesel blends, the flaws here are due to the fact that the CARB staff continues to cling to the concept of there being a "threshold" biodiesel blend level below which there are no increases in NOx emissions, rather than accepting that there is a linear relationship between NOx emissions and increases in biodiesel content. That the staff's "threshold" model is flawed with respect to both soy- and animal-based biodiesel blends and should be replaced by the linear model was made clear in a technical report prepared by Robert Crawford[4] that was submitted to CARB as part of Growth Energy's formal comments on the abandoned 2013 ADF rulemaking.

ADF B3-130 cont.

With respect to the impact of biodiesel on NOx emissions from NTDEs, CARB staff's major finding in this area — that biodiesel does not increase NOx emissions from NTDEs — continues to rely, as it did in the October 2013 rulemaking, on only one reference, a paper by

ADF B3-131

---

a diesel engine that meets at least one of the following criteria:

(1) 2010 ARB emission standards for on-road heavy duty diesel engines under 13 CCR 1956.8,
(2) Tier 4 emission standards for non-road compression ignition engines under 13 CCR 2421, 2423, 2424, 2425, 2425.1, 2426, and 2427, or
(3) equipped with or employs a Diesel Emissions Control Strategy (DECS), verified by ARB pursuant to 13 CCR 2700 et seq., which uses selective catalytic reduction to control NOx.

ADF B3-130 cont.

[4] Crawford, R., "NOx Emission Impact of Soy- and Animal-based Biodiesel Fuels: A Reanalysis," December 10, 2013.

Lammert *et al.*[5] The flaws in the basis for this major finding were explained in Growth Energy's submission in the 2013 ADF rulemaking.[6] A 2014 peer-reviewed publication authored by researchers from the University of California at Riverside[7] (Gysel, *et al.*) who report results from a study funded by the South Coast Air Quality Management District confirms that CARB staff's major finding in this area is flawed. With respect to biodiesel impacts on NOx emissions from NTDEs, Gysel *et al.* report large percentage increases in NOx emissions with biodiesel use in NTDEs and state:

> Lammert *et al.* showed that the effect of SCR aftertreatment negates the effect of fuels on NOx emissions when they tested a 2011 Cummins ISL engine on B20 and B100. This is in strong contrast to the current study vehicle shows that there is rather strong fuel effect with the B50 blends compared to CARB ULSD from the Cummins ISX-15 engine with SCR.

In addition, Gysel *et al.*, provides a discussion referencing at least four other peer-reviewed technical papers[8] which further confirm this flaw in the staff's finding, showing increases in

ADF B3-131 cont.

---

[5] Lammert, M., McCormick, R., Sindler, P. and Williams, A., "Effect of B20 and Low Aromatic Diesel on Transit Bus NOx Emissions Over Driving Cycles with a Range of Kinetic Intensity," *SAE Int. J. Fuels Lubr.* 5(3):2012, doi:10.4271/2012-01-1984.

[6] As an expert stated in Growth Energy's submission:

> ... [T]he CARB staff's unequivocal statements regarding the impact of biodiesel on NOx emissions from all vehicles with NTDEs is simply not reasonable based on data from (1) a single study that (2) tested only two urban buses equipped with the same engine and (3) used instrumentation that was, at best, barely able to measure NOx emissions from the test vehicles in general, and clearly was not sensitive enough to reliably detect changes in NOx emissions due to use of different fuels. Nothing else in the rulemaking file supports the CARB staff's claim that there will not be increased NOx emissions from the use of biodiesel in NTDEs.

Declaration of James M. Lyons, ¶ 23 (Dec. 12, 2013).

[7] Gysel, N., Karavalakis, G., Durbin, T., Schmitz, D., and Cho, A., "Emission and Redox Activity of Biodiesel Blends Obtained from Different Feedstocks from a Heavy-Duty Vehicle Equipped with DFS/SCR Aftertreatment and a Heavy-Duty Vehicle without Control Aftertreatment," SAE Technical Paper 2014-01-1400, April 1, 2014.

[8] Walkowicz, K., Na, K., Robertson, W., Sahay, K., Bogdanoff, M., Weaver C., and Carlson, R., "On-road and In-Laboratory Testing to Demonstrate Effects of ULSD, B20 and B99 on a Retrofit Urea-SCR Aftertreatment System," SAE Technical Paper 2009-01-2733, November 2, 2009; McWilliam, L. and Zimmermann, A., "Emissions and Performance Implications of Biodiesel Use in an SCR-equipped Caterpillar C6.6," SAE Technical Paper 2010-01-2157, October 25, 2010; Mizushima, N., Murata, Y., Suzuki, H., Ishii, H., Goto, Y.,

NOx emissions from biodesel use with NTDEs. It should also be noted that the observed NOx increases from biodiesel use in NTDEs are consistent with the widely accepted linear model form which Crawford's report demonstrates is technical superior to CARB's flawed threshold model.

ADF B3-131 cont.

II. Necessary Changes in the CARB Staff's Approach

In light of the currently available data and the relevant literature, the CARB staff's current approach is insufficient to mitigate the impacts of biodiesel usage. On that basis, Growth Energy asks the staff to consider a regulatory alternative having the following three key elements:

ADF B3-132

1. Require that the mitigation strategies for increased NOx emissions be applied to all biodiesel and blends of biodiesel and diesel fuel where biodiesel was intentionally blended.[9]

ADF B3-133

2. Eliminate exemptions from NOx mitigation requirements for biodiesel used in vehicle fleets comprised of at least 95% NTDEs.

ADF B3-134

3. Eliminate the sunset provision for NOx mitigation requirements.

ADF B3-135

It is critical for the staff to evaluate the need for those three changes in light of other measures that CARB has adopted or is considering adopting to reduce NOx emissions, including the Advanced Clean Cars program and CARB's Sustainable Freight Transport Initiative which involve requirements for "zero-emission" heavy-duty vehicles.

ADF B3-136

---

and Kawano, D., "Effect of Biodiesel on NOx Reduction Performance of Urea-SCR System," SAE Technical Paper 2010-01-2278, October 25, 2010.

[9] The reference to intentional blending has been included to ensure that mitigation is not required for inadvertent blends of biodiesel and diesel that could result from mixing of diesel with biodiesel remaining in storage tanks or in fuel transfer lines.

Growth Energy appreciates the opportunity to provide this input on alternatives to the current approach to developing an ADF regulation, and as noted above, plans to provide additional input once the CARB staff has reviewed the available data in one or more workshops.

Respectfully submitted,

GROWTH ENERGY

ATTACHMENT F

NOx Emission Impacts of Biodiesel Blends

1. Introduction

In the Alternative Diesel Fuels rulemaking, the California Air Resources Board (ARB) is attempting to create a regulatory framework that will permit biodiesel and other alternative diesel fuels to increase their penetration of the California market. Biodiesel is known to increase emissions of nitrogen oxides (NOx). NOx emissions are an important precursor to smog and have historically been subject to stringent emission standards and mitigation programs to prevent growth in emissions over time. A crucial issue with respect to biodiesel is how to "... safeguard against potential increases in oxides of nitrogen (NOx) emissions."[1]

ADF B3-137

In July 2014, ARB released two datasets that represent the fruit of their efforts to compile biodiesel NOx emissions test data available in the literature on heavy-duty truck (HDT) engines. This document and the companion file *"Biodiesel Emissions Analysis Technical Summary 102014.pdf"* present the results of a statistical analysis of the data sets released by ARB that was performed by Rincon Ranch Consulting at the request of Growth Energy.

This analysis focused on whether soy and animal blends will increase NOx at low blend levels. The following issues were examined:

- The NOx impacts of soy and animal blends at B5 and B10;
- The NOx emission differences observed among animal feedstocks and blends;
- For animal blends, the effect on NOx emissions of the Cetane Number (CN) change relative to base fuel that is caused by blending of the animal feedstock; and
- The development of a cetane-based model of the biodiesel NOx impacts of soy and animal blends.

The key results and conclusions of the study are summarized here. For additional information, the reader is directed to *"Biodiesel Emissions Analysis Technicol Summary 102014.pdf"* which has been provided along with this document.

2. Data Used in the Analysis

As noted above, in July 2014, ARB released two datasets of NOx emissions data from testing of biodiesel blends in HDT engines. One file ("B5 & B10 Raw NOx Data") contains the subset of testing for B5 and B10 blends (soy and animal). The test data generated in the four ARB-sponsored UCR studies are present in the form of the individual test run measurements. Because test run information was not reported in their publications, the B5 soy data from Nikanjam 2010 and the B10 soy data from Thompson 2010 are present in the form of emission averages. No animal blends have been tested at the B5 or B10 levels except in the ARB-sponsored emissions testing. A second file ("2014 Biodiesel

ADF B3-138

[1] "Proposed Regulation on the Commercialization of New Alternative Diesel Fuels. Staff Report: Initial Statement of Reason." California Air Resources Board, Stationary Source Division, Alternative Fuels Branch. October 23, 2013. http://www.arb.ca.gov/regact/2013/adf2013/adf2013isor.pdf.

Literature Search Database") contains all of the biodiesel testing available in the literature through the B20 level (soy and animal), including ARB-sponsored testing and the literature search. The data are in the form of emission averages by engine, test cycle, feedstock type, and blend level.

For purposes of this analysis, the following information was added to the ARB datasets:

- The number of test replications for emissions averages for each study (estimated when the source did not report the number);
- The CN for CARB diesel, the biodiesel blends, and the biodiesel feedstocks; and
- Additional NOx emissions testing at the B50 and B100 levels (where available).

Appendix Table A presents a list of the studies included in the dataset and the author references used in citations here.

ADF B3-138 cont.

3. NOx Emissions from Soy Biodiesel Blends

Most past research on biodiesel emissions has focused on soy blends. As a result, the literature is relatively large and diverse. The dataset assembled by ARB is derived from 10 different studies, covers 13 different vegetable feedstocks (10 soy, 2 used cooking oil [UCO], 1 canola), and was conducted using 7 different test cycles on a wide variety of engines in different labs. Most of the data, in terms of number of data points, is derived from the three UCR studies (Durbin 2011, Durbin 2013B, and Karavalakis 2014) sponsored by ARB.

We subjected the soy dataset to a number of different analyses using different statistical techniques and selections of the data to ensure that the conclusions we drew were robust across analytical techniques and datasets. The statistical analysis included the T-Test for the difference in mean values (e.g., between B5 and CARB diesel) and linear regression analysis using several different models. The data subsets were selected to use either individual test runs or emission averages and to contain testing through maximum blend levels of B5, B10, B20, B50, and B100.

ADF B3-139

Our analyses show that there is a consensus among the studies on the NOx impact of soy biodiesel without regard to the specific analytical methods or data used. Soy biodiesel increases NOx emissions by amounts that can be estimated with good statistical confidence because of the large size of the available dataset. The key conclusions are as follows:

- Soy biodiesel increases NOx emissions by ~1% at B5 and ~2% at B10;
- NOx emissions increase in a linear fashion with increasing blend level to reach ~4% at B20 and proportionately larger values at higher blend levels; and
- There is no evidence in the data for a threshold level below which soy biodiesel does not increase NOx.

These conclusions are supported by all of the available studies and data. None of the studies disagree substantially, and while the results for individual blends, engines, and test cycles will vary to some extent, the evidence across a wide range of engines and test cycles is clear. NOx increases can be expected for UCO, canola, and other vegetable biodiesels, but the data are very limited and it is not possible to draw definitive conclusions for these blends.

4. NOx Emissions from Animal Biodiesel Blends

The literature on NOx emissions from animal blends is much smaller. It consists of only four studies, three of which (Durbin 2011, Durbin 2013A, and Karavalakis 2014) were sponsored by ARB. Except for the McCormick 2005 study, the emissions testing was conducted at the UCR CE-CERT lab. A variety of test cycles were used, but most of the testing was conducted on the hot-start FTP cycle. Table 1 presents a summary of the emissions studies for animal biodiesel.

Table 1. Scope of Emissions Testing for Animal Biodiesel

	McCormick 2005	Durbin 2011	Durbin 2013A	Karavalakis 2014
Biodiesel Feedstock	Animal #1	Animal #2	Animal #3	Animal #4
Blend Levels Tested	B20	B5, B20, B50, B100	B5	B5, B10
Engines Tested	2 on-road	3 on-road, 1 off-road	1 on-road	1 on-road
Test Cycles	FTP	FTP, UDDS, 50 mph, ISO 8178	FTP	FTP, SET, UDDS
Test Replications on Biodiesel	6	126	26	80
Is NOx Increase Observed?				
At / Below B10	–	Yes	No	No
Above B10	Yes	Yes	–	–

ADF B3-140

It is important to understand the limitations of this small dataset. Without the ARB-sponsored testing, we would have only the six test replications (individual runs) conducted in the McCormick 2005 study. While the three UCR studies accumulated 232 test replications, the work involved only three different animal feedstocks. Including the McCormick 2005 study, the entire literature on NOx emissions from animal biodiesel is based on only four different animal feedstocks. The small number is an important limitation because animal feedstocks are much less homogenous than soy due the greater variety possible in animal sources and compositions. Further, there are notable differences among the four studies as to whether animal biodiesel increases NOx at the B5 and B10 levels (as indicated by the red circles in the table).

As in the soy analysis, we subjected the animal biodiesel data to a number of different analyses using different statistical techniques and selections of the data to ensure that the conclusions we drew were robust. The T-Test is the most direct method to assess whether NOx emissions are higher at B5 compared to CARB diesel. Using the individual test run data available from the three UCR studies, we find the following for animal biodiesel at the B5 blend level:

- The animal feedstock used in Durbin 2011 increases NOx in 2 of 3 engines. The increase is highly significant[2] statistically for one engine.

[2] The term "significant" is used in this report only to refer to statistical significance. When a result reaches the p=0.05 level, we can be 95 percent confident that it is real. In such case, and at smaller p values, the result is said to be statistically significant. "Significant" has been used by others to indicate that an emissions increase, even if real, is too small to warrant concern. For example, the Predictive Model for RFG will permit alternative gasoline formulations to increase NOx emissions by up to 0.05% and still be classified as emissions compliant. To our

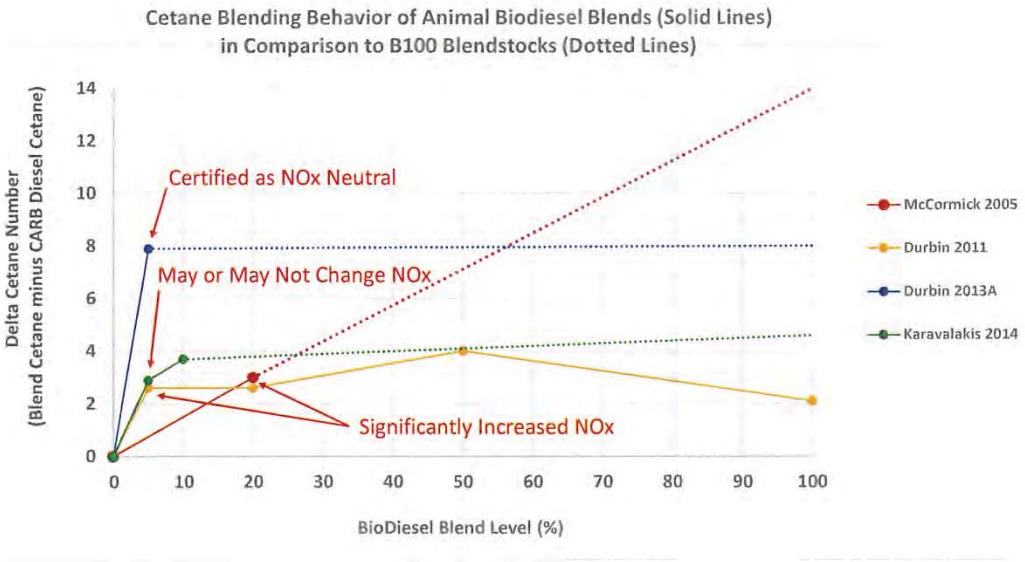
- The animal feedstock used in Durbin 2013A decreases NOx in one engine. The decrease is statistically significant at the p=0.05 level and the blend was certified as NOx neutral at B5.
- The animal feedstock used in Karavalakis 2014 increases NOx in three of six cases and decreases NOx in the other three cases. None of the changes are statistically significant. The blend may or may not change NOx.

ADF B3-140 cont.

Contrary to Staff's assertion that no NOx increase occurs in B5 animal blends, it is clear that some animal blends will significantly increase NOx emissions, while other animal blends will not. The fundamental issue is then understanding what the NOx impact of a particular animal biodiesel blend will be.

The effect of feedstock blending on the CN of the resulting animal blend is the reason for the apparently discordant results among the studies. Figure 1 plots the four series of animal blends in the literature with the blend level on the horizontal axis and the change in blend CN (relative to CARB diesel) on the vertical axis. CN blended linearly to B20 for the McCormick feedstock, which showed a much smaller CN benefit than the feedstocks used by UCR – only three numbers at B20 (0.6 numbers at B5). In contrast, all three UCR animal blends achieve a large CN boost at low blending levels in which most or all of the CN benefit of the feedstock is achieved at B5.

Figure 1. Cetane Blending Behavior of Animal Blends (Solid Lines) Compared to B100 Feedstocks (Dotted Lines)



ADF B3-141

In Durbin 2011, the CNs for the blends are above that of the B100 feedstock. This result is probably caused by lab-to-lab differences (blend CN was determined at CE-CERT, while CN for CARB diesel and the

knowledge, ARB has not formulated a position on the level of NOx increase from alternative diesel fuel that is too small to warrant concern.

B100 feedstock were determined by an outside lab). The actual CN changes are surely lower than shown here – at or below +2 CNs.

The two animal feedstocks that caused statistically significant NOx increases have the smallest CN benefits: McCormick 2005 (red) at B20 and Durbin 2011 (yellow) at B5. The animal B5 blend that passed certification testing as NOx neutral in Durbin 2013A (blue) has the highest CN benefit, where it achieved the entire B100 CN at just 5 percent blending. The Karavalakis 2014 B5 blend (green) had an intermediate CN benefit and may or may not change NOx.

The blending behavior of the UCR blends is surprising in comparison to the McCormick study, and we find relatively little research on the CN blending behavior of animal feedstocks. All conclusions from this dataset will be influenced by the CN blending behavior of the specific animal feedstocks involved. For such conclusions to be reliable, we must be confident that the large CN boost reported for the UCR blends is both real and representative of all animal feedstocks in California. Also, only limited information is available on the sources and characteristics of the animal feedstocks.

ADF B3-141 cont.

To permit all parties to better understand the animal feedstocks that were tested, ARB should release all information that it has on the following:

- CNs (methods of determination and measured values) for the Durbin 2011 and other UCR studies;
- Physical and chemical properties of the animal feedstocks and biodiesel blends tested;
- The distribution of sources, characteristics, and properties in the population of animal feedstocks that are available for use in the California market; and
- How the specific animal feedstocks tested at UCR were selected, including any information that would demonstrate that the feedstock properties and their CN blending behavior are representative of the animal feedstock population available for use in California.

5. Development of a Cetane-based Model of NOx Impacts from Soy and Animal Biodiesel

The results presented above indicate the important role that CN plays in determining the NOx response for animal blends. Animal feedstocks tend to increase the CN of the blend above that of the CARB diesel and the CN change can be large at low blend levels. Soy feedstocks have generally adverse effects and tend to decrease the CN of the blend below that of the CARB diesel; for soy, the CN change at low blend levels can be smaller than the uncertainty in determining CN. The result of our work on a cetane-based model demonstrates that soy and animal blends are not categorically different fuels once their differing effect on CN is accounted for. Their NOx impacts can be represented by the same model as a function of blend level and the change in CN compared to CARB diesel.

ADF B3-142

The document that accompanies this report explains the development of the cetane-based model in some detail. In brief, it was developed using conventional linear regression analysis with log(NOx) emissions as the dependent variable. Intercept terms were included to represent the varying emission levels on CARB diesel for each combination of study, feedstock type, engine, and test cycle. A *b* coefficient was included to represent the change in NOx emissions for each 1 percent biodiesel in a blend at constant CN. A *c* coefficient was included to represent the change in NOx emissions for each 1 number change in CN compared to CARB diesel at constant blend level. Both soy and animal blends

ADF B3-143

were included in the estimation, along with the small number of canola and UCO data points, at blend levels up to (and including) B20.

The model estimation shows that the *b* and *c* coefficients are highly significant statistically ($p < 0.0001$). The estimation results also show the following:

- The *b* coefficient has a value of +0.00156, which estimates that soy and animal biodiesel will increase NOx emissions by 0.16% for each 1 percent biodiesel at constant CN or by 0.8% at B5.
- The *c* coefficient estimates that +5 CNs will decrease NOx emissions by 1.5 percent at constant blend level. This result is completely consistent with earlier work[3] on the relationship between CN and NOx emissions in HDT engines, which also found that +5 CNs will decrease NOx emissions by 1.5 percent in base fuels with CN ~50.
- An increase of -b/c = 0.5 CNs is needed to offset the NOx increase expected from each 1% biodiesel added. For B5, an increase of 2.5 CNs is required to offset the expected NOx increase.

The results explain why soy and animal blends appear to be different fuels. Soy blends have an additional, adverse CN effect that increases their NOx impact to ~1% at B5. Animal blends will generally increase CN and that reduces their NOx impact to about one-half the soy level or less depending on the CN change caused by blending. The results also explain why some animal blends do not increase NOx emissions. If an animal feedstock increases CN by more than ~0.5 numbers for each 1% biodiesel blended, then the resulting fuel may not increase NOx emissions.

ADF B3-143 cont.

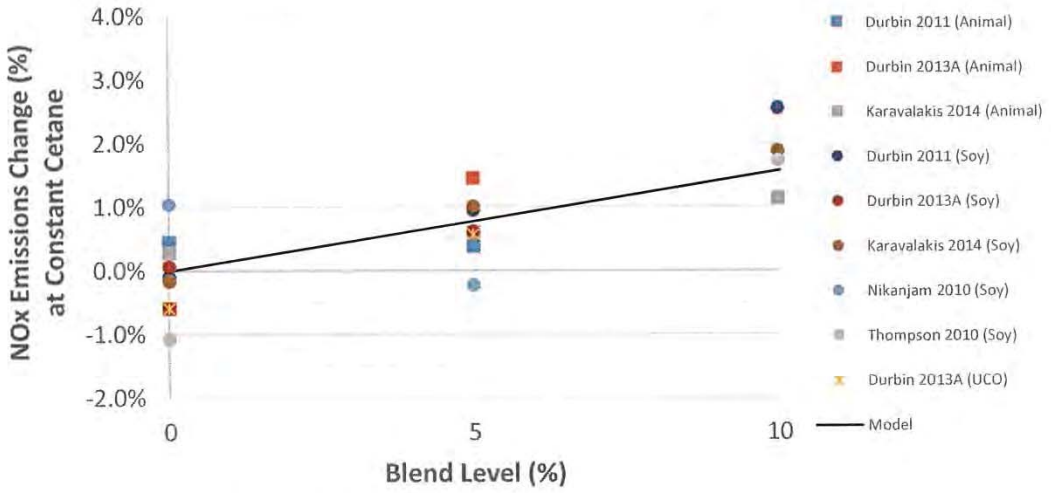
To demonstrate these conclusions, Figure 2 presents NOx emissions as a function of blend level for all fuels used to estimate the model once NOx emissions are adjusted for the CN change observed for each blend (animal blends are plotted as squares, soy blends as circles, and the non-soy vegetable blends as asterisks). For example, if an animal blend increased CN, then its NOx impact is increased as we return it to the base fuel CN. If a soy blend decreases CN, then its NOx impact is decreased as we return it to the base fuel CN. Once adjusted, percent changes in emissions are calculated. As seen in the figure, there is no discernable difference among feedstock types once CN changes are taken into account. Animal and soy blends scatter on both sides of the regression line, indicating that they obey the same blend level model.

Note the scatter of points around the regression line (which gives the "average" response). Some of the scatter is due simply to emissions measurement error. But other factors may be involved in determining the NOx impact for a given feedstock, including differences in the FAME composition and uncertainty in determining CN for the blends. If ARB were to adopt a predictive model to determine the CN improvement needed to mitigate NOx, it should use the model to evaluate a "worst case" feedstock, meaning a point near the upper end of the range at each blend level.

The most important conclusion of this work is that soy and animal biodiesel blends are not categorically different fuels. Their emissions effects are similar, but they show different NOx impacts because they have different effects on CN. Further, this work provides a potential answer to the problem that some animal blends will significantly increase NOx emissions, while other blends will not, by indicating what individual blends may do.

[3] *The Effect of Cetane Number Increase Due to Additives on NOx Emissions from Heavy-Duty Highway Engines.* EPA420-R-03-002. February 2004. Figure IV.A-1.

Figure 2. There Are No Detectable Differences Among Feedstock Types Once NOx Emissions Are Adjusted to Constant CN



Note: Animal blends are plotted as squares, soy blends as circles, and the non-soy vegetable blends as asterisks.

6. Summary and Conclusions

Based on the results summarized above, ARB must consider as part of the current rulemaking a regulatory structure in which the NOx impacts of soy and animal biodiesel are accounted for using a statistical model analogous to the Predictive Model for RFG. We see the cetane-based model presented here as a possible draft for a biodiesel predictive model, but further work is needed to:

- Demonstrate that blends mitigated using DTBP obey the same model; and
- Assess whether the four animal feedstocks that have been tested are representative of all animal feedstocks available in the California market.

ADF B3-144

Additional emissions testing may be needed if it is determined that the four animal feedstocks that have been tested are not representative of the population of animal feedstocks available for use in the California market.

ADF B3-145

Further, more advanced statistical techniques should be used as was done in developing the Predictive Model for California Reformulated gasoline. The dataset used here is highly unbalanced, meaning that there are varying numbers of data points for each combination of study, feedstock type, engine, and test cycle. In fact, only a fraction of all possible study/feedstock/engine/test cycle cells are represented by one or more data points. A technique known as Mixed Effects Modeling is appropriate in such cases and its use will assure that coefficient estimates are not biased by the unbalanced distribution of the data.

ADF B3-146

The key conclusions of this study are summarized below.

- Soy and animal blends are not categorically different fuels once their differing effects on blend CN are taken into account. ADF B3-147
- There is no evidence in the data of a threshold level below which biodiesel fuels as a group do not increase NOx, whether soy or animal. However, individual blends may not increase NOx if the CN gain caused by blending is sufficiently large to offset the underlying tendency of all biodiesel blends to increase NOx emissions. ADF B3-148
- Soy blends clearly and significantly increase NOx by ~1% at B5 and by proportionately larger amounts at higher blend levels. Soy blends require mitigation at all levels to offset increased NOx emissions. ADF B3-149
- Animal blends are more complicated. The current research is limited and the evidence is mixed. At least one B5 animal blend significantly increased NOx, while another has been certified as NOx neutral. Other B5 animal blends may or may not increase NOx depending on their effect on CN (and possibly other factors). ADF B3-150
- Staff's assertion that no NOx increase occurs at B5 in animal blends is incorrect. Some animal blends will significantly increase NOx emissions, while other animal blends will not. ADF B3-151
- Animal blends cannot be assumed to have no impact on NOx emissions without a determination of the impact of feedstock blending on CN. ADF B3-152

###

APPENDIX TABLE A: REFERENCES TO LITERATURE

Author	Title	Feedstocks Studied	Blends Studied
Clark 1999	Transient Emissions Comparisons of Alternative Compression Ignition Fuel	Soy	B20
McCormick 2002	Fuel Additive and Blending Approaches to Reducing NOx Emissions from Biodiesel	Soy, UCO	B20
McCormick 2005	Regulated Emissions from Biodiesel Tested in Heavy-Duty Engines Meeting 2004 Emissions	Soy, Canola, Animal	B20
Eckerle 2008	Effects of Methyl Ester Biodiesel Blends on NOx Emissions	Soy	B20
Nuszkowski 2009	Evaluation of the NOx emissions from heavy duty diesel engines with the addition of cetane improvers.	Soy	B20
Nikanjam 2010	Performance and emissions of diesel and alternative diesel fuels	Soy	B5, B20
Thompson 2010	Neat fuel influence on biodiesel blend emissions	Soy	B10, B20
Durbin 2011	Biodiesel Characterization and NOx Mitigation Study	Soy, Animal	B5, B10, B20
Durbin 2013A	CARB B5 Preliminary and Certification Testing	Animal	B5
Durbin 2013B	CARB B20 Biodiesel Preliminary and Certification Testing	Soy, UCO	B20
Karavalakis 2014	CARB Comprehensive B5/B10 Biodiesel Blends Heavy-Duty Engine Dynamometer Testing	Soy, Animal	B5, B10

DELIVERED BY HAND

February 18, 2015

sierra research

1801 J Street
Sacramento, CA 95811
Tel: (916) 444-6666
Fax: (916) 444-8373

Ann Arbor, MI
Tel: (734) 761-6666
Fax: (734) 761-6755

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

RE: "Comments on the LCFS and ADF rulemaking proposals."

Dear Clerk of the Board:

I have discovered that one attachment to my Declaration included in electronic filing for Growth Energy that Josh Wilter of my staff made yesterday was not included in the upload. I am enclosing the attachment here and am emailing it to Jim Aquila and Lex Mitchel who are listed as the staff contacts for this item in the Hearing Notice. The contents of this attachment do not differ from the content of my Declaration, and the bulk of the analysis in the attachment was provided to the ARB staff on October 24, 2014 as workshop comments.

Sincerely,

Jim Lyons
Senior Partner

Attachments:

NOx EMISSIONS IMPACTS OF BIODIESEL BLENDS

Prepared by:

Rincon Ranch Consulting
2853 S. Quail Trail
Tucson, AZ 85730

Prepared for:

Sierra Research
1801 J. Street
Sacramento, CA 95811

February 10, 2015

NOx EMISSIONS IMPACTS OF BIODIESEL BLENDS

Table of Contents

List of Figures

Figure — Page

List of Tables

Table — Page

NOx EMISSION IMPACTS OF BIODIESEL BLENDS

1. EXECUTIVE SUMMARY

The purpose of the Alternative Diesel Fuels (ADF) rulemaking, according to the Air Resources Board (ARB), is to create a regulatory framework that will permit biodiesel and other low-carbon, alternative diesel fuels to "enter the commercial market in California, while mitigating any potential environmental or public health impacts." [1]

The work presented in this report assesses the impacts of biodiesel use on NOx emissions from conventional and new technology diesel engines. It was performed by Rincon Ranch Consulting under subcontract to Sierra Research at the request of Growth Energy.

At present, most diesel fuel and biodiesel is consumed in conventional diesel engines that do not have exhaust gas after-treatment to reduce NOx emissions. The consensus of the literature is that biodiesel will increase NOx emissions by amounts that depend on the blending percentage (how much biodiesel is present in the diesel fuel) and the type of biodiesel feedstock (soy versus animal sources). NOx increases of 1-2% are expected from soy biodiesel at blend levels of B5 to B10 with smaller increases expected, in general, from animal biodiesel at the B5 to B10 level. ADF B3-153

Over time, new technology diesel engines (NTDEs) equipped with exhaust gas after-treatment controls for NOx will increasingly make up the heavy duty fleet in response to other ARB programs. While baseline emissions from these engines will be reduced compared to conventional engines, the consensus of the literature available today is that use of biodiesel will still increase NOx emissions above the reduced baseline. At the B20 level, the NOx increase appears to be greater on a percentage basis than would be expected in conventional diesel engines. ADF B3-154

The results of this work indicate the following with respect to conventional diesel engines:

- Soy biodiesels will increase NOx emissions at the B5 and B10 levels by approximately 1% and 2%, respectively. This work and Staff's analysis concur in both the conclusion and the estimated levels of NOx increase at B5 and B10. Soy biodiesels in this blend range require NOx mitigation on a per-gallon basis in order to prevent increases in NOx emissions. ADF B3-155
- The consensus of the research community is that the effect of soy biodiesel on NOx emissions is continuous and linear with respect to the blending percentage. NOx ADF B3-156

[1] "Proposed Regulation on the Commercialization of New Alternative Diesel Fuels. Staff Report: Initial Statement of Reason." California Air Resources Board, Stationary Source Division, Alternative Fuels Branch. January 2, 2015. http://www.arb.ca.gov/regact/2015/adf2015/adf15isor.pdf. Page 11.

increases have been observed at levels as low as B1.[2] The statistical analysis performed for ARB by Rocke supports this conclusion and estimates that soy biodiesel will increase NOx emissions by about 0.2% for each 1% biodiesel in the blend (0.99% for each 5% biodiesel). ADF B3-156 cont.

In spite of this consensus, the Staff proposal requires NOx mitigation for soy-based biodiesel only above the B5 level in summer months and above the B10 level in winter months. Soy biodiesel blended at the B5 and lower levels would not require mitigation in any circumstance. The ADF regulatory framework must require mitigation of soy-based biodiesels at all blend levels if it is to ensure that such fuels do not increase NOx emissions. ADF B3-157

- The effect of animal-based biodiesel on NOx emissions is more complicated than for soy-based blends. As the available literature demonstrates, some animal-based biodiesels will increase NOx emissions while other animal biodiesels will not. While Staff's proposal would establish B10 as the control level for animal-based biodiesel (e.g., mitigation would be required year-round for blends above B10), the available data do not support Staff's conclusion that there will not be increases in NOx emissions from B10 and lower blends. Given the Staff proposal, the only way to ensure that animal-based biodiesel does not increase NOx emissions is to require mitigation at all blend levels. ADF B3-158

- Staff presents information indicating that animal biodiesels decrease NOx by 0.2% on average and that the emissions change in comparison to CARB diesel fuel is not statistically significant. The average and the test for statistical significance are both flawed by the failure to consider the varying effects that animal feedstocks have on Cetane Number (CN). The absence of CN as a variable in Staff's analysis leads Staff to wrongly conclude that animal biodiesels will not increase NOx below the B10 level. ADF B3-159

- It is well established that increasing CN will reduce NOx emissions from diesel engines. Whether an animal biodiesel will increase NOx depends primarily on the extent to which the feedstock blending increases the CN of the blended fuel. Soy and animal biodiesel blends are not categorically different fuels once the differing effect of soy- and animal-feedstocks on CN is taken into account. ADF B3-160

With respect to new technology diesel engines (NTDEs):

- Staff is incorrect in concluding that biodiesel use will not increase NOx in NTDEs. This conclusion is based on a highly selective reading of the technical literature (choosing one of four available studies) and relies on the one study in which the laboratory was not well equipped to measure the low levels of tailpipe NOx emissions from NTDEs. ADF B3-161

- A fair reading of the technical literature indicates that B20 biodiesel will increase NOx emissions by about 20% in NTDEs. The four best studies estimate that B20 biodiesel ADF B3-162

[2] McCormick 2002 tested a Fisher-Tropsch (FT) base fuel blended at the B1, B20, and B80 levels. Although the very high FT cetane number (≥75) takes it out of the range of commercial diesel fuels, the study nevertheless measured higher NOx emissions at the B1 level than it did on the FT base fuel.

increases NOx by 18-22% in NTDEs and that the increase is statistically significant. This is a greater percentage NOx increase in proportion to blend level than the increase caused by soy biodiesel in conventional diesel engines (1% at B5, 2% at B10 and ~4% at B20).

ADF B3-162 cont.

- The technical literature also indicates that one should expect NOx emissions to increase at blend levels below B20, with the size of the NOx increase being proportionate to blend level. At the B5 level, NOx emissions from NTDEs are expected to increase by about 5%.

ADF B3-163

- Staff makes no mention of the concern that use of biodiesel fuels in NTDEs may lead to the loss of NOx conversion efficiency in urea-SCR systems by shifting the NO_2/NOx ratio to lower values. Staff's proposal to allow B20 biodiesel to be used in NTDEs without mitigation potentially places at risk the investment in NOx after-treatment systems to meet the stringent NOx certification levels now in effect.

ADF B3-164

This analysis demonstrates that the proposed regulations will not "ensure that the use of biodiesel due to LCFS will not result in increases in NOx emissions in California." In fact, the regulations will result in increased NOx emissions in California from the following:

- B5 and lower soy biodiesels year round;
- B6 to B10 soy biodiesels in winter;
- At least some B10 and lower animal biodiesels year-round; and
- B20 and lower biodiesels of all types in NTDEs.

ADF B3-165

To our knowledge, ARB has not formulated a position on the level of NOx increase from alternative diesel fuel that is too small to warrant concern. A point of comparison for the NOx increases permitted by the proposed ADF regulations is the ARB program for Reformulated Gasoline (RFG). The RFG program permits alternative gasoline formulations to be sold in the California market provided they are demonstrated to be emissions equivalent to a reference gasoline using the Predictive Model for RFG. The emissions analysis differs somewhat for winter and summer gasoline, but in no instance may the alternative formulation increase emissions of the pollutants considered by more than 0.05%.

ADF B3-166

The biodiesel NOx emission increases permitted under the proposed ADF regulations dwarf the 0.05% threshold applied to RFG. Soy biodiesel will increase NOx by more than 0.05% at blend levels above 0.25% biodiesel (B0.25). Some animal biodiesels will increase NOx by 0.05% or more at blend levels twice as high (B0.5). The NOx emissions increase in NTDEs appears to be substantially greater on a percentage basis, so that biodiesels will exceed the 0.05% threshold at much lower blend levels.

ADF B3-167

In the ISOR, Staff uses the term "low saturation" to refer to soy and other feedstocks with CN < 56 and "high saturation" to refer to feedstocks, including animal sources, with CN ≥ 56. Classification based on saturation is useful because of its association with CN. By itself, however, it does not alleviate the concerns regarding NOx increases from unmitigated fuels.

ADF B3-168

The analysis presented here indicates that CN changes induced by biodiesel blending have a large influence on the size of the NOx increase that is observed. Soy (low saturation) biodiesels adversely affect CN leading to larger NOx increases; animal (high saturation) biodiesels increase CN leading to smaller NOx increases. In fact, soy and animal biodiesels are not categorically different fuels once their differing effect on blend CN is taken into account.

ADF B3-169

It is strongly recommended that ARB consider as part of the ADF rulemaking a regulatory structure in which the NOx impacts of soy and animal biodiesel are accounted for using a statistical model analogous to the Predictive Model for RFG. The analysis documented in this report provides a possible form for a biodiesel predictive model.

ADF B3-170

2. NOX EMISSIONS FROM CONVENTIONAL DIESEL ENGINES

2.1 ARB Analysis in Support of the Proposed Regulations

In support of the proposed regulations, ARB commissioned an analysis of the available NOx emissions data by David M. Rocke, PhD. The results of the analysis are reported in Appendix G: Supplemental Statistical Analysis[3] to the ISOR. The analysis used NOx emission measurements on ULSD, B5, and B10 fuels in conventional diesel engines from five studies. The dataset is substantially the same as that used by Rincon Ranch Consulting in the analysis presented later in this section.

The Rocke analysis formulated a series of statistical models involving log(NOx) as the dependent variable and used a statistical approach termed Mixed Effects modeling to estimate the coefficient values. The Mixed Effects approach has statistical advantages over more commonly used methods when dealing with unbalanced datasets, as is the case here. A number of different models were specified, estimated, and the results compared in order to ensure that conclusions drawn from the analysis do not depend upon the model specifications.

ADF B3-171

For soy-based biodiesel, the Rocke study concludes that soy fuels increase NOx by 1% at B5 and by 2% at B10. The study also demonstrated that the NOx increase is linearly related to the blend level. The slope was estimated to be 0.99% for each 5% biodiesel in a blend and was highly significant statistically ($p << 0.001$). These results agree with the Rincon Ranch analysis presented later in this report. There is no controversy with regard to the NOx impact of soy-based biodiesel. Soy biodiesel will increase NOx emissions at all blend levels by about 0.2% for each 1% biodiesel in the blend.

With respect to animal biodiesel, the Rocke study concludes that animal biodiesel does not increase NOx emissions at B5 or B10. The emission changes that are observed are not statistically significant. There is controversy here because the Rocke analysis did not account for the effect of feedstock blending on the CN of the tested fuels. The CN change compared to ULSD is a fixed effect that must be accounted for because the four animal feedstocks that have been used in the technical literature show substantially different cetane behavior in blending.

ADF B3-172

[3] http://www.arb.ca.gov/regact/2015/adf2015/adf15appg.pdf.

The case for cetane as an explanatory variable for NOx emissions in animal blends is made in Section 2.2.4 of this report. It is well established that increasing CN will reduce NOx emissions from diesel engines. For example, ARB has shown that the additive DTBP can be used to raise CN and mitigate NOx increases caused by biodiesel blending. Whether an animal biodiesel will increase NOx depends primarily on the extent to which the feedstock blending increases CN of the blended fuel. The two animal blends that showed the smallest CN gain over ULSD caused statistically significant NOx increases in the engines tested. The one animal blend that showed the largest CN gain was certified to be NOx neutral, while the animal blend with the next largest CN gain may or may not be NOx neutral. Cetane appears to blend linearly when using soy feedstocks, so that the CN gain over ULSD is highly correlated with blend level. The same is not true for animal feedstocks, where highly non-linear blending behavior has been observed.

The Rocke analysis used a Mixed Effects model to estimate the NOx emissions change at B5 and B10. For animal blends, it concluded that the observed emission changes are not statistically significant. Implicit in the approach is the assumption that the fuels being tested are different, individual realizations from a homogenous population. In this instance, the residual variation not accounted for by the blend level is a random effect representing the scatter in test results due to a variety of factors. The statistical significance of the blend level effect (a fixed effect) is judged in comparison to the residual variation. When the residual variation is large in comparison to the fixed effect, the latter is said to be not statistically significant.

ADF B3-172 cont.

The assumption of a homogenous population is appropriate for soy-based biodiesels. One soybean is much like the next, and the only appreciable differences among soy fuels will result from the methods of preparation. However, the assumption of homogeneity is not appropriate for animal-based biodiesels, which can be drawn from a variety of animal sources and prepared in different ways. The non-homogeneity is seen most readily in the greatly different cetane responses of biodiesel fuels:

- In the McCormick 2005 and Durbin 2011 studies, the animal feedstocks increased the CN of the biodiesel blends by small amounts. These fuels led to statistically significant increases in NOx.
- In the Durbin 2013A study, blending at the B5 level was sufficient to raise the CN of the blend by 8 numbers to reach the cetane level of the feedstock itself. This fuel was certified as NOx neutral at B5.
- The animal feedstock used in the Karavalakis 2014 study was intermediate in its CN effect and also intermediate in its NOx effect.

Because the ARB and Rocke studies have not included cetane as an explanatory variable for animal-based biodiesels, the residual variation term has been enlarged since a portion of it could be accounted for by including a fixed-effects term for cetane. With an enlarged estimate of the residual variance, the studies more easily find that the fixed effect of blend level is not statistically significant.

The absence of cetane as an explanatory variable also affects other methods of analysis used by Rocke. In a t-test comparison of emission differences between biodiesel and ULSD, Rocke finds two cases in which animal B5 changes NOx by statistically significant amounts (one increasing NOx and the other decreasing NOx) and one such case in animal B10 (decreasing NOx), while the other cases show no statistically significant change compared to the base fuel. The study wrongly concludes that these results demonstrate no or little systematic evidence for B5 or B10 animal to increase NOx emissions. In fact, these cases are systematically related to the CN gain of the animal blends in comparison to the base fuel.

ADF B3-172 cont.

The Rocke analysis was well planned and executed, and we concur with the conclusions drawn for soy-based blends. Because the analysis for animal-based blends is flawed by omission of a cetane variable, it should be revised to address CN gain. We expect that a revised analysis will shed further light on the circumstances in which animal-based biodiesels will and will not increase NOx emissions.

2.2 Rincon Ranch Analysis of ARB NOx Emissions Data

In July 2014, ARB released two datasets that represent the fruit of its efforts to compile the available biodiesel NOx emissions test data on conventional heavy-duty truck (HDT) engines. This report and the companion file *"Biodiesel Emissions Analysis Technical Summary 102014.pdf,"* which is attached to and incorporated in this report, present the results of a statistical analysis of the data sets released by ARB that was performed by Rincon Ranch Consulting at the request of Growth Energy.

The analysis presented below focused on whether soy and animal blends will increase NOx at low blend levels in conventional diesel engines. The following issues were examined:

- The NOx impacts of soy and animal blends at B5 and B10;
- The NOx emission differences observed among animal feedstocks and blends;
- For animal blends, the effect on NOx emissions of the CN change relative to base fuel that is caused by blending of the animal feedstock; and
- The development of a cetane-based model of the biodiesel NOx impacts of soy and animal blends.

2.2.1 Data Used in the Analysis

As noted above, in July 2014, ARB released two datasets of NOx emissions data from testing of biodiesel blends in HDT engines. One file ("B5 & B10 Raw NOx Data") contains the subset of testing for B5 and B10 blends (soy and animal). The test data generated in the four ARB-sponsored UCR studies are present in the form of the individual test run measurements. Because test run information was not reported in their publications, the B5 soy data from Nikanjam 2010 and the B10 soy data from Thompson 2010 are present in the form of emission averages. No animal blends have been tested at the B5 or B10 levels except in the ARB-sponsored emissions testing. A second file ("2014 Biodiesel Literature Search Database") contains all of the biodiesel

ADF B3-173

testing available in the literature through the B20 level (soy and animal), including ARB-sponsored testing and the literature search. The data are in the form of emission averages by engine, test cycle, feedstock type, and blend level.

For purposes of this analysis, the following information was added to the ARB datasets:

- The number of test replications for emissions averages for each study (estimated when the source did not report the number);
- The CN for CARB diesel, the biodiesel blends, and the biodiesel feedstocks; and
- Additional NOx emissions testing at the B50 and B100 levels (where available).

Appendix Table A presents a list of the studies included in the dataset and the author references used in citations here.

ADF B3-173 cont.

2.2.2 NOx Emissions from Soy Biodiesel Blends

Most past research on biodiesel emissions has focused on soy blends. As a result, the literature is relatively large and diverse. The dataset assembled by ARB is derived from 10 different studies, covers 13 different vegetable feedstocks (10 soy, 2 used cooking oil [UCO], 1 canola), and was conducted using 7 different test cycles on a wide variety of engines in different labs. Most of the data, in terms of number of data points, are derived from the three UCR studies (Durbin 2011, Durbin 2013B, and Karavalakis 2014) sponsored by ARB.

We subjected the soy dataset to a number of different analyses using different statistical techniques and selections of the data to ensure that the conclusions we drew were robust. The statistical analyses included the t-test for the difference in mean values (e.g., between B5 and CARB diesel) and linear regression analysis using several different models. The data subsets were selected to use either individual test runs or emission averages and to contain testing through maximum blend levels of B5, B10, B20, B50, and B100.

ADF B3-174

Our analyses show that there is a consensus among the studies on the NOx impact of soy biodiesel without regard to the specific analytical methods or data used. Soy biodiesel increases NOx emissions by amounts that can be estimated with good statistical confidence because of the large size of the available dataset. The key conclusions are as follows:

- Soy biodiesel increases NOx emissions by ~1% at B5 and ~2% at B10;
- NOx emissions increase in a linear fashion with increasing blend level to reach ~4% at B20 and proportionately larger values at higher blend levels; and
- There is no evidence in the data for a threshold level below which soy biodiesel does not increase NOx.

These conclusions are supported by all of the available studies and data. None of the studies disagree substantially, and while the results for individual blends, engines, and test cycles will vary to some extent, the evidence across a wide range of engines and test cycles is clear. NOx

increases can be expected for UCO, canola, and other vegetable biodiesels, but the data are very limited and it is not possible to draw definitive conclusions for these blends.

ADF B3-174 cont.

2.2.3 NOx Emissions from Animal Biodiesel Blends

The literature on NOx emissions from animal blends is much smaller—it consists of only four studies, three of which (Durbin 2011, Durbin 2013A, and Karavalakis 2014) were sponsored by ARB. Except for the McCormick 2005 study, the emissions testing was conducted at the UCR CE-CERT lab. A variety of test cycles were used, but most of the testing was conducted on the hot-start FTP cycle. Table 1 presents a summary of the emissions studies for animal biodiesel.

Table 1. Scope of Emissions Testing for Animal Biodiesel

	McCormick 2005	Durbin 2011	Durbin 2013A	Karavalakis 2014
Biodiesel Feedstock	Animal #1	Animal #2	Animal #3	Animal #4
Blend Levels Tested	B20	B5, B20, B50, B100	B5	B5, B10
Engines Tested	2 on-road	3 on-road, 1 off-road	1 on-road	1 on-road
Test Cycles	FTP	FTP, UDDS, 50 mph, ISO 8178	FTP	FTP, SET, UDDS
Test Replications on Biodiesel	6	126	26	80
Is NOx Increase Observed?				
At / Below B10	–	Yes	No	No
Above B10	Yes	Yes	–	–

ADF B3-175

It is important to understand the limitations of this small dataset. Without the ARB-sponsored testing, we would have only the six test replications (individual runs) conducted in the McCormick 2005 study. While the three UCR studies accumulated 232 test replications, the work involved only three different animal feedstocks. Including the McCormick 2005 study, the entire literature on NOx emissions from animal biodiesel is based on only four different animal feedstocks. The small number is an important limitation because animal feedstocks are much less homogenous than soy due the greater variety possible in animal sources and compositions. Further, there are notable differences among the four studies as to whether animal biodiesel increases NOx at the B5 and B10 levels (as indicated by the red circles in the table).

As in the soy analysis, we subjected the animal biodiesel data to a number of different analyses using different statistical techniques and selections of the data to ensure that the conclusions we drew were robust. The t-test is the most direct method to assess whether NOx emissions are higher at B5 compared to CARB diesel. Using the individual test run data available from the three UCR studies, we find the following for animal biodiesel at the B5 blend level:

- The animal feedstock used in Durbin 2011 increases NOx in 2 of 3 engines. The increase is highly significant[4] statistically for one engine.

- The animal feedstock used in Durbin 2013A decreases NOx in one engine. The decrease is statistically significant at the p=0.05 level, and the blend was certified as NOx neutral at B5.

- The animal feedstock used in Karavalakis 2014 increases NOx in three of six cases and decreases NOx in the other three cases. None of the changes are statistically significant. The blend may or may not change NOx.

ADF B3-175 cont.

Contrary to Staff's assertion that no NOx increase occurs in B5 animal blends, it is clear that some animal blends will significantly increase NOx emissions, while other animal blends will not. The fundamental issue is then understanding what the NOx impact of a particular animal biodiesel blend will be.

The effect of feedstock blending on the CN of the resulting animal blend is the reason for the apparently discordant results among the studies. Figure 1 plots the four series of animal blends used in the studies, with blend level on the horizontal axis and the change in blend CN (relative to CARB diesel) on the vertical axis. CN blended linearly to B20 for the McCormick feedstock, which showed a much smaller CN benefit than the feedstocks used by UCR—only three numbers at B20 (0.6 numbers at B5). In contrast, all three UCR animal blends achieve a large CN boost at low blending levels in which most or all of the CN benefit of the feedstock is achieved at B5.

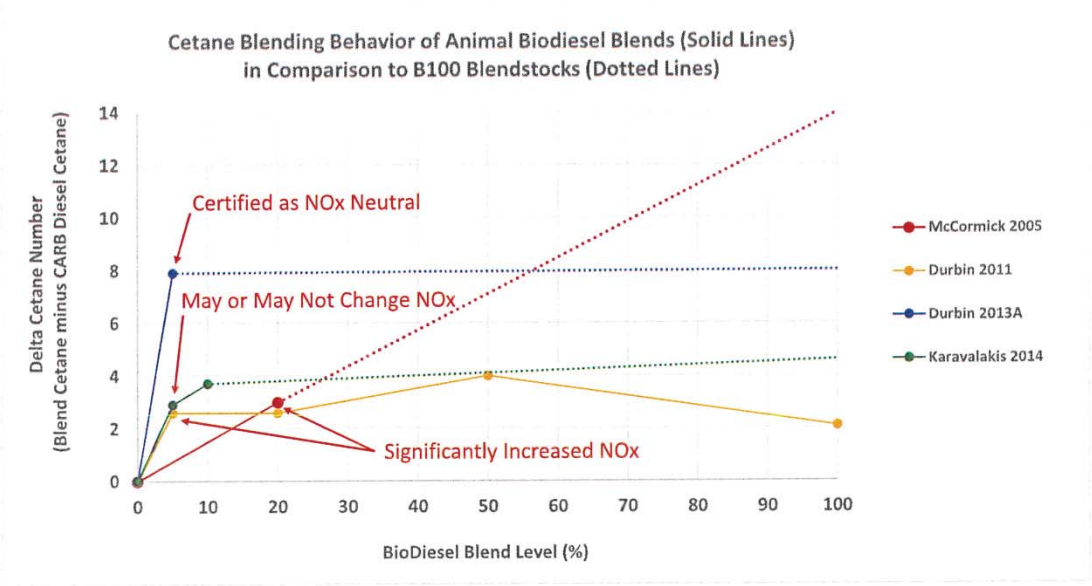
In Durbin 2011, the CNs for the blends are above that of the B100 feedstock. This result is probably caused by lab-to-lab differences (blend CN was determined at CE-CERT, while CN for CARB diesel and the B100 feedstock were determined by an outside lab). The actual CN changes are surely lower than shown here—at or below +2 CNs.

ADF B3-176

The two animal feedstocks that caused statistically significant NOx increases have the smallest CN benefits: McCormick 2005 (red) at B20 and Durbin 2011 (yellow) at B5. The animal B5 blend that passed certification testing as NOx neutral in Durbin 2013A (blue) has the highest CN benefit, where it achieved the entire B100 CN at just 5% blending. The Karavalakis 2014 B5 blend (green) had an intermediate CN benefit and may or may not change NOx.

[4] The term "significant" is used in this report only to refer to statistical significance. When a result reaches the p=0.05 level, we can be 95 percent confident that it is real. In such case, and at smaller p values, the result is said to be statistically significant.

Figure 1. Cetane Blending Behavior of Animal Blends (Solid Lines) Compared to B100 Feedstocks (Dotted Lines)



The blending behavior of the UCR blends is surprising in comparison to the McCormick study, and we find relatively little research on the CN blending behavior of animal feedstocks. All conclusions from this dataset will be influenced by the CN blending behavior of the specific animal feedstocks involved. For such conclusions to be reliable, we must be confident that the large CN boost reported for the UCR blends is both real and representative of all animal feedstocks in California. Also, only limited information is available on the sources and characteristics of the animal feedstocks.

To permit all parties to better understand the animal feedstocks that were tested, ARB should release all information that it has on the following:

- CNs (methods of determination and measured values) for the Durbin 2011 and other UCR studies;
- Physical and chemical properties of the animal feedstocks and biodiesel blends tested;
- The distribution of sources, characteristics, and properties in the population of animal feedstocks that are available for use in the California market; and
- How the specific animal feedstocks tested at UCR were selected, including any information that would demonstrate that the feedstock properties and their CN blending behavior are representative of the animal feedstock population available for use in California.

ADF B3-176 cont.

Staff's use of the terms low saturation (for soy) and high saturation (for animal) to classify biodiesel is useful to differentiate between feedstocks that will tend to decrease CN and those that will tend to increase it. However, it is not a sufficient step in that the CN change at each blend level is the determinative factor for NOx emissions, not the CN of the feedstock itself. Soy feedstocks appear to blend linearly with respect to cetane; however, animal feedstocks often lead to a highly non-linear CN response, as shown in Figure 1.

ADF B3-176 cont.

2.2.4 Development of a Cetane-based Model of NOx Impacts from Soy and Animal Biodiesel

The results presented above indicate the important role that CN plays in determining the NOx response for animal blends. Animal feedstocks tend to increase the CN of the blend above that of the CARB diesel and the CN change can be large at low blend levels. Soy feedstocks generally decrease the CN of the blend below that of the CARB diesel; for soy, the CN change at low blend levels can be smaller than the uncertainty in determining CN. The result of our work on a cetane-based model demonstrates that soy and animal blends are not categorically different fuels once their differing effect on CN is taken into accounted. Their NOx impacts can be represented by the same model as a function of blend level and the change in CN compared to CARB diesel.

The document that accompanies this report explains the development of the cetane-based model in some detail. In brief, it was developed using conventional linear regression analysis with log(NOx) emissions as the dependent variable. Intercept terms were included to represent the varying emission levels on CARB diesel for each combination of study, feedstock type, engine, and test cycle. A *b* coefficient was included to represent the change in NOx emissions for each one percent biodiesel in a blend at constant CN. A *c* coefficient was included to represent the change in NOx emissions for each one number change in CN compared to CARB diesel at constant blend level. Both soy and animal blends were included in the estimation, along with the small number of canola and UCO data points, at blend levels up to (and including) B20.

ADF B3-177

The model estimation shows that the *b* and *c* coefficients are highly significant statistically ($p < 0.0001$). The estimation results also show the following:

- The *b* coefficient has a value of +0.00156, which estimates that soy and animal biodiesel will increase NOx emissions by 0.16% for each one percent biodiesel at constant CN or by 0.8% at B5.
- The *c* coefficient estimates that +5 CNs will decrease NOx emissions by 1.5% at constant blend level. This result is completely consistent with earlier work[5] on the relationship between CN and NOx emissions in HDT engines, which also found that +5 CNs will decrease NOx emissions by 1.5% in base fuels with CN ~50.

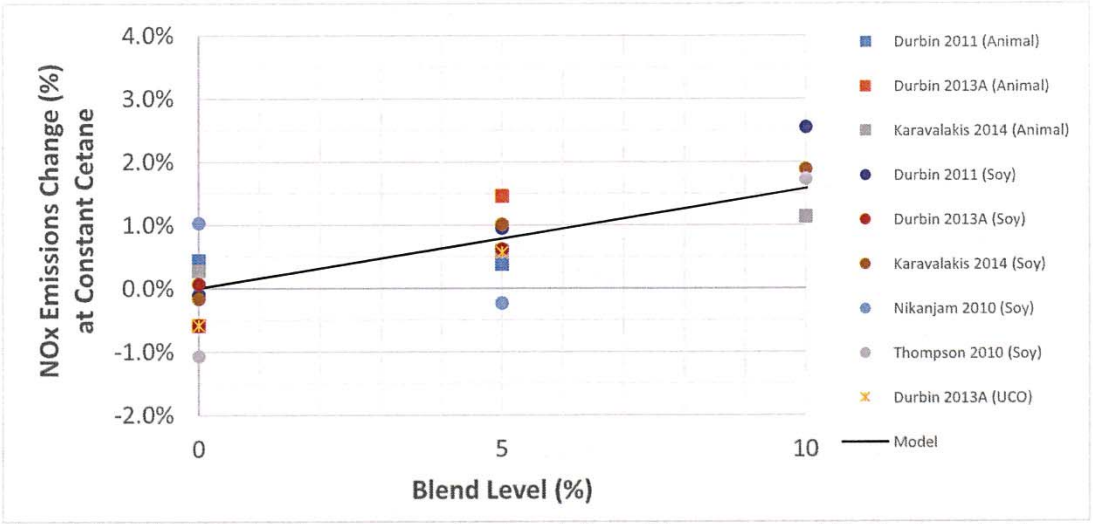
[5] The Effect of Cetane Number Increase Due to Additives on NOx Emissions from Heavy-Duty Highway Engines. EPA420-R-03-002. February 2004. Figure IV.A-1.

- An increase of -b/c = 0.5 CNs is needed to offset the NOx increase expected from each 1% biodiesel added. For B5, an increase of 2.5 CNs is required to offset the expected NOx increase.

The results explain why soy and animal blends appear to be different fuels. Soy blends have an additional, adverse CN effect that increases their NOx impact to ~1% at B5. Animal blends will generally increase CN and that reduces their NOx impact to about one-half the soy level or less, depending on the CN change caused by blending. The results also explain why some animal blends do not increase NOx emissions. If an animal feedstock increases CN by more than ~0.5 numbers for each 1% biodiesel blended, then the resulting fuel may not increase NOx emissions.

To demonstrate these conclusions, Figure 2 presents NOx emissions as a function of blend level for all fuels used to estimate the model once NOx emissions are adjusted for the CN change observed for each blend. For example, if an animal blend increased CN, then its NOx impact is increased as we return it to the base fuel CN. If a soy blend decreases CN, then its NOx impact is decreased as we return it to the base fuel CN. Once adjusted, percent changes in emissions are calculated. As seen in the figure, there is no discernable difference among feedstock types once CN changes are taken into account. Animal and soy blends scatter on both sides of the regression line, indicating that they obey the same blend level model.

Figure 2. There Are No Detectable Differences Among Feedstock Types Once NOx Emissions Are Adjusted to Constant CN



Note: Animal blends are plotted as squares, soy blends as circles, and the non-soy vegetable blends as asterisks.

Note the scatter of points around the regression line (which gives the "average" response). Some of the scatter is due simply to emissions measurement error; however, other factors may be involved in determining the NOx impact for a given feedstock, including differences in the

ADF B3-177 cont.

FAME (fatty acid methyl ester) composition and uncertainty in determining CN for the blends. If ARB were to adopt a predictive model to determine the CN improvement needed to mitigate NOx, it should use the model to evaluate a "worst case" feedstock, meaning a point near the upper end of the range at each blend level.

The most important conclusion of this work is that soy and animal biodiesel blends are not categorically different fuels. Their emissions effects are similar, but they show different NOx impacts because they have different effects on CN. Furthermore, this work provides a potential answer to the problem that some animal blends will significantly increase NOx emissions, while other blends will not, by indicating what individual blends may do.

ADF B3-177 cont.

3. NOX EMISSIONS IN NEW TECHNOLOGY DIESEL ENGINES

Staff's position is that biodiesel will not increase NOx emissions in NTDEs at levels up to and including B20. Its assessment is stated in the ISOR as follows:

> *Engines that meet the latest emission standards through the use of Selective Catalytic Reduction (SCR) have been shown to have no significant difference in NOx emissions based on the fuel used. A study conducted by the NREL looked at two Cummins ISL engines that were equipped with SCR, and found that NOx emissions control eliminates fuel effects on NOx, even for B100 and even in fuels compared against a CARB diesel baseline.[20] However, a recent study at UC Riverside tested B50 blends and found a NOx increase with a 2010 Cummins ISX.[21] The UC Riverside study did not look at blends below B50. Staff proposes to take a precautionary approach and in the light of data showing there may be a NOx impact at higher biodiesel blends but not at lower biodiesel blends, Staff is limiting the conclusion of no detrimental NOx impacts in NTDEs to blends of B20 and below. Additional studies on NTDEs have been completed, however since they included either retrofit engines or non-commercial engines Staff did not include their results in this analysis.*[22,23,24] (Page 24)

ADF B3-178 cont.

Staff's reliance on Lammert 2012 (Ref. 20) is misplaced because the NREL lab was not equipped to measure the low NOx emission levels of the test vehicles, as the abstract of the Lammert paper clearly notes.[6] In fact, none of the emission changes observed in the study (with one exception) were statistically significant due to the high standard errors that necessarily exist when measurements are made close to the level of detection. In this instance, the failure to observe statistically significant NOx emissions increases from biodiesel at the B20 level is not a demonstration that such increases do not exist.

This specific shortcoming of the Lammert study is why its negative results are in conflict with the finding of the UC Riverside study (Gysel 2014) cited by Staff and the three other studies (Walkowicz 2009, McWilliam 2010, Mizushima 2010) that Staff dismissed. With respect to the

ADF B3-179

[6] "SCR systems proved effective at reducing NOx to near the detection limit on all duty cycles and fuels, including B100." Lammert 2012, Abstract.

three other studies, we see no reason why they should be dismissed. It is not the case that factory-designed NOx after-treatment systems will reduce NOx levels to below the detection limit of well-equipped labs (see Gysel 2014 and engine certification testing). Testing conducted using retrofit NOx after-treatment systems that achieve representative levels of NOx control, as in these studies, is entirely suitable for determining whether biodiesel increases tailpipe NOx emissions on a percentage basis. Having a different absolute level of emissions does not preclude reliable measurement of a percentage change.

ADF B3-179 cont.

When all available studies are included, a consensus of the literature is that biodiesel at the B20 level will increase NOx emissions from NTDEs in most, if not all cases. Lammert 2012 is the one study at odds with the rest of the literature. A range of biodiesel types were used in the studies. NOx increases should be expected at the B20 level for all biodiesel types until such time as additional research indicates differential impacts for biodiesels derived from different sources

3.1 Review of the NTDE Literature

The following sections briefly summarize the NTDE testing conducted in the studies and the conclusions drawn on the NOx emissions impact of biodiesel fuels. Testing of conventional diesel engines without NOx after-treatment is not considered, nor is testing on non-California fuels (low aromatics ULSD was considered equivalent to CARB ULSD). Appendix Table B presents a list of the studies included in the NTDE dataset and the author references used in citations here.

Walkowicz 2009. Chassis dynamometer testing was conducted using a 2005 International 9200i tractor equipped with and without a retrofit diesel oxidation catalyst (DOC) and urea-SCR NOx after-treatment system. On-road emissions measurements also were made using a RAVEM portable emissions measurement system. A ULSD base fuel was tested, as were B20 and B99 biodiesel blends. The type of biodiesel (soy or animal) was not specified, but was mostly likely soy-based as this is the feedstock most common in the market and in engine research.

- Under loaded, on-road conditions, biodiesel increased NOx by 17% at B20 and by about 40% at B99. At B20, the increase was marginally significant ($p=0.10$); at B99, the increase was statistically significant ($p=0.05$).
- Chassis dyno testing was done 24 months later at an ARB lab. The vehicle was determined to have high oil consumption, and lubricating oil was likely present in the exhaust stream. On the UDDS cycle, biodiesel increased NOx by 7% at B20 (marginally significant at $p=0.07$) and by 35% at B99 (highly significant, $p<0.01$).

The authors concluded "The use of biodiesel did result in higher NOx emissions than the use of ULSD (in tests with statistical significance)." The B20 test results did not reach the usual $p=0.05$ level for statistical significance, but were marginally significant ($0.05 < p \leq 0.10$).

McWilliam 2010. A Caterpillar 6.61 engine equipped with DOC and urea-SCR NOx after-treatment was tested using the European non-road transient cycle (NRTC). The fuels used were ULSD plus B20 and B100 biodiesels blended from a rapeseed methyl ester. Figure 9 of the

paper shows tailpipe NOx emissions of the vehicle in g/kWh units. Reading from the graph because numerical emission values were not given, tailpipe NOx emissions increase ~15% at B20 and ~150% at B100. Based on the narrow error bars shown in the figure, both of these increases are statistically significant.

This study was conducted by Caterpillar because previous work had highlighted the potential for biodiesel to have an adverse impact on the NOx conversion efficiency of urea-SCR after-treatment systems. Thus, reductions in conversion efficiency have the potential to increase NOx emissions by amounts that exceed that caused by the biodiesel itself. At B20, only a 1% loss of conversion efficiency was noted, but a substantial 6% loss was observed at B100.

The authors of this paper concluded "Additional control strategies will be necessary to correct for NOx increases during biodiesel operation on installations requiring compliance regardless of fuel used."

Mizushima 2010. An inline 4-cylinder diesel engine equipped with DOC, diesel particulate trap (DPT), and urea-SCR NOx after-treatment system was tested using the JE-05 exhaust emissions test cycle used for heavy-duty vehicles in Japan. The fuels used were ULSD plus B20 and B100 blended from waste vegetable oil (WVO). Figure 4 of the paper shows tailpipe NOx emissions of the engine in g/kWh units. NOx emissions are highly linear with biodiesel blending level. Reading from the graph because numerical emission values were not given, tailpipe emissions increase ~20% at B20 and ~100% at B100. The paper does not address the statistical significance of these results.

With respect to NOx conversion efficiency, the study noted a drop from 76% on ULSD to 47% at B100, with a smaller but still measurable drop at B20. The impact on NOx conversion efficiency was linked to the effect of biodiesel in lowering the overall NO_2/NOx ratio at the SCR inlet leading to reduced conversion efficiency.

The authors drew no conclusions regarding the NOx emissions effects of B20 biodiesel as the focus of their research was on the B100 fuel.

Lammert 2012. The NREL study examined NOx emissions from transit buses on both EPA and CARB diesel fuels, B20 soy blends of each, and B100 soy. Chassis dynamometer testing was conducted using the Manhattan Bus (MAN), Orange County Transit Authority (OCTA) and UDDS test cycles. Two of the buses were NTDEs, including a 2010 Cummins ISL and 2011 Gillig/Cummins ISL. Only the 2010 Cummins was tested using the CARB ULSD base fuel and the biodiesel fuels.

NOx emission results for the 2010 Cummins bus are shown in Figure 10 of the paper. For B20, NOx emissions decreased compared to CARB ULSD on all three cycles (MAN, OCTA, and UDDS), and for B100 on the MAN cycle (OCTA and UDDS were not tested). None of the differences were statistically significant except for B20 on the UDDS cycle, and the standard errors plotted in the figure are large in comparison to the emission averages.

The authors explain the non-significance of their results as follows:

> *For much of the cycle NOx would be at or near the detection limit of the laboratory equipment, which resulted in a 95% confidence interval error that was high relative to the value of the cycle emissions.* (Page 6)

One of the authors' conclusions is that SCR NOx after-treatment appears to nearly negate the effect of fuels on NOx emissions. Another conclusion is that SCR NOx after-treatment also negates any duty cycle effect on NOx. (Page 8) For buses without NOx after-treatment, NOx emissions are strongly related to the kinetic intensity (load) of the test cycle. This result is consistent with all past vehicle and engine research studies, which show that NOx emissions are increased when a diesel engine is operated under increased load. However, no such relationship is observed for SCR-equipped buses. Increased load will increase engine-out NOx levels in an SCR-equipped bus. Unless this is accompanied by an increase in NOx conversion efficiency, tailpipe NOx emissions should also increase. Neither conclusion is reliable because of the study's problems in measuring NOx emissions even on ULSD fuel.

Gysel 2014. A 2010 Cummins ISX-15 equipped with DOC, DPF and urea-SCR NOx after-treatment was tested on CARB ULSD and B50 biodiesel blended from soy, waste cooking oil (WCO) and animal fat feedstocks. Chassis dynamometer testing was performed at CE-CERT using the UDDS test cycle.

Figure 7 of the paper shows the NOx emissions measured on ULSD and the three B50 biodiesel blends. The soy and WCO B50 blends increased NOx by 43% and 101%, respectively, with both increases being highly statistically significant ($p<0.01$). The animal B50 blend increased NOx by 47%, which was marginally significant ($p=0.065$). The authors' conclude that "Overall, NOx emissions exhibited increases with biodiesel for both vehicles with the differences in NOx emissions relative to CARB ULSD being statistically significant for the new Cummins ISX-15 engine." (Page 6)

The authors note the negative results reported by Lammert 2012 as being in contrast to those of their study, "which shows that there is a relatively strong fuel effect with the B50 blends compared to CARB ULSD from the Cummins ISX-15 engine with SCR." (Page 6). They also note the following:

> *The NOx increase with biodiesel for SCR-equipped engines is usually attributed by a reduction of exhaust temperature and the change of NO_2/NO ratio in NOx emissions [38]. In general, the lower exhaust temperatures with biodiesel will lower the oxidation rates of NO to NO_2 from the DOC. It has been shown that a NO_2/NOx ratio below 0.5 significantly changes SCR reaction chemistry lowering the SCR removal efficiency of NOx [39]. Walkowicz et al. [40] found increases in NOx emissions of 7% with B20 and 26% with B99 compared to ULSD for a heavy-duty diesel vehicle equipped with a 2004 Caterpillar 400 hp C13 engine. For the same vehicle equipped with a urea-based SCR system, NOx increases were very similar on a percentage basis, with B20 and B99 having 7% and 27%, respectively, higher NOx than ULSD.* (Page 6)

The authors continue to say:

> *The trend of increasing NOx emissions for biodiesel blends is consistent with a wide range of studies found in the literature. Comprehensive investigations conducted by Mueller et al. [41] and Sun et al. [42] confirmed that biodiesel promotes a combustion process that is shorter and more advanced than conventional diesel, which contributes to the formation of thermal NOx. The higher NOx emissions with biodiesel for both vehicles could also be a consequence of the higher oxygen content in biodiesel, which enhances the formation of NOx. The lower volatility of biodiesel compared to diesel fuel could also contribute to decreased fractions of premixed burn, as a result of fewer evaporated droplets during the ignition delay period [43]. Another contributing factor for NOx emissions increase could be the engine control module (ECM), which may dictate a different injection strategy based on the lower volumetric energy content of biodiesel. Eckerle et al. [44] suggested that a higher fuel flow is required with biodiesel compared to diesel fuel for an engine to achieve the same power. The ECM interprets this higher fuel flow as an indicator of higher torque, and therefore makes adjustments to engine operating parameters that, under certain operating conditions, increase NOx emissions.* (Page 6).

The engineering mechanisms described by the authors indicate that biodiesel should be expected to increase NOx emissions in NTDEs at blend levels below the B50 examined in the study. There is no basis in these mechanisms to believe that biodiesel will not increase NOx emissions at B20 but will increase NOx emissions at B50.

ADF B3-180

3.2 Consensus on Biodiesel NOx Impacts

Table 2 presents a summary of the available literature on the NOx emissions impact of biodiesel at the B20 blend level. Four of the five studies tested B20 fuels on NTDEs. Staff choose to rely on the one study in which NOx emissions were at or near the detection limit of the laboratory equipment for much of the test cycle on each fuel and to dismiss the other three studies "... since they included either retrofit engines or non-commercial engines ...". The study that was retained did not observe a NOx increase because it had trouble measuring NOx emissions from the NTDE tested. The studies that were dismissed showed consistent NOx emission increases in the range of 10-20% at B20.

Staff notes the Gysel study, which found significantly increased NOx emissions at B50 compared to CARB ULSD, as its reason for setting the biodiesel control level at B20 for NTDEs. However, Staff did not note the study's discussion indicating that the Lammert results were in contrast to their results and to the results of other studies in the literature. Nor did Staff note the discussion of mechanisms by which biodiesel is believed to increase NOx emissions in NTDEs. These mechanisms include a reduction of the NO_2/NOx ratio that leads to loss of NOx conversion efficiency in urea-SCR systems, promotion of a combustion process that contributes to increased formation of thermal NOx, higher NOx emissions due to the oxygen content of biodiesel, and the lower volatility and lower volumetric energy content of biodiesel. These mechanisms indicate that biodiesel can be expected to increase NOx emissions in NTDEs at blend levels below the B50 examined in the study.

ADF B3-181

Table 2. Summary of NTDE Literature on NOx Emissions Impact of B20

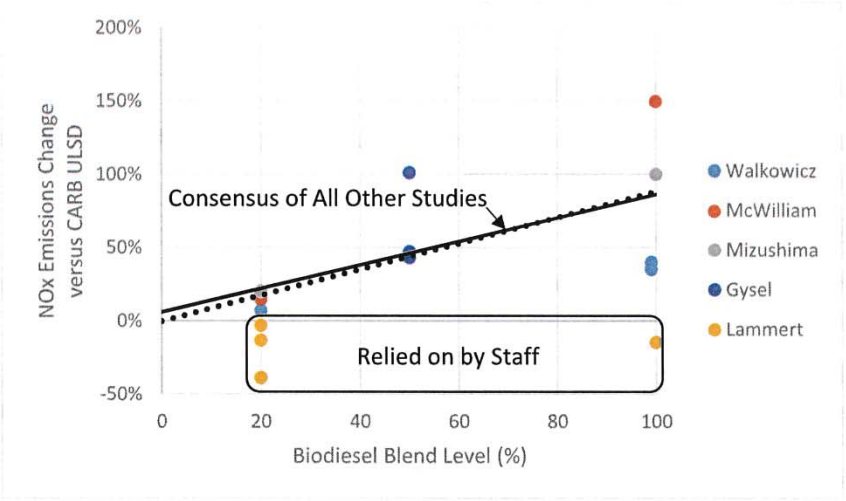
	B20 NOx Emissions Change (%) versus CARB ULSD	Comments
Studies Relied on by Staff		
Lammert 2012	NOx emissions decrease on three cycles	UDDS cycle decrease is statistically significant. NOx emissions on all fuels were at or near the detection limit of the laboratory equipment.
Gysel 2014	B20 not tested	The paper discusses how biodiesel effects NOx emissions. These mechanisms suggest that biodiesel should increase NOx emissions at levels below B50.
Studies Dismissed by Staff		
Walkowicz 2009	+17% on-road + 7% chassis dyno	Both results are marginally significant ($0.10 \leq p < 0.05$)
McWilliam 2010	~15% increase	European transient cycle
Mizushima 2010	~20% increase	Japanese heavy-duty test cycle

ADF B3-182

Figure 3 summarizes the impact of biodiesel on NTDE NOx emissions at all blend levels. The four studies (excluding Lammert 2012) establish a linear relationship between NOx emissions and blend level. The first trend line (solid black) passes very nearly through the origin without being constrained to do so. The second trend line (dotted black) is constrained to pass through the origin. While there is substantial scatter around the trend lines, the consensus of the four studies is that biodiesel increases NOx by 18-22% at B20, by 45-50% at B50, and by 90-100% at B100.

In spite of this consensus, Staff chose to rely only on the Lammert 2012 study, which shows that biodiesel decreases NOx emissions at both the B20 and B100 blend levels. This is the study that had difficulty measuring NOx emissions because NOx was at or near the detection limit of the laboratory equipment for much of the test cycle on all fuels.

Figure 3. The Impact of Biodiesel on NTDE NOx Emissions



To test the statistical significance of the trend lines shown in the figure, conventional regression analysis was conducted using the data reported by four of the studies (Lammert 2012 excluded) as summarized in Table 3. Regression A corresponds to the figure's solid trend line and is not constrained to pass through the origin. Its slope is +0.80% increase per 1% biodiesel in the blend; it is statistically significant at the p=0.035 level. Regression B corresponds to the dotted trend line and is constrained to pass through the origin. Its slope is +0.89% increase per 1% biodiesel, and it is statistically significant at the p<0.001 level. The two regression models predict a 22% and 18% increase, respectively, in NOx emissions at B20 in NTDEs.

ADF B3-183

Table 3. Statistical Significance of Biodiesel NOx Effect in NTDEs

	Intercept	Significance	Slope (% NOx Increase per 1% biodiesel)	Significance	Predicted NOx Increase at B20
Regression A	6.4	p = 0.80	+0.80% (±0.32%)	p = 0.035	22%
Regression B	None	n/a	+0.89% (±0.16%)	p <0.001	18%

A fair reading of the technical literature would lead Staff to expect that biodiesel will increase NOx emissions in NTDEs by about 20% at B20 and by proportionately smaller amounts at blend levels below B20. At the B5 level, the impact is expected to be an increase in NOx emissions of about 5%. At the B20 level, the NOx increase appears to be greater on a percentage basis than would be expected in conventional diesel engines (1% at B5, 2% at B10, and ~4% at B20). The

loss of NOx conversion efficiency when biodiesel fuels are used is one likely reason for the greater impact. ADF B3-183 cont.

4. SUMMARY AND CONCLUSIONS

The key conclusions of this study are summarized below with respect to conventional diesel engines and new technology diesel engines.

Conventional Diesel Engines

- Soy and animal blends are not categorically different fuels once their differing effect on blend CN is taken into account. ADF B3-184
- There is no evidence in the data of a threshold level below which biodiesel fuels as a group do not increase NOx, whether soy or animal. As shown here, the magnitude of the NOx impact observed depends on both the blend level and the change in CN that results from blending of the biodiesel feedstock. ADF B3-185
- Soy blends clearly and significantly increase NOx by ~1% at B5 and by ~2% at B10. The effect is continuous and linear with respect to the blend level at all levels above ULSD. Soy blends require mitigation at all levels to offset increased NOx emissions. ADF B3-186
- Staff's proposal requires NOx mitigation in summer months for soy fuels at blend levels greater than B5. Because soy fuels increase NOx at all blend levels, mitigation should be required for B5 and lower blends to prevent increased NOx emissions. ADF B3-187
- Animal blends are more complicated. The current research is limited, and the evidence is mixed. At least one B5 animal blend significantly increased NOx, while another has been certified as NOx neutral. Other B5 animal blends may or may not increase NOx depending on their CN effect (and possibly other factors). ADF B3-188
- Staff's assertion that no NOx increase occurs at B5 in animal blends is incorrect: some animal blends will significantly increase NOx emissions, while other animal blends will not. ADF B3-189
- Animal blends cannot be assumed to have no impact on NOx emissions without a demonstration that feedstock blending raises CN enough to offset potential NOx increases. ADF B3-190

New Technology Diesel Engines

- Staff is incorrect in concluding that biodiesels will not increase NOx in NTDEs. The Staff conclusion is based on a highly selective reading of the technical literature that relies on the one study in which the laboratory was not well equipped to measure the low levels of tailpipe NOx emissions from NTDEs. ADF B3-191

- There is greater reason to exclude the study Staff relied on than the three studies that Staff excluded. If that is done, there are no test data at the B20 level or below in NTDEs and no basis whatsoever to permit biodiesel fuels in NTDEs in California. ADF B3-192

- While the available data are limited, the four best studies (excluding Lammert 2012) support the conclusion that biodiesel increases NOx by 18-22% at B20 and that the increase is statistically significant. Staff has no basis to claim that no NOx impacts are associated with biodiesel at the B20 level and below in NTDEs. ADF B3-193

- A fair reading of the technical literature would lead Staff to expect that biodiesel will increase NOx emissions by about 20% at B20 and by proportionately smaller amounts at lower blend levels. This is a greater percentage NOx increase in proportion to blend level than the increase caused by soy biodiesel in conventional diesel engines (1% at B5, 2% at B10, and ~4% at B20). ADF B3-194

- Staff makes no mention of the concern that the use of biodiesel fuels may lead to the loss of NOx conversion efficiency in urea-SCR after-treatment systems by shifting the NO_2/NOx ratio to lower values. Conversion losses were observed at B20 in two of the studies. ADF B3-195

Based on the results summarized above, it is strongly recommended that ARB consider as part of the ADF rulemaking a regulatory structure in which the NOx impacts of soy and animal biodiesel are accounted for using a statistical model analogous to the Predictive Model for RFG. We see the cetane-based model presented here as a possible draft for a biodiesel predictive model, but substantial additional work is needed to: ADF B3-196

- Demonstrate that blends mitigated using DTBP obey the same model; and

- Further assess the impacts of biodiesel produced from animal feedstocks on both CN gain in blends as well as NOx emissions.

Further, more advanced statistical techniques should be used as was done in developing the Predictive Model for California Reformulated gasoline. The dataset used here is unbalanced, meaning that there are varying numbers of data points for each combination of study, feedstock type, engine, and test cycle. In fact, only a fraction of all possible study/feedstock/engine/test cycle cells are represented by one or more data points. Mixed Effects modeling is appropriate in such cases and its use will assure that coefficient estimates are not biased by the unbalanced distribution of the data. ADF B3-197

###

APPENDIX TABLE A: REFERENCES TO LITERATURE ON CONVENTIONAL DIESEL ENGINES

Author	Title	Feedstocks Studied	Blends Studied
Clark 1999	Transient Emissions Comparisons of Alternative Compression Ignition Fuel	Soy	B20
McCormick 2002	Fuel Additive and Blending Approaches to Reducing NOx Emissions from Biodiesel	Soy, UCO	B20
McCormick 2005	Regulated Emissions from Biodiesel Tested in Heavy-Duty Engines Meeting 2004 Emissions	Soy, Canola, Animal	B20
Eckerle 2008	Effects of Methyl Ester Biodiesel Blends on NOx Emissions	Soy	B20
Nuszkowski 2009	Evaluation of the NOx emissions from heavy duty diesel engines with the addition of cetane improvers.	Soy	B20
Nikanjam 2010	Performance and emissions of diesel and alternative diesel fuels	Soy	B5, B20
Thompson 2010	Neat fuel influence on biodiesel blend emissions	Soy	B10, B20
Durbin 2011	Biodiesel Characterization and NOx Mitigation Study	Soy, Animal	B5, B10, B20
Durbin 2013A	CARB B5 Preliminary and Certification Testing	Animal	B5
Durbin 2013B	CARB B20 Biodiesel Preliminary and Certification Testing	Soy, UCO	B20
Karavalakis 2014	CARB Comprehensive B5/B10 Biodiesel Blends Heavy-Duty Engine Dynamometer Testing	Soy, Animal	B5, B10

APPENDIX TABLE B: REFERENCES TO LITERATURE ON NEW TECHNOLOGY DIESEL ENGINES

Author	Title	Feedstocks Studied	Blends Studied
Walkowicz 2009	On-road and In-Laboratory Testing to Demonstrate Effects of ULSD, B20 and B99 on a Retrofit Urea-SCR Aftertreatment System	Soy?	B20, B99
McWilliam 2010	Emissions and Performance Implications of Biodiesel Use in an SCR-equipped Caterpillar C6.6	Rapeseed	B20, B100
Mizushima 2010	Effect of Biodiesel on NOx Reduction Performance of Urea-SCR System	WVO	B20, B100
Lammert 2012	Effect of B20 and Low Aromatic Diesel on Transit Bus NOx Emissions Over Driving Cycles with a Range of Kinetic Intensity	Soy	B20, B100
Gysel 2014	Emissions and Redox Activity of Biodiesel Blends Obtained from Different Feedstocks from a Heavy-Duty Vehicle Equipped with DPF/SCR Aftertreatment and a Heavy-Duty Vehicle without Control Aftertreatment	Soy, WCO, animal	B50

Comment Letter 3_B_LCFS_GE Responses

ADF B3-1 The comment states that ARB's assessment of NOx emission impacts of biodiesel is flawed, that there are statistically significant increases to NOx emissions at blends below B5, and that ARB's statistical analysis was incorrect. Please see responses **ADF 17-4**, **ADF 17-7, ADF 17-9** and **ADF B3-74.**

ADF B3-3 The comment asserts that during the period from April 1 to October 31 there would be unmitigated NOx emissions associated with the use of low saturation biodiesel blended at B5 and that that during the period from November 1 to March 31 there would be unmitigated NOx emissions associated with the use of low saturation biodiesel blended at B10. As discussed in the response to comment **ADF 17-9**, the emissions from these blends are offset by the use of renewable diesel and NTDEs therefore additional mitigation is not required. See Chapter 5.E and Chapter 6.H of the ADF Staff Report for a discussion on staff's analysis of offsetting factors for biodiesel.

The ADF Regulation, as proposed, requires additional NOx controls during the time of the year when necessary, as described in Chapter 5 of the ADF Staff Report, while maximizing the PM reductions from biodiesel and allowing increased flexibility for the biodiesel industry. While seasonal differences in NOx emissions occur with this approach, NOx emissions decrease on an annual basis, and the approach allows the State to realize the full PM benefits from biodiesel. This is discussed in detail in Appendix B, Table B-1 of the ADF staff report.

ADF B3-4 The comment states that allowing the blend level to double during winter months would increase NOx emissions in California which is inconsistent with ARB's CEQA obligations and ARB's goal to protect air quality. The ADF Regulation presents a balanced approach to maintaining air quality and reducing emissions, while maintaining flexibility for industry and consumers. For an explanation on ARBs approach and reasoning for low saturation biodiesel blends, please see the response to comment **ADF B3-3**. This response also contains a reference to comment **ADF 17-9.** The additional reference to **ADF 17-9** summarizes our findings for both low and high saturation diesel blends. For high-saturation biodiesel blends, as discussed in Appendix G of the ADF staff report and response to comment **ADF 17-9**, "the animal biodiesel shows no statistically significant increase in NOx at either level,"

meaning B5 or B10 animal blends would not present an increased risk to air quality no matter the time of year.

In conclusion, ARB staff determined that while the introduction of low saturation biodiesel may lead to small increases in NOx emissions there are other mitigating and offsetting factors that would compensate for this increase and the overall NOx level in the atmosphere would decrease over time due to these factors. For more information on this topic please see response **ADF 17-7**.

ADF B3-5 The comment questions ARB's assessment that use of NTDEs would not result in a NOx emissions increase below B20 blends and the sunset provision that is based on this fact. Please see response **ADF 17-4**.

ADF B3-6 The comment states that failure by staff to require accurate measurement and reporting of the biodiesel content of biodiesel blends would lead to unmitigated increases in NOx emissions, violations of pump labeling, and violations of vehicle manufacture requirements. Please see response **ADF 17-8**.

ADF B3-7 The comment states that the two year delay in implementation of mitigation requirements for the ADF Regulation would cause unnecessary adverse air quality impacts and violates the statutes governing the rule. During the regulatory development process, ARB Staff consulted with stakeholders regarding the lead-time to prepare for mitigation. Stakeholder feedback indicated that two years was a reasonable amount of lead-time. Staff does not plan to increase or decrease the amount of lead time. Please also see response **ADF 17-21** regarding additional concerns about timeline.

Regarding monitoring of the program, it is ARB Staff's intention to closely monitor the efficacy of the ADF regulation. The LCFS program will be reviewed by January 1, 2019, and the ADF regulation includes provisions for staff to conduct a program review by December 31, 2019. While the LCFS program and the ADF program are related, they would be difficult to evaluate during the same time interval. Such a choice would generate avoidable cost and work for ARB. ARB believes it will be more appropriate to evaluate each program separately to ensure there is an appropriate amount of staff time, effort, and attention focused into each review. Staff will consider conducting the ADF program review earlier or more often if major issues arise that demand changes to the ADF program.

ADF B3-8 The comment states that waiting three years to review the program's efficacy would result in unnecessary adverse air quality impacts. ARB staff does not believe that there will be adverse air quality impacts from this action. Staff has already completed an initial determination, and the 2019 review is just that, a review based on updated information. Please also see responses **ADF B3-7** and **ADF 7-1**.

ADF B3-9 The comment states that the current rulemaking is establishing the precedent for the Board, rather than the Executive Officer, to make decisions regarding adverse environment impacts and thus the same process must be followed for any future alternative diesel fuel. No response is needed, insofar as the comment relates to future actions, not the proposed ADF and LCFS. Insofar as the comment suggests that the ADF should not delegate future review of new fuels' potential impacts, we note that the ADF already delegates the approval of new ADFs to the EO. The same person – the EO – should also consider any potential impacts from a decision to approve those fuels. Health and Safety Code sections 39515 and 39516 provide for a broad delegation of powers from the Board to the Executive Officer. The ADF Regulation anticipates that the approval of some Phase 3 fuels would require amendments to ARB regulations to add fuel specifications or other requirements for sale of the fuel in California; if such amendments go to the Board for approval, the Board and not the Executive Officer would make any requisite findings under CEQA. See response **ADF F5-12**.

ADF B3-10 The comment states that allowing producers and blenders of biodiesel fuels to receive LCFS credits prior to implementing mitigation requirements provides an advantage over other fuel producers who have to implement mitigation prior to receiving LCFS credits. The comment implies that no LCFS credits should be provided for producing a fuel until mitigation measures are in place, specifically, until the January 1, 2018, implementation deadline. In general, fuel producers must comply with all applicable regulations for the given fuel. Additionally, analysis supporting the ADF Regulation shows no increase in NOx emission from the current year. Staff disagrees that the provisions of the ADF Regulation give any fuel an advantage regarding LCFS credits. The LCFS can drive demand for certain fuels, and the ADF Regulation ensures that diesel substitute fuels are used considering their environmental impacts.

The comment states that other ADFs would have an unfair competitive advantage under Stages 1, 2, and 3a despite the fact the products lead to adverse environmental impacts. The ADF Regulation requires applicants of Stage 1, 2, and 3 fuels to provide the Executive Officer information regarding potential environmental effects of the candidate fuel and to conduct a multimedia evaluation in Stage 2. Staff has proposed additional 15-day language to clarify this intent. The Executive Officer is supposed to consider the candidate ADF's impacts to the environment in the application approval process. See sections 2293.5(a)(3) and 2293.5(b)(3). Section 2293.5(b)(6)(B) describes the process for Stage 2 fuels to move to Stage 3 if adverse emissions impacts are found in Stage 2.

ADF B3-14

This 2013 comment and the subsequent comments, numbered **ADF B3-14** through **ADF B3-136,** were directed at earlier proposals from ARB, including a 2013 proposal that was withdrawn long before the commenter re-submitted, in 2015, their December 12, 2013 document containing these statements. ARB is not legally bound to respond to all statements concerning old documents that are not relevant to the current rulemaking and are no longer being considered by ARB. Nonetheless, ARB staff has responded here though it is not legally obligated to do so. To the extent the commenter's statements might marginally pertain to the current proposal, please see responses **ADF 17-4** and **ADF 17-7.**

As part of the program review of the biodiesel provisions to be conducted by 2020, staff would evaluate the data and assumptions used to calculate NOx impacts.

ADF B3-16

The 2013 comment questions whether the ADF Regulation offers adequate mitigation measures to prevent adverse environmental impacts from increased use of biodiesel in California. Please see responses **ADF 17-7,** and **ADF 17-4**.

ADF B3-17

The 2013 comment states that the ADF Regulation would lead to significant increase in NOx emissions without proper mitigation measures to account for that increase. The comment also implies that biodiesel is being held to a different standard than other alternative fuels that may be used to acquire LCFS credits. Biodiesel is not being held to a different standard than other fuels. Each fuel is analyzed and treated according to its individual effects on the environment and appropriate action is taken based on the specifics of these analyses. Please also see responses **ADF 17-7** and **ADF 17-4**.

Further, Table B-1 in Appendix B of the ADF staff report displays ARB staff's analysis of NOx emissions from 2014 through 2023. This analysis shows that NOx emissions would decrease over time (from the 2014 baseline) with the implementation of the ADF Regulation.

The ADF Regulation may impose some costs on regulated parties who blend higher than five percent biodiesel, as described in the staff report. These costs would be related primarily to testing fuels to demonstrate they are high saturation, and use of the DTBP additive to reduce NOx or certification of additional in-use NOx controls.

ADF B3-20 The 2013 comment states that not all of the Durbin 2011 data was made available. The content of the "Durbin 2011" study was submitted in a report to ARB which was made available to the public and is available at the ARB website at: http://www.arb.ca.gov/fuels/diesel/altdiesel/20111013_CARB%20Final%20Biodiesel%20Report.pdf

ADF B3-21 The 2013 comment states that there is no evidence to support ARB's conclusion that NOx emissions do not increase until the B10 level is reached. This comment is specific to the 2013 ADF proposal, and is no longer relevant. The provisions discussed are not in the 2015 ADF proposal.

ADF B3-22 The 2013 comment states that there is clear and statistically significant evidence that biodiesel increases NOx emissions in at least some engines. Please see response **ADF B3-7**.

ADF B3-23 The 2013 comment states that NOx emissions have a statistically significant increase at the B5 blend level. In response to the comment, ARB staff performed additional testing. Results and subsequent analysis has led to revised findings from the 2013 proposal. For more information, please see response **ADF B3-7**.

ADF B3-24 The 2013 comment states that there are NOx increases with biodiesel use even at low blend levels and therefore the use of a threshold of significance is inappropriate. The comment states that the 10 percent "Significance Level" should be reduced to zero because of statistical increases in NOx below 10 percent. This comment is specific to the 2013 proposal, and is no longer relevant. The provisions discussed are not in the 2015 proposal. However, ARB Staff conducted a statistical analysis on the provisions of the current proposal. That analysis can be found

in Chapter 6, and a supplemental analysis in Appendix G of the ADF Staff Report. Test data and further analysis became available after these 2013 comments. Additionally, the 2015 ADF Regulation includes in-use NOx control requirements for biodiesel.

ADF B3-31 The 2013 comment states that ARB should lower the "Significance Level" for biodiesel mitigation to zero and should use actual blend levels at the batch level rather than statewide averages for determining the "effective blend levels." Please see response **ADF B3-24.** Test data and further analysis became available after these 2013 comments. Additionally, the 2015 ADF Regulation includes in-use NOx control requirements for biodiesel.

ADF B3-32 The 2013 comment states that both DTBP and blending low-NOx diesel fuel along with biodiesel could possibly be used at the batch level to mitigation NOx increases in biodiesel blends. This comment is specific to the 2013 proposal. The NOx controls options in the 2015 ADF Regulation are effective at blend levels specified in the regulation and supported by studies and test results reviewed by staff at the time the current proposal was prepared.

ADF B3-34 The 2013 comment states that both DTBP and blending low-NOx diesel fuel along with biodiesel could be used as appropriate mitigation as long as they are used correctly. This comment is specific to the 2013 ADF proposal, and is no longer relevant. The 2015 ADF Regulation includes in-use NOx control requirements for biodiesel, including provisions for mitigation measures. For more information, please see Appendix 1 of Subarticle 2.

ADF B3-43 The 2013 comment explains that the South Coast Air Quality Management District and the San Joaquin Valley Unified Air Pollution Control District had concentrated their air quality improvement efforts on decreasing NOx because it is a critical pollutant for reducing regional ozone and fine particulate matter. The comment implies that any increase to NOx would be a severe problem for these two areas that suffer from extreme nonattainment. The ADF Regulation works in concert with ARB's and local district diesel engine fleet regulations to decrease the NOx increase from biodiesel over time. Technologies such as NTDEs that do not yield a NOx increase related to biodiesel, as well as increasing volumes of renewable diesel which decreases NOx, lead to a decrease in NOx over time.

ADF B3-44 This 2013 comment states that the statewide mitigation approach of the ADF Regulation does not comply with CEQA and suggests an

alternative analysis method. The analysis completed in this comment use a different methodology than ARB staff's analysis and thus reaches different results. Please see response to comment **ADF 17-7** for a response to the statewide approach used in staff's analysis. Additionally, local air districts were consulted and continuously involved in the development of the proposal. This ensured that the effects of the regulation would maintain the benefits on a local level.

Please see responses **ADF 17-4** for more details on staff's analysis of biodiesel NOx emissions in NTDEs.

ADF B3-45 The 2013 comment states that the NOx increases from biodiesel use under the ADF program would exceed thresholds adopted by the South Coast Air Quality Management District and the San Joaquin Valley Air Pollution Control District by many orders of magnitude. Therefore, the comment concludes that the type of statewide mitigation concept contained in the ISOR does not comply with CEQA. The ADF Regulation is designed to minimize any adverse impacts of the effects of biodiesel. For the analysis conducted in the ADF Staff Report, 2014 was used as the baseline year and therefore some NOx emissions from biodiesel use are already occurring as part of the current conditions. The effects of biodiesel were described in the EA considering the impacts of both the ADF Regulation and the LCFS proposal. These regulations work in tandem: the LCFS provides incentives to use fuels that reduce GHGs, and biodiesel that meets the ADF requirements ensures that its adverse impacts are minimized and decrease over time. Although the regulation would affect fuels statewide if approved and implemented, local air districts were consulted and continuously involved in the development of the proposal. This ensured that the effects of the regulation would maintain the benefits on a local level as well.

ADF B3-46 The 2013 comment states that low-level biodiesel blends are not benign and that mitigation of the NOx increases associated with them are required at the time and place where those emissions occur. The comment also adds that the Staff Threshold Model is incorrect and that a Linear Model for NOx increases of biodiesel blends is more appropriate. Please see response to **ADF 8-1**.

ADF B3-47 The 2013 comment questions ARB's conclusions drawn from data obtained in the literature review. This comment is specific to the 2013 ADF Regulation, and is no longer relevant. However, staff conducted a statistical analysis comparing biodiesel blends to

conventional CARB diesel fuel for the 2015 ADF Regulation. The results of this analysis are found in Appendix G of the ADF Staff Report. A summary of the results of this analysis is found in response to comment Please see responses **ADF 17-4, ADF 17-7, ADF 17-9** and **ADF B3-74.**

ADF B3-48 The 2013 comment states that there is no evidence supporting that NOx emissions do not increase until the B10 level is reached. This comment was made in reference to the 2013 proposal; ARB has since modified the proposal based on additional data and analysis. Please see response **ADF 17-4, ADF 17-7**, and **ADF 17-9.**

ADF B3-49 The 2013 comment states that there is clear and statistically significant evidence that biodiesel increases NOx emissions at the B5 level in at least some engines. This comment was made in reference to the 2013 proposal; ARB has since modified the proposal based on additional data and analysis. Please see response **ADF 17-4, ADF 17-7**, **ADF 17-9,** and **ADF B3-74.**

ADF B3-50 The 2013 comment states that because the literature review studies contained no data on B5 blends that there is no evidence that NOx emission are not increased below the B10 blend level. This comment was made in reference to the 2013 proposal; ARB has since modified the proposal based on additional data and analysis. Please see response **ADF 17-4, ADF 17-7**, and **ADF 17-9.**

ADF B3-51 The 2013 comment states that there is no evidence that biodiesel blends below B10 do not increase NOx emissions; therefore, there is no validity in the Staff's Threshold Model. This comment was made in reference to the 2013 proposal; ARB has since modified the proposal based on additional data and analysis. Please see response **ADF 17-4, ADF 17-7**, and **ADF 17-9.**

ADF B3-52 The 2013 comment states that two of the studies in the literature review present evidence that NOx impact from biodiesel are a continuous effect present at even low blending levels. This comment was made in reference to the 2013 proposal; ARB has since modified the proposal based on additional data and analysis. Please see response **ADF 17-4, ADF 17-7**, **ADF 17-9, and ADF B3-74.**

ADF B3-53 The 2013 comment states that for the three engines where ARB has published emissions values, all the data demonstrate a significant increase in NOx emissions for both soy- and animal-

based fuels. This comment was made in reference to the 2013 proposal; ARB has since modified the proposal based on additional data and analysis. Please see response **ADF 17-4, ADF 17-7**, **ADF 17-9, and ADF B3-74.**

ADF B3-54 The 2013 comment states that for the B5 fuels tested by ARB NOx emissions were observed to increase. Therefore, the comment adds, the results are sufficient to disprove ARB's contention that blends at the B5 level would not increase NOX emissions. This comment was made in reference to the 2013 proposal; ARB has since modified the proposal based on additional data and analysis. Please see response **ADF 17-4, ADF 17-7**, **ADF 17-9 and ADF B3-74.**

ADF B3-55 The 2013 comment states that ARB's own test data demonstrate that B5 would significantly increase NOx emissions in at least some engines. This comment was made in reference to the 2013 proposal; ARB has since modified the proposal based on additional data and analysis. Please see response **ADF 17-4, ADF 17-7**, **ADF 17-9, and ADF B3-74.**

ADF B3-56 The 2013 comment states that all available research provides evidence that NOX increases are real and mitigation measures would be necessary to prevent the increases in NOx emissions due to biodiesel. This comment was made in reference to the 2013 proposal; ARB has since modified the proposal based on additional data and analysis. Please see response **ADF 17-4, ADF 17-7**, and **ADF 17-9.**

ADF B3-64 The 2013 comment states that the results found in the Eckerle 2008 study provide evidence that biodiesel fuels emissions impacts are proportional to the blending percentage at all levels including B5. Please see response **ADF 17-4, ADF 17-7**, and **ADF 17-9.**

ADF B3-65 The 2013 comment states that the results found in the McCormick 2002 study provide evidence that increased NOx emissions have been observed at very low blending levels. Please see response **ADF 17-4, ADF 17-7**, and **ADF 17-9.**

ADF B3-66 The 2013 comment states that the results found in the McCormick 2005 study provides evidence that NOx emissions increase linearly with biodiesel blend percentage. Please see response **ADF 17-4, ADF 17-7**, and **ADF 17-9.**

ADF B3-67 The 2013 comment implies that because the Nuszkowski 2009 study conducted no testing on the NOx emissions below the B10 level it provides no evidence that NOx emissions do not increase at low blend levels. Please see response **ADF 17-4, ADF 17-7**, and **ADF 17-9.**

ADF B3-68 The 2013 comment implies that because the Thompson 2010 study conducted no testing on the NOx emissions below the B10 level it provides no evidence that NOx emissions do not increase at low blend levels. Please see response **ADF 17-4, ADF 17-7**, and **ADF 17-9.**

ADF B3-72 The 2013 comment states that all the data from the Durbin 2011 study was not made available. Please see response **ADF B3-20**.

ADF B3-74 The 2013 comment states that the failure to find statistical significance using the t-test is not evidence that B5 does not increase NOx emissions. As a sensitivity check, staff considered several statistical models, including a linear regression model. All yielded results that support staff's conclusions: soy based biodiesel yields higher NOx emissions than conventional diesel at blend levels of 5 percent and higher, and animal based biodiesel yields NOx emissions that are indistinguishable from the variability in emissions from conventional diesel at blend levels of 5 and 10 percent.

One can speculate that additional B5 testing might lead to the detection of statistically significant emissions from animal based biodiesel blends, but staff based their analysis on the best available data. The fact that a statistically significant difference was not detected suggests that the magnitude of such a difference, if it exists, is small. For more information, please see response **ADF 8-1.**

ADF B3-76 The 2013 comment states that the Threshold model is clearly a less-satisfactory representation of the test date than the Linear model. This comment is related to the 2013 ADF Regulation. The provisions discussed (a B10 threshold of NOx emissions) are no longer in the 2015 ADF Regulation.

ADF B3-77 The 2013 comment explains a different statistical approach and states that this regression analysis can account for the relative uncertainties of the data points providing a more accurate and reliable assessment of the impact on NOx emissions. See response to comment **ADF B3-74** and **ADF 8-1**.

ADF B3-78 The 2013 comment states that the trend line that appeared to be supportive of the Staff Threshold model now appears to be the result of biases in the ULSD data and B5 emission averages. See response to comment **ADF B3-74** and **ADF 8-1**.

ADF B3-79 The 2013 comment states that conclusions regarding the impact of B5 on NOx emission cannot be drawn from the computed percent changes that are reported in the Durbin 2011 study. See response to comment **ADF B3-74** and **ADF 8-1**.

ADF B3-80 The 2013 comment states that when a weighted regression analysis is performed there is no evidence to support the conclusion that B5 blends would not increase NOx emissions. This comment relates to the 2013 ADF Regulation. The provisions discussed (B5 blends not increasing NOx) are no longer in the 2015 ADF Regulation.

ADF B3-88 The 2013 comment states that clear evidence exists showing that biodiesel increases NOx emissions in proportion to the blending percent. This comment was made in reference to the 2013 proposal; ARB has since modified the proposal based on additional data and analysis. Please see response **ADF 17-4, ADF 17-7, ADF 17-9** and **ADF B3-74**.

ADF B3-98 The 2013 comment states that statistically significant increase in NOx emissions would occur from the use of B5 biodiesel blends and unmitigated NOx emission increases have the potential to create significant adverse environmental impacts. This comment was made in reference to the 2013 proposal; ARB has since modified the proposal based on additional data and analysis. Please see response **ADF 17-4, ADF 17-7, ADF 17-9,** and **ADF B3-74.**

ADF B3-99 The 2013 comment states that there is a statistically significant increase in NOx emissions at or below the B5 level and therefore biodiesel use in California under the ADF Regulation would result in unmitigated increase in NOx emissions. This comment was made in reference to the 2013 proposal; ARB has since modified the proposal based on additional data and analysis. Please see response **ADF 17-4, ADF 17-7**, **ADF 17-9,** and **ADF B3-74.**

ADF B3-103 The 2013 comment questions whether enough data has been used to support that use of biodiesel in NTDEs would not lead to a NOx emission increase. While this comment was made in reference to the 2013 proposal, the comment is applicable to the analysis

conducted for the current ADF Regulation which includes biodiesel use in NTDEs as an offsetting factor. Staff has reviewed additional available studies on NOx emissions from NTDEs. Please see **ADF 17-4** for more details.

ADF B3-104 The 2013 comment questions whether the limited analysis contained in the Lammert 2012 study is sufficient evidence that NTDEs would not increase NOx emissions. While this comment was made in reference to the 2013 proposal, the comment is applicable to the analysis conducted for the current ADF Regulation which includes biodiesel use in NTDEs as an offsetting factor. Staff has reviewed additional available studies on NOx emissions from NTDEs. Please see **ADF 17-4** for more details.

ADF B3-105 The 2013 comment states that, due to the limited study material available for review, the conclusion that NOx emissions from all vehicles with NTDEs would not increase is not reasonable or properly supported. The comment states that ARB staff made unsupported claims regarding NOx impacts of biodiesel in NTDEs. Please see response to comment **ADF 17-4**.

ADF B3-108 The 2013 comment states that staff is not acknowledging the preliminary test analysis that shows an increase in NOx emissions at blends below B10. This comment is related to the 2013 ADF Regulation. Staff has conducted additional research and technical analysis, which is included it in the 2015 ADF Regulation. The 2015 ADF Regulation takes into account the potential increases in NOx from the use of biodiesel and balances these with the offsetting effects of NTDEs and renewable diesel use. This approach results in NOx emissions decreases associated with the use of biodiesel over time (Table B-1 in Appendix B of the ADF Staff Report).

ADF B3-110 The 2013 comment states that ARB should establish a market mechanism to incentivize the production of low NOx fuels and to disincentivize the production of NOx-increasing biodiesel fuels. This comment is related to the 2013 ADF Regulation. The provisions discussed (NOx credit trading) are no longer in the 2015 ADF Regulation. For more information on the use of renewable diesel to offset biodiesel NOx emissions, please see response to comment **LCFS 46-277**.

ADF B3-111 The 2013 comment states that there is not enough evidence that NTDEs would result in no increased NOx emissions. The comment adds that even if proper evidence were found for NTDEs reducing

the emissions of all pollutants, then such a finding would necessitate the creation of significance thresholds for other regulated fuels. This comment is specific to the 2013 proposal. However, staff has reviewed additional available studies on NOx emissions from NTDEs. Please see **ADF 17-4** for more details.

ADF B3-112

The 2013 comment states that widespread use of biodiesel and biodiesel blends without mitigation would increase NOx emissions and that not all relevant documents and information were provided to the public for review. ARB welcomes all public feedback relating to material discussed at the pre-rulemaking workshops. The public can submit feedback at any time during the pre-rulemaking process to inform regulatory development. Staff has made changes to the proposal since this February 13, 2014 workshop and has made every effort to ensure that requested data was made available to the public.

Please see response **ADF 17-9.**

The 2013 comment states that biodiesel use associated with the ADF Regulation would result in NOx emissions without adequate mitigation. ARB staff expects both the use of NTDEs and the use of renewable diesel to increase with encouragement from ARB and other State and federal regulatory activity. Both the increased use of NTDEs and the increased use of renewable diesel would decrease of NOx emissions from biodiesel use, compared to current levels, by large amounts. Therefore, the minor increases of NOx emissions that are resulting from biodiesel use would be adequately offset by the increased use of NTDEs and renewable diesel fuel. ARB staff's analysis shows that this mitigation is sufficient to offset the increase in NOx emissions with biodiesel blends and still allows the community to gain the other benefits associated with biodiesel use (such as decreased PM and CO2 emissions).

ADF B3-116

The 2013 comment provides data from one section of the presentation labeled "CARB HD Engine Study Results" and conclusions regarding statistically significant NOx emission increase for B5 soy and waste vegetable oil blends. This comment does not constitute an objection or recommendation regarding the proposal released in December 2014. However, the comment purports to provide an overview of the *CARB HD Engine Study Results* presentation of NOx emissions data and conclusions. For ARB staff's analysis, please see Chapter 7 and Appendix B of the ISOR. Staff's analysis was conducted using the best available data

to evaluate the NOx emissions impacts of the ADF Regulation. Additionally, staff's analysis was completed in consultation with stakeholders and industry experts, as well as an independent statistical review, found in Appendix G of the ADF staff report, of the data and methods which staff utilized.

ADF B3-123 The 2013 comment includes alternative methods for finding a significance threshold and states that the commenter's own analysis demonstrates the use of biodiesel, even at levels below B5, would result in increases NOx emissions. This comment is based upon an outdated proposal presented at an April 2014 public workshop; ARB has since modified the proposal. Please see response **ADF 17-4, ADF 17-7**, and **ADF 17-9.**

ADF B3-124 The 2013 comment states that the use of the current methodology for establishing a significance level would not prevent increases in NOx emissions. This comment is based upon an outdated proposal presented at an April 2014 public workshop; ARB has since modified the proposal. Please see response **ADF 17-4, ADF 17-7**, and **ADF 17-9.**

ADF B3-125 The 2013 comment states that the "effective blend" approach is flawed and that the per-gallon mitigation concept proposed for extreme ozone nonattainment areas should be applied throughout the State. This comment is related to the April 17, 2014 pre-rulemaking workshop and is not relevant to the current proposal, as the proposal has since changed. Please see response **ADF 17-4, ADF 17-7**, and **ADF 17-9.**

In order to ensure that the use of higher blends of biodiesel do not increase NOx emissions, the ADF Regulation establishes NOx control levels above which per gallon in-use requirements would be instituted (section 2293.6 (a)(2) Table A.1). Staff established the NOx control levels at a level such that the requirements would be protective and lead to decreasing NOx emissions over time relative to current conditions.

ADF B3-130 The pre-proposal submittal states that ARB's use of a threshold for biodiesel blend level is flawed and that NOx increase from biodiesel blends increases linearly with blend percentage. This feedback is related to comments submitted in August 2014 and is not relevant to the current proposal as the proposal has since changed. Please see response **ADF 17-4, ADF 17-7**, and **ADF 17-9.**

ADF B3-131 The pre-proposal submittal questions ARB's assessment that the use of NTDEs would prevent NOx emission increases. The comment asserts that ARB staff's finding of no NOx impact from NTDEs is flawed and provides technical papers which confirm their conclusion. The comment states that staff's finding regarding NOx impacts of biodiesel in NTDEs is flawed. Please see response to comment **ADF 17-4**.

ADF B3-132 The comment states that the current approach is insufficient to mitigate the impacts of biodiesel usage. This comment is based upon an outdated proposal presented as a preliminary rulemaking proposal with the solicitation for alternatives for the SRIA in July 2014. However, the ADF Regulation accounts for any areas of NOx increase with appropriate levels of mitigation. The analysis concluded that implementation of the ADF Regulation would result in decreasing NOx over time.

Please see response **ADF 17-4.**

ADF B3-133 The comment states that the ADF Regulation should require mitigation strategies for increased NOx emissions to all biodiesel and blends of biodiesel. The approach taken in the ADF is designed to provide environmental and health benefits to California without causing an economic hindrance to industry. Staff's analysis is described in Chapters 6, 7 and 10 of the ADF Staff Report. Requiring mitigation of NOx emissions for every blend level would create excessive costs without providing additional benefits. The biodiesel provisions in the proposed ADF Regulation are feasible across all biodiesels, biodiesel blends, and diesel fuel.

Please see response **ADF 17-4.**

ADF B3-134 The comment states that exemptions from NOx mitigation requirements for biodiesel use in fleets comprised of at least 95 percent NTDEs should be eliminated. Based on studies reviewed by staff, it was concluded that there is no statistically significant NOx increase at B20 when used in NTDEs. Therefore, it is appropriate to allow exemptions for the vehicle fleets comprised of high percentages of NTDEs. Additional information about NTDE effects on NOx emissions is available in Chapter 6, Subpart D, Part 6, entitled "Emissions in New Technology Diesel Engines" of the ISOR.

ADF B3-135 The comment states that the sunset provision for NOx mitigation requirements should be eliminated. Please see response to

comment **ADF B3-134**. Additionally, because there is no statistically-significant NOx increase for blends below B20 when used in NTDEs, and because eventually virtually all on-road diesel engines will be NTDEs, it would limit industry unnecessarily if we did not provide a sunset provision for in-use requirements tied to NTDE market penetration. Staff projects that will occur in about 2023. As part of the review of the biodiesel provision to be conducted by 2020, staff would consider the data and assumptions used to calculate NOx impacts for their accuracy and representativeness at that time.

ADF B3-136 The comment stresses the need to evaluate the three changes explained in comment **ADF B3-133**, **ADF B3-134**, and **ADF B3-135**. Please see responses **ADF B3-133, ADF B3-134**, and **ADF B3-135.**

ADF B3-137 The comment describes the goal of the ADF rulemaking as an attempt to allow biodiesel and other alternative diesel fuels to be used within the State while safeguarding against potential increases in oxides of nitrogen emissions. This comment does not constitute an objection or recommendation regarding the proposal released in December 2014.

Please see responses **ADF 17-7 and ADF 17-4.**

ADF B3-138 The comment describes the data available both from ARB funded studies and from the literature review. This comment does not constitute an objection or recommendation regarding the 2015 ADF Regulation. However, the comment provides information regarding two datasets released by ARB in July 2014, and information added to the datasets thereafter. For detailed information regarding ARB Staff's analysis, please see Chapter 7 and Appendix B of the Staff Report. Staff's analysis was conducted using the best available data to evaluate the NOx emissions impacts of the ADF Regulation. Additionally, staff's analysis was completed in consultation with stakeholders and industry experts, as well as an independent statistical analysis, found in Appendix G of the ADF Staff Report.

ADF B3-155 The comment states that because soy biodiesels would increase NOx emissions for B5 and B10 by 1 percent and 2 percent, respectively, mitigation on a per-gallon basis in order to present NOx increases is necessary. This comment does not constitute an objection or recommendation regarding the proposal released in

December 2014. Please see response **ADF 17-4, ADF 17-7**, and **ADF 17-9.**

ADF B3-156 The comment states that NOx impacts for soy biodiesel are linear with an impact down to B1. ARB staff analysis and an independent analysis found:

- B5 soy is significantly higher than CARB diesel
- B10 soy is significantly higher than CARB diesel
- B5 animal is not significantly higher than CARB diesel
- B10 animal is not significantly higher than CARB diesel

As noted in Chapter 6 of the staff report, although these results are consistent with a linear relationship between blend level and NOx emissions for soy blends in the 5-10 percent range, data were not available for blend levels below 5 percent, and it is not possible to establish whether the relationship is linear in the 0-5 percent range. Please see response **ADF 17-4, ADF 17-7**, and **ADF 17-9.**

ADF B3-157 The comment states that soy biodiesel should require mitigation in any circumstances, regardless of blend level, to ensure no increase in NOx emissions. Please see responses **ADF B3-3 ADF 17-7, ADF 17-4**, and **ADF 17-9.**

ADF B3-158 The comment states that the available data does not support Staff's conclusion that there would not be increases in NOx emissions for animal-based biodiesel from B10 and lower blends; therefore, the only way to ensure no increase in NOx emissions it to require mitigation at all blend levels for animal-based biodiesel.

Staff's statistical analysis, as well as an independent statistical analysis, concluded that neither the 5 percent nor the 10 percent of blends of high saturation (animal) biodiesel increase NOx emissions over CARB diesel. Therefore it is appropriate to set the NOx control level for high saturation biodiesel at B10 without seasonal variation. For more information on the statistical analysis please see response to comment **ADF 8-1**.

ADF B3-159 The comment states that the average and the test for statistical significance for animal-based biodiesels is flawed by the failure to consider the varying effects that animal feedstocks have on cetane number. Staff agrees that cetane number (CN) of a fuel is a strong indicator of its potential NOx emissions. Based on the studies staff

reviewed, which included testing primarily on soy and animal feedstocks, these feedstocks could generally be categorized as either low or high saturation based on differences in their cetane number. Low saturation biodiesel, such as soy-based biodiesel, exhibited a natural CN at or below 56. High saturation biodiesel, such as animal biodiesel, exhibited a natural CN of 56 or above. Therefore, staff proposed a CN cutoff of 56 for the provisions involving NOx control levels. Staff also proposed seasonal based variations as well. In the period between November 1 and March 31, NOx control is less necessary due to reduced ozone exceedances; however, during this same period PM controls are especially important. In order to maximize the PM reductions from biodiesel and allow increased flexibility for the biodiesel industry, staff proposed a higher NOx control level during this period.

Biodiesel certification provisions allow any ADF blend up to B20 that is proven to achieve CARB diesel emissions equivalency to be certified upon approval, regardless of CN.

ADF B3-160 The comment describes soy and animal fuels relationship to cetane number and the change in cetane number's relationship to the increase in NOx emissions. This comment does not constitute an objection or recommendation regarding the proposal released in December 2014. However, response to comment **ADF B3-159** describes how the ADF Regulation includes CN consideration for the NOx control levels.

ADF B3-161 The comment states that the staff is incorrect that biodiesel use would not increase NOx in NTDEs. Please see response **ADF 17-4.** Additionally, the studies on which staff relied were conducted at well regarded labs meeting federal emissions testing standards (National Renewable Energy Lab, and UC Riverside).

ADF B3-162 The comment states that a fair reading of the technical literature indicates that B20 biodiesel would increase NOx emissions by about 20 percent in NTDEs. Staff conducted a robust and thorough review of the technical literature, which is detailed in Chapter 6 of the ADF Staff Report. Staff's conclusions on biodiesel NOx emissions from NTDEs are detailed in response to comment **ADF 17-4**. The comment refers to data ARB staff determined was not relevant to the analysis because the data were generated using retrofitted equipment rather than NTDE systems designed for commercial use. Because they were not designed holistically with the engine, but rather were designed as a retrofit, the engine

controls and retrofit controls are not designed to work together in the same way that commercial systems work.

ADF B3-163 The comment states that evidence in the technical literature also indicates that NOx emissions are expected to increase at blend levels below B20 proportionately to blend level; therefore, B5 blends would increase NOx emissions. Please see response **ADF B3-162, ADF 17-4**, **ADF 17-7**, and **ADF 17-9**.

ADF B3-164 The comment states that staff has not considered the concern that use of biofuels in NTDEs may lead to the loss of NOx conversion efficiency in urea-SCR systems. Staff did not specifically examine the effects that NO2/NOx ratio upstream of the SCR might have on NOx conversion efficiency. However, staff examined the effect of biodiesel use on the combined engine/SCR system and determined NTDE effects on NOx based on that analysis. Staff's conclusion was that, for the levels of biodiesel expected in the market (B20 and below), NOx emissions in NTDEs were not dependent on biodiesel content. For more information please see response to comment **ADF 17-4**.

ADF B3-165 The comment states that adoption of the ADF Regulation would lead to increases in NOx emissions by allowing use of B5 and lower soy biodiesels year round, allowing B6 to B10 soy biodiesels in winter, allowing B10 and lower animal biodiesels year-round, and allowing B20 and lower biodiesels in all types of NTDEs. Please see responses **ADF 17-7** and **ADF 17-4.**

ADF B3-166 The comment suggests that ARB has not formulated a position on the level of NOx increase from ADFs that is too small to warrant a concern.

Rather than allow a stated amount of emissions, the ADF provides that if emissions from an ADF are not able to be mitigated or offset to a less-than-significant level, a Stage 3 EO will not be issued. The three-stage process is designed to identify and mitigate any potential emissions increases from an ADF. Please see response **ADF 17-7** for more information.

Please see response **ADF 17-4.** Table B-1 in Appendix B of the ADF staff report displays ARB staff's analysis of NOx emissions from 2014 through 2023. This analysis shows that NOx emissions would decrease over time (from the 2014 baseline) with the implementation of the ADF Regulation.

ADF B3-167 The comment compares the ADF Regulation to the Reformulated Gasoline (RFG) program and notes that the NOx emission increases permitted under the ADF Regulation dwarf the 0.05 percent threshold applied to the RFG. Please see response to **ADF B3-166,** which includes references to **ADF 17-4** and **ADF 17-7**.

ADF B3-168 The comment agrees that classification of fuels based on saturation is useful; however, it does not alleviate the concerns regarding NOx increases from unmitigated fuels. The ADF Regulation considers the NOx impacts of low and high saturation feedstocks as well as the effects of offsetting factors such as the increasing VMT of NTDE's and use of renewable diesel over time. These combined effects are what provide the decrease in the NOx effect of biodiesel over time.

ADF B3-170 The comment strongly recommends that ARB consider modifying the ADF Regulation to incorporate a regulatory structure in which the NOx impacts are accounted for using a statistical model analogous to the predictive model for RFG. Staff considered the use of a predictive model based on multiple biodiesel properties to calculate NOx emissions of biodiesel. However, staff found blendstock cetane to be the primary property affecting biodiesel NOx emissions; other factors were poorly correlated to NOx emissions. Therefore staff concluded that the more simple approach of determining feedstock emissions effects based on variation in cetane number was the preferred approach.

ADF B3-171 This comment summarizes the findings of the Rocke study that ARB commissioned and notes that the results of that study were similar to the Rincon Ranch analysis presented later in the commenter's report. This comment does not constitute an objection or recommendation regarding the proposal released in December 2014.

ADF B3-172 The comment suggests that the statistical analysis performed by staff and an independent statistician did not properly analyze the effect of cetane number on animal biodiesel blendstocks. Staff analyzed the effect of cetane number on biodiesel blendstocks and believes that this variable has been properly accounted for both in the statistical analysis and in the regulatory proposal. For more information on why staff took a statistical approach that was reliant on as few assumptions as possible and did not use the assumptions suggested in the comment. Please see response to comment **ADF B3-74**. This response also contains a reference to

response **ADF 17-3.** For more information on the effects of cetane number please see response **ADF B3-159**.

ADF B3-173 This comment does not constitute an objection or recommendation regarding the proposal released in December 2014.

ADF B3-174 The comment describes the current research available that is focused on soy-based biodiesel blend analysis. ARB disagrees with the conclusions set forth. For detailed information regarding ARB staff's analysis, please see Chapter 7 and Appendix B. Staff's analysis was conducted using the best available data to evaluate the NOx emissions impacts of the ADF Regulation. Additionally, staff's analysis was completed in consultation with stakeholders and industry experts, as well as an independent statistical review, found in Appendix G of the ADF staff report, of the data and methods which staff utilized.

ADF B3-175 The comment states that staff's assertion that no NOx increase occurs in B5 animal blends is flawed. Staff's analysis was conducted using the best available data to evaluate the NOx emissions impacts of the ADF Regulation. Additionally, staff's analysis was completed in consultation with stakeholders and industry experts, as well as an independent statistical review, found in Appendix G of the ADF staff report, of the data and methods which staff utilized. For detailed information regarding staff's analysis, please see Chapter 7 and Appendix B of the ADF staff report.

ADF B3-176 The comment describes various studies and analysis that have been performed on animal-based biodiesel blends in regards to cetane number. The comment also requests that all information associated with the Durbin 2011 study be made available. Please see response **ADF B3-20, Durbin 2011 Study** for that information**.**

In addition, the comment requests that feedstock selection method for the Durbin 2011 study be released to demonstrate the fuels used in ARB's analysis were representative of the animal biodiesel available in California. For ARB's fuel analysis, staff endeavored to procure biodiesel that was commercially available and met the required ASTM standards in order to be representative of biodiesel in California.

For additional information on assumptions, technical review, and data selection please see response **ADF B3-1**.

ADF B3-177 This comment describes in detail an alternative analysis that includes a cetane number model for determining the behavior of soy and animal based biodiesel in relation to cetane number. Please see response to comment **ADF B3-170.**

ADF B3-178 The comment states that the staff's reliance on the Lammert 2012 study is misplaced and that the failure in this study to observe statistically significant NOx emissions increases is not demonstration that such increases to not exist. Please see response **ADF B3-162**. This response also contains a reference to response **ADF 17-4**. Additionally, the studies on which staff relied were conducted at well regarded labs meeting federal emissions testing standards (National Renewable Energy Lab, and UC Riverside).

For more information on statistical conclusions please see response to comment **ADF B3-74**. This response also contains a reference to response **ADF 17-3.**

ADF B3-179 The comment states that ARB staff made unsupported claims regarding NOx impacts of biodiesel in NTDEs. Please see response to comments **ADF 17-4**.

ADF B3-180 The comment states that biodiesel should be expected to increase NOx emissions in NTDEs at blend levels below B50. Please see response **ADF B3-162** and **ADF 17-4**.

ADF B3-181 The comment questions the literature review that was done on NTDE effects on NOx and states that biodiesel can be expected to increase NOx emission in NTDEs at blend levels below B50. Please see response **ADF B3-162** and **ADF 17-4**.

ADF B3-182 The comment summarizes results from studies considered in ARB's NTDE literature review and questions the material staff chose to include and exclude from their final analysis. Please see response **ADF B3-162** and **ADF 17-4**.

ADF B3-183 The comment states that a fair reading of the technical literature would lead staff to expect that biodiesel would increase NOx emissions in NTDEs proportionately to blend level below B20. Please see response **ADF B3-162** and **ADF 17-4**.

ADF B3-185 The comment states that there is no evidence in the data of a threshold level below which biodiesel fuels do not increase NOx. Please see response to comment **ADF B3-159.**

ADF B3-186 The comment states that NOx increases are continuous and linear with respect to blend level in soy-based blends; therefore, soy blends require mitigation at all levels to offset increased NOx emissions. Please see response to comment **ADF B3-74** and **ADF 17-3**. Additionally, any uncertainty in NOx emissions at blends B5 and below would be adequately offset by the increased use of NTDEs and renewable diesel fuel. These offsetting factors would be part of the program review ARB would conduct in accordance with section 2293.6(a)(6) of the ADF Regulation.

ADF B3-187 The comment questions allowing no mitigation for soy-based blends below the B5 blend level because soy fuels increase NOx at all blend levels. Please see response to comment **ADF B3-186**, which includes references to **ADF 17-3, and ADF B3-74.**

ADF B3-188 The comment states that animal blends are more complicated and current findings can only conclude that animal blends may or may not increase NOx depending on their CN effect. Please see response to comments **ADF B3-158** and **ADF B3-159.** Also included is a reference to response **ADF B3-1.**

ADF B3-189 The comment states that staff's assertion that no NOx increase occurs at B5 in animal blends is incorrect. Please see response to comment **ADF B3-158,** which includes a reference to **ADF B3-1.**

ADF B3-190 The comment states that animal blends cannot be assumed to have no impact on NOx emissions without a demonstration that feedstock blending raises CN enough to offset potential NOx increases. Please see response to comment **ADF B3-159.**

ADF B3-191 The comment states that staff is incorrect in concluding that biodiesels would not increase NOx with NTDEs and that this conclusion was based on a highly selective reading of the technical literature. Please see response **ADF B3-162**. This response also contains a reference to response **ADF 17-4**.

ADF B3-192 The comment states that there is greater reason to exclude the study staff relied on than the three studies that staff excluded. The comment adds that including the three additional studies would provide evidence not to permit biodiesel use in NTDEs in California. Staff finds no reason to exclude the Lammert study. Please see response **ADF B3-162** and **ADF 17-4**.

ADF B3-193 The comment states that staff has no basis to claim that no NOx impacts are associated with biodiesel at the B20 level and below in

NTDEs. The analysis completed in this comment employs different assumptions on the quality and appropriateness of the study data than ARB's analysis. Therefore the comment draws different conclusions than ARB staff. Please see response **ADF B3-162** and **ADF 17-4**.

ADF B3-194 The comment states that a fair reading of the technical literature would lead staff to expect that biodiesel would increase NOx emissions proportionally to blend level. Please see response **ADF B3-162** and **ADF 17-4**.

ADF B3-195 The comment states that staff does not account for the fact that use of biodiesel fuels may lead to loss of NOx conversion efficiency in urea-treatment systems. Please see response **ADF B3-164** and **ADF 17-4**.

ADF B3-196 The comment suggests that ARB should use a statistical model analogous to the Predictive Model for RFG rather than the cetane-based model currently in the proposal. Please see response to comment **ADF B3-170**.

The following group of comments is testimony given at the First Board Hearing.

This page intentionally left blank.

laboratories and demonstration settings. To ensure that these fuels are available to help us transition to a low carbon future, staff is proposing new regulations that streamline the requirements for emerging alternative diesel fuels. It also will provide for robust environmental review of these fuels before they enter the market to ensure that current environmental protections are maintained.

Mr. Corey, please introduce this item.

EXECUTIVE OFFICER COREY: Yes, thank you, Chairman Nichols.

Since the initial implementation of low carbon fuel standard, significant changes have started to occur in California's fuel market which we talked about that for a while. The carbon intensity of our state's fuel pool is declining. As fuels like renewable diesel, biodiesel, natural gas, ethanol, electricity, and hydrogen are more prevalent, today's proposed regulation represents a vital step in supporting this important transition.

Staff's proposal today provides a clear pathway of commercialization of alternative diesel fuels, incorporates the best available science, and maintains our current environmental protections. In particular, the proposal will address NOx emissions related to the use of biodiesel.

The proposal works in conjunction with proposed low carbon fuel standard re-adoption you just heard about to ensure that we deploy fuels that contribute to our climate and as well as our air quality goals.

In addition, staff's proposal is part of ARB's response to the State Appeals Court decision we talked about earlier.

Now I'd like to invite Lex Mitchell of the Industrial Strategies Division to begin the staff presentation.

(Thereupon an overhead presentation was presented as follows.)

MANAGER MITCHELL: Good afternoon, Chair Nichols and members of the Board.

Today, I will presenting the proposal to establish a regulation on the commercialization of alternative diesel fuels, also called ADFs. As with the earlier item on the LCFS, we will not be asking the Board to take any approval action today.

--o0o--

MANAGER MITCHELL: As an overview, there will be five portions of this presentation which are listed here. We will first discuss the need for the proposal, then provide background, and outline our regulatory development process. We will then discuss the proposed process for

approving alternative diesel fuels, the specific requirements for biodiesel as an ADF, and the impacts and benefits of the proposed regulation.

Finally, we will present potential 15-day changes.

--o0o--

MANAGER MITCHELL: We will start the presentation with the need for the ADF proposal

--o0o--

MANAGER MITCHELL: In order to minimize confusion, we will first cover what is and isn't considered an alternative diesel fuel under the current proposal. Examples of ADFs include biodiesel, which is already being used and is the first ADF proposed to be regulated under this process, and dimethyl ether, an ADF in the beginning stages of the environmental review process.

Both of these fuels are chemically different than conventional diesel and neither has an existing ARB specification. Examples of compression ignition fuels that are not ADFs include renewable diesel, which is a liquefied hydrocarbon chemically indistinguishable from conventional diesel and natural gas, which already has an ARB specification.

From here on, blends of ADFs, primarily biodiesel

blends, will be discussed and some familiarity with how blends are referred to as needed. Biodiesel blends are referred to as BXX, where X represents the percentage blend level. For example, B10 is a blend of the 10 percent biodiesel and 90 percent conventional diesel.

--o0o--

MANAGER MITCHELL: Before we go any further, I'd like to spend some time clarifying the difference between biodiesel and renewable diesel, two terms that frequently get intermixed. Biodiesel is a fatty acid methyl ester and is chemically different from conventional diesel.

The biodiesel molecule contains two oxygen groups, unlike conventional diesel, which contains none.

Renewable diesel, on the other hand, is a hydrocarbon chemically indistinguishable from conventional diesel, but with lower aromatic content that is typically found in petroleum diesel.

Despite their differences, biodiesel and renewable diesel are complimentary fuels. Biodiesel's good lubricity and renewable diesel's good cold temperature performance can complement each other.

--o0o--

MANAGER MITCHELL: Now that we've covered what ADFs are, why do we think an ADF regulation is necessary?

First of all, ADFs can deliver significant

environmental benefits. And we expect to see their volumes grow as both state and federal policies drive their supply and demand.

In order to encourage this expected increase in ADF volumes, it is essential that market certainty and regulatory clarity be provided to emerging ADFs. As these volumes increase, it is essential that ARB ensure their commercialization is done in a manner that protects environmental and public health.

The ADF proposal is designed to address all of these objectives. In addition the proposed regulation addresses one of the problems a court found with ARB's adoption of the original LCFS regulation in 2009 by addressing potential NOx impacts from biodiesel use.

--o0o--

MANAGER MITCHELL: Staff has extensively studied biodiesel and renewable diesel emissions and has found that both lower GHG, PM, and toxic emission. For example, a blend of 20 percent biodiesel has been found to decrease PM by about 20 percent.

Additionally, renewable Diesel decreases NOX relative to petroleum diesel primarily due to its lower aromatic content.

Staff has found that biodiesel can increase NOx in some situations in older heavy-duty vehicles. The ADF

proposal applies the lessons learned from the evaluation process for biodiesel in order to develop a process to evaluate future ADFs. In addition, the proposal allows biodiesel use while addressing the NOx concerns recognized during biodiesel testing, maximizing environmental benefits.

--o0o--

MANAGER MITCHELL: This table shows the LCFS credits generated by biodiesel and renewable diesel in 2014 and 2020. Biodiesel and renewable diesel make up a large and increasing portion of the total LCFS credits as time goes by and significantly contribute to the success of the program.

--o0o--

MANAGER MITCHELL: In addition to biodiesel, which is already contributing to the LCFS, other ADFs are expected to emerge as incentives continue. Current evaluation of these fuels involves various regulations and statute. The ADF proposal would take these requirements, clarify them, and compile them into one regulatory framework, which will provide additional certainty for proponents of upcoming ADFs, such as dimethyl ether, which is currently undergoing evaluation.

--o0o--

MANAGER MITCHELL: Let's move now to the

regulatory development process.

--o0o--

MANAGER MITCHELL: ARB has spent the last eight years developing and conducting studies on biodiesel emissions and analyzing the results of these studies, including spending about three million for testing to understand biodiesel's impact.

In addition to the original research conducted by ARB, staff conducted a literature review and sponsored an independent statistical analysis of the data. Staff has had extensive interaction with stakeholders on our biodiesel program, including 13 public meetings to discuss testing and seven reg development workshops.

The combination of comprehensive biodiesel testing and continual stakeholder involvement and feedback led to the ADF proposal presented today.

--o0o--

MANAGER MITCHELL: During the multimedia evaluation and additional review of biodiesel emissions, nitorgen oxides, or NOx, was found to be a pollutant of concern whose emissions varied by feedstock.

For example, on this graph, you can see that biodiesel derived from soy feedstocks leads to greater NOx increases than biodiesel derived from animal feedstocks. Whereas, renewable diesel decreases NOx. All of these

impacts were measured for pre-2010 heavy-duty engines. Light-duty, medium-duty, and new technology heavy-duty diesel engines have been found to have no biodiesel NOx impacts.

We'll come back to this slide later in the presentation.

--o0o--

MANAGER MITCHELL: Moving on to the objectives of the proposed regulation. In development of the ADF proposal, ARB has adhered to the following objectives:

Establishment of a clear pathway for commercialization of ADFs in order to provide regulatory certainty and encourage the use of ADFs. Ensuring public health and air quality protections from ADFs used as a replacement for conventional diesel in order to ensure the integrity of our existing air pollution reduction programs. And establishment of criteria for biodiesel use and NOx emissions control, to ensure that the benefits of biodiesel use can be realized without associated degradation in ozone-related air quality.

--o0o--

MANAGER MITCHELL: We will now go through an overview of the ADF proposal. The ADF proposal includes two main provisions, the general evaluation process for environmental analysis of emerging ADFs and the fuel

specifications and in-use requirements for biodiesel.

The environmental evaluation process for emerging ADFs consists of three stages, following ADFs from lab to demonstration to commercial scale.

The proposal will limit fuel volumes and consider test location. Through this review and evaluation process, the conclusion may lead to staff to develop additional in-use controls and specifications for that fuel, or if there are no detrimental effects found, only reporting may be required.

The fuel specifications being proposed for biodiesel and, in fact, the three-stage evaluation requirements are based on staff's multimedia evaluation of biodiesel, as well as renewable diesel, both of which are nearing completion and will be completed by the follow up Board hearing.

--o0o--

MANAGER MITCHELL: Let's move on to the evaluation process for emerging ADFs.

--o0o--

MANAGER MITCHELL: The three stage evaluation process for commercialization of ADFs was developed to evaluate environmental impacts and control potential detrimental impacts prior to the widespread use of an emerging fuel.

During this process, staff would complete a multimedia evaluation of the fuel to determine adverse emission impacts for any pollutants of concern considering offsetting factors to determine the need for in-use requirements or fuel specifications for the ADF. The mechanism for dealing with pollutant increases would be to set a pollutant control level above which pollutant reduction strategies would be required.

--o0o--

MANAGER MITCHELL: This graphic shows the three stages and hypothetical volumes of fuel distributed as the fuel progresses through the stages. Initially, an ADF proponent would apply for a pilot program under Stage 1, which would include disclosure of ADF composition, preliminary emissions testing, evaluation of potential environmental and health effects, and volumetric limit of no more than one million gallons per year.

In Stage 2, the focus is on fuel specification development and would include a full multimedia evaluation, consensus standards development, consideration of engine concerns, determination of potential adverse emission impacts, and volumetric limit of 30 million gallons per year.

After completing Stage 2, a fuel may advance to either Stage 3A or 3B, depending on its environmental

impacts. If adverse emission impacts are found, the fuel would be regulated under Stage 3A, which includes development of in-use requirements and fuel specifications. If a fuel is found to have no detrimental impacts, it would be eligible for Stage 3B, where only reporting is required.

As noted earlier, this three stage process is reflective of current regulatory requirements and policies already in place.

--o0o--

MANAGER MITCHELL: Let's move now to the biodiesel specific requirements of the proposal.

--o0o--

MANAGER MITCHELL: In order to control the NOx increases from biodiesel, staff developed specific in-use requirements and fuel specifications. The proposal included reporting provisions which begin in 2016, but in-use requirements do not begin until 2018. This time lime allows for implementation of mitigation options for compliance pathways.

A pathway for certification of additional in-use options has been included to allow testing of novel methods the offset NOx emission, including novel Additives, blend stocks, or production methods.

The biodiesel in-use requirements will sunset

when vehicle miles traveled in the on-road heavy-duty fleet is greater than 90 percent new technology diesel engines. This is currently anticipated to occur by 2023. Additionally, the biodiesel provisions will undergo a program review to be completed by 2020.

--o0o--

MANAGER MITCHELL: Beginning in 2018, biodiesel would be limited to B5 or B10, depending on feedstock and season. Feedstocks under this proposal would be distinguished by cetane number rather than prescription of feedstock source and cetane cutoff for determining feedstock is 66.

Higher cetane biofuels such as animal-based biodiesel tends to produce less NOx than lower cetane biodiesel, such as soy-based biodiesel, and therefore be used in higher blends.

Additionally, blends up to B20 could be sold if they use an additive or other certified control. Biodiesel used in light-duty and medium-duty vehicles has been shown not to increase NOx. Newer heavy-duty vehicles have been shown not to experience the NOx increase from biodiesel as well that is seen in older heavy-duty vehicles due to the use of selective catalytic reduction emission controls. The ADF proposal includes an exemption process for these vehicles.

--o0o--

MANAGER MITCHELL: You'll recall this slide from earlier. The important point here is that our extensive testing showed that biodiesel are not created equally and the different feedstocks result in different NOX effects. Just as importantly, our testing also showed the offsetting effect on NOx from the use of renewable diesel. These two findings informed the proposed regulation.

--o0o--

MANAGER MITCHELL: As part of staff's analysis of the effects of biodiesel use, offsetting factors were considered to determine the real world effect of its use, rather than simply the lab results of engine testing.

Most importantly, it was found that new heavy-duty new technology diesel engines or or NTDEs do not experience a NOx increase with biodiesel up to B20 due to SCR emission controls and the heavy-duty market is substantial and increasingly complied of NTDEs.

Additionally, the NOx decrease from renewable diesel means that some of the emissions from biodiesel are offsetting, leading to less need for in-use requirements on biodiesel, especially considering the recent and expected continual increase in volumes of renewable diesel. These offsetting factors combine to eliminate the NOx increase from biodiesel over time, hence the sunset

provisions, by in the mean time controls on NOx are needed.

--o0o--

MANAGER MITCHELL: This graph shows the increase in vehicle miles traveled by new technology diesel engines as well as the NOx increase from biodiesel.

As newer vehicles become an increasingly large contributor, the vehicle miles traveled in the on-road heavy-duty diesel fleet as shown by the shaded bars. The corresponding NOx increase from biodiesel becomes increasingly reduced.

As you can see, in 2023, when newer vehicles are expected to contribute more than 90 percent VMTs, the NOx increase from biodiesel becomes negligible. At that point, we are proposing to sunset the biodiesel in-use requirements.

--o0o--

MANAGER MITCHELL: Practically speaking, we expect regulated entities to comply with the regulation primarily by selling biodiesel blends at or below a B5 blend level.

However, the proposed includes other options that will increase flexibility for compliance which are listed here. For example, for businesses geared toward B10 sales, either a high cetane feedstock may be used or any

feedstock may be used in the winter.

For businesses geared toward B20 sales, either targeted sales to exempt vehicles or additive use will accommodate these sales. The table on this slide shows the NOx control level by both feedstock and time of year, which lead to these compliance options.

--o0o--

MANAGER MITCHELL: As was mentioned earlier, the NOx emissions from biodiesel are expected to decrease over time leading to a sunset of the in-use requirements when new heavy-duty on-road trucks are more than 90 percent of vehicle miles traveled. This is expected to occur by 2023.

Additionally, as the fuel market is still in flux in its transition to diesel substitutes, a review of the program will be completed by 2020. This review will consider a variety of factors, such as SCR adoption and fuel volumes, and whether we are on the right trajectory toward the projected sunset of biodiesel blend limits.

--o0o--

MANAGER MITCHELL: Let's move now to the impacts and benefits of the alternative diesel fuels proposal.

--o0o--

MANAGER MITCHELL: Staff prepared one draft environmental analysis, or EA, that covered both the

proposed LCFS and ADF regulations because two rules are interconnected. The draft EA was prepared according to the requirements of ARB's certified regulatory program under the California Environmental Quality Act, or CEQA. The analysis focused on changes in fuel production supply and use. The existing regulatory and environmental setting or the actual physical environmental conditions in 2014 is used as a base line for determining the significance of the proposed regulations impacts on the environment.

--o0o--

MANAGER MITCHELL: As discussed in the previous presentation for LCFS, the draft environmental analysis identified both beneficial impacts and adverse environmental impacts from the proposed regulation.

Beneficial impacts were identified in the areas of reduced GHG emissions, reduced criteria pollutants, including reduced PM2.5 emissions and energy. The draft EA identified less than significant impacts to certain resources such as minerals and recreation.

Potential significant impacts were identified in a number of resource categories such as agriculture, biological, and hydrology and water quality. Significant cumulative impacts were also identified for resources.

While some of these identified impacts are

related to long-term operational changes, others are potential short-term effects related to construction of new fuel production facilities.

--o0o--

MANAGER MITCHELL: The economic impacts of the ADF proposal were evaluate in two ways, as part of a state-wide macro economic evaluation of the effects of the ADF and LCFS proposals and as the direct costs of the ADF proposal provisions.

Because the ADF and LCFS proposals were so interlinked, the macro and economic impact of the proposals could not be desegregated and therefore the evaluation was completed using the simultaneous effects of both proposals on fuel volumes and prices.

As was discussed in the LCFS presentation, the macro economic evaluation employed a conservative framework and found that the combination of proposals would have a very small impact on the overall state economy.

Compliance with the ADF provisions are expected to result in costs of about one-tenth of a cent per gallons on B5 diesel in 2018. And as the fleet transitions to newer engines is expected to shrink and eventually be eliminated by 2023. For biodiesel producers whose business is reliant on sales of higher biodiesel

blend levels and who are not located near a terminal with biodiesel blending facilities, there are will be additional challenges to the regulation.

Staff continues to work with stakeholders to identify additional flexibility to address this challenge while maintaining the NOx protections of the proposal.

--o0o--

MANAGER MITCHELL: The primary reason why alternative diesel fuels and other diesel substitutes are important and should be encouraged is due to their variety of beneficial impacts. For example, biodiesel, renewable diesel, and dimethyl ether can all reduce PM and toxics compared to conventional diesel, leading to lower localized toxic exposure, and renewable diesel can reduce NOx emissions.

All of these fuels can be produced from feedstocks that lower greenhouse gas emissions and are capable of contributing to our 2020 and 2030 air quality goals. Additionally, all of these fuels can be produced from domestic sources produced in the USA, leading to increased energy security.

--o0o--

MANAGER MITCHELL: We will now move on to 15-day changes and next steps.

--o0o--

MANAGER MITCHELL: Staff has included some potential 15-day changes for consideration in Attachment A of the Resolution. Examples of potential changes include further flexibility for captive fleets that would not adversely effect air quality, clarification of certification procedures, definitional changes, and minor clarifications, and corrections.

--o0o--

MANAGER MITCHELL: This is the first of two Board hearings so the Board will not adopt the ADF today. We recommend that the Board direct staff to continue working with stakeholders to refine the proposal and coordinate development with the LCFS team.

--o0o--

MANAGER MITCHELL: Going forward, staff will complete and respond to comments on the environmental analysis document. The peer review of our biodiesel multimedia evaluation is in progress and the multi-media process will be completed by the second Board hearing.

Staff will also propose 15-day changes for comment prior to the second Board hearing.

Thank you for your attention. This concludes staff's presentation. I would be happy to answer any questions you may have.

CHAIRPERSON NICHOLS: We do have 14 witnesses who

have signed up. But yes.

BOARD MEMBER SERNA: Thank you, Madam Chair.

Quick question for staff on the chart that you showed twice that showed the NOx effect of biodiesel in older heavy-duty vehicles, are you encouraging us not to get too hung up on the soy feedstock biodiesel because that's only applicable to the older engines. And with the introduction of newer engines that that NOx concern will go away?

MANAGER MITCHELL: I wouldn't characterize it as the difference in the feedstocks. We think that the NOx effect goes away over time, like you said, due to the newer vehicles. More or less what the proposal does is it assumes that unless you take an action and use a cleaner feedstock that you're using one of the soy feedstocks, which we consider the lower cetane fuels.

ASSISTANT DIVISION CHIEF KITOWSKI: Maybe I can recharacterize that a little bit.

The use of soy and animal as part of the testing programs, but they weren't very good metrics for regulation. So in moving from the test program to the regulation, we shifted from soy and animal feedstocks to high saturation or high cetane and low saturation low cetane. They're area pretty much analogous.

BOARD MEMBER GIOIA: Thank you.

CHAIRPERSON NICHOLS: Before we go, you have a question?

BOARD MEMBER ROBERTS: You'll have to indulge me. I know I'm the only one that doesn't know the answer to this.

The difference between biodiesel and renewable biodiesel? And why do they call it renewable because it doesn't seem like it's renewable?

MANAGER MITCHELL: Biodiesel and renewable diesel are both produced from the same feedstocks. Those are any fat or oil that you can find.

The difference is in the processing. So the biodiesel process is it takes this kind of lighter chemical treating to create this fatty acid methyl ester, which is a distinct type of chemical.

Renewable diesel takes those same feedstocks and it uses a more similar to a refinery process a hydro treating process to create a fully non-oxygenated saturated fuel.

The reasoning why they're called something different I think is that biodiesel was kind of the first adoptor of this technology so that biodiesel was there first. And then to distinguish, they just wanted to make sure that what people are calling fatty acid methyl esters is biodiesel and it's different from renewable diesel,

which came along later. So it's not that one is renewable, one's not.

CHAIRPERSON NICHOLS: Renewable sounds good and --

BOARD MEMBER ROBERTS: It sounds like it's going to be there after you use it. So --

CHAIRPERSON NICHOLS: It's just terminology.

BOARD MEMBER ROBERTS: It's in the process you're starting with similar products. And that's where the --

MANAGER MITCHELL: Transetherification is the chemical process for producing biodiesel and hydro treating is the chemical process for producing renewable diesel.

BOARD MEMBER ROBERTS: You made it so crystal clear.

CHAIRPERSON NICHOLS: The whole concept of fatty acids is not really worth talking about.

BOARD MEMBER GIOIA: There is a good band name in there somewhere.

CHAIRPERSON NICHOLS: With that, I think we should proceed to hearing from the witnesses. So we'll start with Matt.

MR. MIYASATO: Thank you, Madam Chair.

For the record, Matt Miyasato, the Deputy Executive Officer for Science and Technology Advancement

ADFT1-1

at the South Coast Air Quality Management District.

I'm here to voice our support for the staff recommendation and your ultimate approval of the ADF regulation.

I also want to point out that you've heard a lot of accolades about your staff. They continue to work, go out of their way to work with us. We brought up the concerns we had over NOx increases or potential for NOx increases. And they do what we do, they rely on data to make the recommendations before your Board which is in your package today. So we appreciate staff continueing to work with us.

So again, we urge your ultimate approval when this comes before you for a vote. Thank you.

ADFT1-1 cont.

CHAIRPERSON NICHOLS: Thank you. Ms. Case.

MS. CASE: I'm going to sound like a broken record when I thank everybody again.

CHAIRPERSON NICHOLS: Could you raise the mike?

MS. CASE: Richard Corey and Lex Mitchell and everybody on the staff for all the work that they've put into this, because it really has been a lot of work. And I do appreciate it.

As I said in my earlier testimony, my biodiesel plant is in San Diego, which is one of the smaller diesel markets that is not at this point terminal blending. We

make our biodiesel from 100 percent used cooking oil captured from restaurants. So we convert french fry oil into biodiesel.

The biodiesel that we make on the our plant is one of the lowest carbon biodiesels out there, because we are making it from the used cooking oil. And it's soon to be lower as we are in the middle the project to install cogeneration at our plant, which we are really proud of.

This regulation I know was pain-stakenly arrived at over a long period of time, and I believe it represents a great compromise for all sides. I particularly support that there is the in-use time line, which will allow our business to adapt. We do sell a lot of our fuel into the B20 market. So we do need to make some changes to our business plan. And we look forward to continuing to work with staff on finding ways that we can target fleets that will not cause increased NOx and in addition work with our trade industry group on developing additives. ADFT2-1

So thank you for everything that you've done to get to this point. And in this spirit of the Chairman's comment earlier, I'm very confident that we will innovate and adapt to these changes as we have in the past and everyone should to protect our environment. Thank you.

CHAIRPERSON NICHOLS: Okay. Thank you.

Curtis Wright? Curtis Wright here?

Celia DeBose.

MS. DE BOSE: So this is Celia DeBose again with the California Biodiesel Alliance, the industry trade association representing over 50 stakeholders.

And again, we're supporting the comments of the National Biodiesel Board and urging the adoption of this regulation. So if staff needs more kudos, kudos.

And the interesting thing about this is that it's not just you guys, but it's generations before because we really have been working on this for about ten years. What we've been engaged in is a process of bringing in new fuel to market in California. So we've marked with State agencies, helped them check off what they need to check off. And what's important now is that the Air Resources Board moved forward with this important step so that we can move forward with a structure and a process that allows us to deal with this one criteria pollutant.

So we really appreciate the exemption, the exemption for the 90 percent new technology diesel engines for heavy-duty fleets, the exemption for the light and medium duty fleets, the opportunity to create our own additive. And I was very happy to see further blend level flexibility for captive fleets as something that we can talk about. So thank you again. We really look forward to continued engagement as we finalize and implement this. ADFT3-1

Just on another note, it's great to have our fuel recognized for its beneficial qualities. And we know that we do well under the low carbon fuel standard because we reduce greenhouse gases. But it's nice to hear you guys also recognize all the other benefits. We really look forward to bringing the health benefits to California as much as possible and especially the PM reductions that have been really noted -- Richard Corey mentioned this at our conference on February 4th saying that biodiesel is important for reductions in toxic diesel particular matter. So we do this already. We want to do it more. We want to help provide solutions in the communities that are most impacted that suffer the most from the diseases caused by diesel pollution. And a lot of our plants are located in these areas. So we're going to accomplish this by creating more good family supporting jobs. So thank you guys so much. ADFT3-2

CHAIRPERSON NICHOLS: Thank you.

MR. NEAL: Thank you, Madam Chair and members of the Board.

Shelby Neal with the National Biodiesel Board representing the biodiesel and renewable diesel industries. We are not quite as excited to be headed to the gallows as the gentleman was this morning. But we are never the less excited.

We would like to thank the ARB Board and especially staff and particularly Richard Corey for really in my 17 years in and around government unprecedented level of focus and work on an extraordinarily dull topic. So thank you really all of you for doing that.

I'm no expert in business, but Warren Buffet it often says this, he says capital goes to where it can get the highest return with predictable risks. So it's the last clause in that sentence where we've had trouble. Predictable risk. But this regulation along with LCFS readoption fixes that.

So this should move our industry from survival mode, which is surviving is better than the alternative, but it's no way to live long term. So this should move us into a more comfortable area. And in 2023, or when we can develop an additive so-called solution which we are working on already, we can thrive and we can flourish in the state. I think we will. ADFT4-1

I want to thank ARB staff for just doing an incredible job. We stated in our public comments that we didn't think this regulation was necessary in a perfect world. But that's not intended to be a criticism. ARB has a very different mission than our industry does or other scientists who look at this. And every step they took the most conservative path, the most protective of ADFT4-2

public health. We support that view. That's why we willingly accept these limitations. Thank you very much for your time. ADFT4-2 cont.

CHAIRPERSON NICHOLS: Mr. Teall.

MR. TEALL: Russ Teall, Biodico and currently President of the California Biodiesel Alliance.

I will try not to repeat the things that have been already said. I agree with them entirely.

But the history of this goes back to 1993. That was our first meeting with the Air Resources Board to talk about biodiesel. It was brand-new at the time. And so it's been a 22-year journey up to this point. And is it perfect? It's as close to perfect as you can get. There's been a lot of give and take, back and forth. And the complexity of the regulation reflects a desire I think to get it right. You know, it's a complex topic. And in order to balance the needs of industry with the needs of the environment, I think it's a well crafted decision. ADFT5-1

One point that needs to be made is that biodiesel substantially reduces air toxics, other than the criteria pollutants, all the polyaeromatic hydrocarbons, et cetera, we're the only fuel that's been through Tier 1 and Tier 2 health effect testing the U.S. EPA successfully. So that's a point that was recognized by staff. ADFT5-2

Thirteen public meetings, seven ADF workshops,

countless private meetings, phone calls, e-mails, I'm going to look forward to getting back to Santa Barbara at the end of this journey.

Other than thanking Richard, Floyd, and Jack have done a tremendous job, you know, transitioning Floyd in the beginning directing this entire process, setting a mood that was correct in terms of listening to industry, reacting. And I think as a two-way learning, we learn things along the way that about ARB and what the objectives are. And I think they learned as well.

So I guess in conclusion, we whole heartedly support the ADF program in part because of staff. You know, we know that staff is there. They're listening. And we look forward to continuing the dialogue during this 15-day notice period. Thank you. ADFT5-3

CHAIRPERSON NICHOLS: Thank you.

Mr. Von Wedel.

MR. GERSHEN: I think Randall left.

Thank you again. At the risk of sounding a little repetitive, the development of this ADF regulation has been a challenging process. We appreciate ARB has been mindful of all the stakeholder interests.

As I'm sure you know by now, California biodiesel industry is made up of independent producers marketers, feedstock suppliers, a variety of stakeholder feedstock,

all sizes and shapes. A big challenge has been to be inconclusive, and ARB staff has been very attentive to our needs and demonstrating the willingness to work with our industry to help develop a variety of compliance options. And we really do appreciate that. Thank you. ADFT6-1

As mentioned in my prior comments, I'm confident that working together with ARB, California biodiesel can build on our successes. We look forward to continue working with you even more to reducing carbon emissions, lowering emissions, and creating high paying green jobs in disadvantaged community across the state. Thanks. ADFT6-2

CHAIRPERSON NICHOLS: Lisa Morenton again.

MS. MORTENSON: Hello, Chairman Nichols and members of the Board.

I sincerely appreciate the opportunity to talk about the ADF. This is a very personal issue for me. I cannot count the number of sleepless nights that I have had during the twists and turns of the development of the ADF rulemaking. So this is very important to our industry.

As you know, biodiesel use in California has made a positive impact. It reduces harmful emissions and it also stimulates the economy. It's important to remember that biodiesel is an advanced biofuel that is proven. It's reliable. And it is available in commercially ADFT7-1

significant volumes. And it is our commercial success is why we are in the Stage 3 as a commercial fuel under the ADF rulemaking. So part of this is very positive. The commercial success of biodiesel have moved us into this new level of regulation.

ADFT7-1 cont.

Biodiesel does have strong public and bipartisan support, and that's because it has so many terrific benefits. It has wonderful performance benefits. It has very strong lubricity properties, which reduces wear and tear on engines, and it also has strong detergent properties.

It has terrific environmental benefits reducing harmful emissions which improve human health. And we heard from Lex Mitchell earlier that biodiesel lowers localized toxic exposure. That is so important to protect our most impacted communities. And it's also important to remember that the diesel engine is 20 to 30 percent more efficient than electric engine.

ADFT7-2

And we, of course, can't forget the economic benefits. Biodiesel creates jobs, revenues, and taxes. When you have in-state production such as what we do at Community Fuels, you're creating advanced manufacturing jobs, which have the highest multiplier effect of any industry. So biodiesel is really exciting and really good for California.

I ask you to put on your imagination cap and imagine if biodiesel were the typical diesel fuel used in California and petroleum diesel were trying to gain approval. Imagine how different that conversation would be.

We spoke about how biodiesel is ready to deliver significant volumes to California. The ADF proposal will impose limitations and constrain how biodiesel is used within the state. While I understand why the alternative diesel fuel rulemaking is necessary, I do request that CARB pay very close attention to this ADF rulemaking and to work hard to sunset this regulation at the earliest possible opportunity. ADFT7-3

We want to grow biodiesel in California. We want to realize all the benefits that biodiesel has for this state. And to do that, we need more flexibility and higher volumes of biodiesel. And just quickly, I want to thank Mr. Corey for his personal involvement in this very important issue. He made a big impacts in the direction of this regulation. Thank you.

CHAIRPERSON NICHOLS: Okay. Thank you. Extra time always allowed for thanks.

MR. SIMPSON: Madam Chair and members of the Board. Harry Simpson with Crimson Renewable Energy, biodiesel producer here in California.

Obviously, we paid very close attention over this marathon process that we've gone through in getting to where we are today with the ADF regs. I think in our company was formed in '07, and I think some of the stuff started even before that.

So we would certainly like to thank Mr. Corey and Lex and Floyd and the many others who have been on this road to get us to the proposed regs today.

I know that sounds like a broken record, but you guys really do deserve a hand for that. You guys have consistently engaged with all the different stakeholders and that was certainly no easy feat. And your willingness to do it on a very regular basis and hear what everyone had to say went to I think what many of us would call a grand compromise in terms of the regs that we have before us today.

That compromise was the product of a lot of strong data, a lot of technical analysis, a lot of fighting back and forth as to how that shook out. In the end, I think you were able to acknowledge the significant health and carbon reduction benefits that biodiesel offers and reconcile that with any issues and the need to safeguard air quality in terms of NOx. ADFT8-1

So while it's not ideal, we fully support it. And I think it provided much needed regulatory certainty.

Like Lisa said, I, too, have had many sleepness nights wondering if the close to $30 million we have invested in our plant is going to go up in smoke. And we get essentially regulated out of business.

So I'm happy to say that's not the case, and I think the community in which we in the state of California I think last year we contributed about $40 million directly into the economy. When we're done with our expansion, it will be $80 million in 2016. It's good to see that investment will continue to make a contribution and bring much needed carbon reduction benefits to the LCFS. Thank you. We support the regs.

CHAIRPERSON NICHOLS: Great. Mr. Barrett.

MR. BARRETT: Good afternoon. I'm Will Barrett with the American Lung Association of California.

And as noted in the letter that we submitted along with our colleagues that CERT, the Coalition for Clean Air, NRDC, we support the proposed diesel regulation. You'll hear from some of the other signors of that letter in a few minutes.

We believe the proposal successfully addresses the need for cleaner alternatives to harmful fossil fuels, with the need to ensure that no additional harm is caused by these alternatives as they come into the market or the market expands because of the potential for biodiesel to

ADFT9-1

increase smog-forming NOx emissions under certain formulations or engine models or operating conditions put forward by CARB set to avoid backsliding on NOx is appropriate.

We also do appreciate that the proposal and Lex's presentation included compliance strategies to maximize the greenhouse gas and particulate benefits of buy diesel. We encourage ARB to explore additional opportunities to capture NOx neutral and NOX reducing particulate and carbon pollution benefits of this alternative. ADFT9-1 cont.

The air pollution public health and health equity impacts of petroleum fuels are well documented and must continue to be addressed through strong regulations that get all fuels impacts on lung health in our climate. We believe the ADF proposal is an important step in this process of curbing many harmful pollutants at once and protecting the health of future generations of Californians. So I just wanted to add to the chorus and thank for the staff's work on this. And thank you all. ADFT9-2

CHAIRPERSON NICHOLS: Great. Mr. Magavern.

MR. MAGAVERN: Bill Magavern, Coalition for Clean Air in support. I did not go through all the ins and outs of this long regulatory process. I have a lot of respect for those who did. I'm very impressed with the final result.

For years, we've had this tension. I think as we heard earlier today just, about everybody other than the oil companies wants to bring lower carbon fuels to market. And we need to reduce our reliance on petroleum so there are a lot of good arguments for alternative fuels. ADFT10-1

At the same time, as air advocates, we want to make sure we're not unintentionally increasing any air pollutants. And of course, it's your mission to prevent that from happening. So I think that this balance has been struck and this regulation really achieves that. Petroleum diesel is a plague on our health, so let's bring on the biodiesel with the appropriate protections. Thank you very much. ADFT10-2

CHAIRPERSON NICHOLS: Okay.

MR. DELAHOUSSAYE: Good afternoon. Dayne Delahoussaye representing Neste Oil. Neste Oil support supports the ADF regulation and and we're advocating the Board continue forward with it.

We're glad and proud that the findings of the NOx reductions agrees with our research and our experience as well. So we are supportive of California moving forward with that step.

The one technical comment I would point out and I made this in more detail in my written submissions for both the LCFS and the ADF because they tie together is the ADFT11-1

definitional language specifically when you're discussioning this fuel.

I believe one of them calls them non-renewable diesel. The other calls it renewable. At a minimum, encourage the same terminology for both of these funds referring to the same fuel.

Additionally, the ADF goes into great pains to describe -- the fuel they described was the hydrocarbon fuel. And so we would encourage as we're trying to develop a right technology for this and consistency that renewable hydrocarbon diesel be the term we're describing so we can avoid any confusion between different usage and different markets of other uses and that kinds of stuff. For example, some Canadian jurisdictions define renewable diesel as both hydro treated and biodiesel stuff. I think having a more clear definition of what it is renewable as opposed to what it's not non-ester renewable diesel being a more appropriate and simple definition for that kind.

ADFT11-1 cont.

And as well as then align the two definitions. They both have different public parts and things like that and there is a lot of overlap, but they're not unanimous. I would encourage being at least under the same division to have a definition that is in line and in agreement with each other. And you don't have two jurisdictions within the Air Resources Board playing that game. Other

questions, I'm happy. Otherwise, thank you for your time. ADFT11-1 cont.

CHAIRPERSON NICHOLS: Good point. Probably requires the equivalent of a spell check to be used. And make sure we use the same terms each time. Okay.

Mr. Hedderich.

MR. HEDDERICH: So 13 is much better than 45 or 46. Moving up in.

And I understand why, Chair Nichols, you pronounced my name correctly. It's misspelled. It ends in an H.

I'm not going to repeat the comments you heard from other folks. We're very supportive as the nation and north America's largest biodiesel producer and also a significant producer of renewable hydrocarbon biodiesel. Very supportive of all the comments that you heard. Agree there is some definitional issues we need to work out to make sure we're using the same language.

I was going to offer to Supervisor Roberts if he wants to see what the different plants look like, happy to show him. This has been a torturous process, I'll say. It needs to come to conclusion so our industry can move forward, so we can move forward with the LCFS, so we can have some certainty. Very much appreciate all the effort that staff did to bring this issue to closure. And with that, let's move forward and get closure. Thank you.

CHAIRPERSON NICHOLS: Okay. Thank you.

Mr. Mui.

MR. MUI: Good afternoon. Simon Mui with NRDC.

We also support the adoption of the ADF regulation. And like Bill Magavern, I've been on the periphery and following and reading.

But I do have to commend staff and management for really balancing the need to achieve the GHG reduction goals while mitigating any NOx issues. And we do think that ARB -- this is one great example where ARB has really ensured as we transition to new energy sources, we are managing the trade-offs.

So I really commend staff. And I know that often times industry may have sleepless nights. I can guess that ARB and staff has had sleepless nights. Maybe as a Resolution Richard can actually take a weekend off.

But I do want to say that this is reasonable. Our understanding is looking at the science that this is based on the best available technical studies and work. And we are very enthusiastically supporting this as maximizing both the LCFS and ADF together are really maximizing the public health benefits of these programs. Thank you. ADFT13-1

CHAIRPERSON NICHOLS: Thank you.

And last, Mr. Fulks, from the Diesel Technology

Forum.

MR. FULKS: Madam Chair, Board members, always awesome to be batting cleanup, standing between you and going home. So I will be as brief as I possibly can.

The Diesel Technology Forum is not taking a position on ADF, but we did want to come in and acknowledge the professionalism, the courtesy, and the just plain decency of your staff in the development of not just the ADF, but also the LCFS. It's been a pleasure to work with your staff. I'm just piling on, I know.

I did want to take a yellow highlighter to the precedent-setting policy that you were engaging here with the ADF in that it is an acknowledgement that emission control systems for diesel engines will be used as a NOx mitigant for this fuel moving forward after 2018.

We did note that under the LEV III development process the notion of using fuel as a NOx mitigant for vehicle hardware was never even allowed to be considered. So this is a precedent-setting policy change that we will be taking note of as we move into the future trying to reach the Governor's 50/50/50 by 30 goals. We're going to be relying on diesel for a while to get some of these fuel economy gains. ADFT14-1

And as there may be a clash between those goals and the ultra low NOx rule that is a voluntary rule now ADFT14-2

but may be coming back to you as a mandatory measure. So therefore, I just wanted to plant the seed that now that the precedent has been established that you can use hardware to mitigate NOx from fuel, it may come back to you some day that maybe perhaps we can consider using fuel as a NOx mitigant for hardware down the line.

ADFT14-2 cont.

So thank you for your attention. And again tip of the hat to your staff.

CHAIRPERSON NICHOLS: Well, it's an interesting comment, but I'm not really buying it.

MR. FULKS: I'll put it in the record anyway.

CHAIRPERSON NICHOLS: I'll tell you why, because I think that there is a lot of precedent for recognizing that emissions occur when fuel is used in an engine. And when you're projecting emissions, you have to look at what the engine is doing as well as what the fuel is doing.

So I don't think that position that the staff has taken here -- and I could be corrected on this -- is that the new vehicle standards are a mitigation for the fuel any more than the fuel is a mitigation for the engines when we're certifying engines. We certify engines based on a type of fuel that we assume is going to be in the marketplace. And this is the same thing in reverse.

MR. FULKS: Understood. We wanted to open the dialog as we move forward with ultra low NOx.

CHAIRPERSON NICHOLS: Always good to see you. Mr. Corey needed another round of thanks. That's great. Thank you.

Okay. That's it for the witness list. And are there any additional comments by the Board? Question, Mr. Dr. Sperling.

BOARD MEMBER SPERLING: I'm not speaking as a Board member yet. As a scientist, I look at Table 12 and I see these are really very small differences when you take into account we're talking about 50, 90, 95 percent reductions otherwise. So are there -- there's uncertainty. There has to be a lot of uncertainty here. So I'm wondering if I was looking as a scientist, I would say, okay, what are the confidence intervals here. What's probablistically, what are we talking about here. But one percentage? Two percentage? I know there is judges involved and that stuff. So that's why you I'm asking this as a scientist first.

MANAGER MITCHELL: I can parrot some of what we put in the staff report. We did do an ARB staff level statistical analysis and we commissioned a statistical analysis from an independent researcher, and they both found basically that we've got these results are statistically significant.

BOARD MEMBER SPERLING: At what level? At 90

percent?

MANAGER MITCHELL: Generally, we look if you want to, P values of .05 or less.

BOARD MEMBER SPERLING: Yeah. Okay. I had to ask that.

CHAIRPERSON NICHOLS: What does that lead you to think?

BOARD MEMBER SPERLING: That it's unfortunate we got to put it. We created this complex set of rules and, you know, burdens on companies. And it's a small effect. And I know, you know, we don't want to be -- our goal is to reduce NOx, not to increase it. But it really is a tiny amount, and it's not even relevant to anything except old engines. We've created this complex rule. So I'm kind of holding my -- I'm trying to accept it because I know we need to do it or that's my understanding because of lawsuits. But as public policy, it's kind of questionable.

CHAIRPERSON NICHOLS: Well, it's what happens when you get mixed up with CEQA.

BOARD MEMBER SPERLING: I know. That's why I don't want to be part of the next lawsuit either.

CHAIRPERSON NICHOLS: But it is -- isn't just lawsuits. But it is the law actually that requires that we be able to say with more certainty than you might like

that it will not be an increase in NOx as a result of what we're doing. That's a hard thing to prove, I know.

BOARD MEMBER SPERLING: I'll say one last thing. You could look at electric vehicles and say some -- I'm not going to go there.

CHAIRPERSON NICHOLS: You're not going there. You can think whatever you like.

Ms. Mitchell.

BOARD MEMBER MITCHELL: Thank you.

I also wanted to thank staff for working on this. And Jack Kitowski, I know he put a lot of time in it. And as you all know for South Coast, it's really important that we prevent further NOx -- increases in the NOx emissions. We have a fairly daunting task ahead of us for 2016 AQMP and our reductions that are needed by 2023 and 2032. I talked about it many times sitting on this Board. So this was a hard thing to do.

It does result in some complexity, but I think staff did a really good job working it out. And I know they worked very closely with staff at South Coast to iron out all the little wrinkles in this to get to a point where it's acceptable and will help South Coast reach the targets that we have to reach. So thank you for all the work that you've put in on it.

CHAIRPERSON NICHOLS: Thank you.

BOARD MEMBER BERG: I'd like to just make one observation as I was listening to the testimony and the regulated community, it really came to mind as I look at this and saw all of the support and the accolades for staff, but actually the accolades for the industry, because I did hear how challenging -- it was a marathon. It was torture. It's not ideal. It caused sleepless nights. And then from the environmental of our NGO friends that, you know, the tension of finding balance, the managing of trade-offs. And all of this very rarely produces a public testimony sheet of all support. And it made me think, you know, a roomful of an entrepreneurs and a roomful of people that really want to get the job done, this is what it looks like. So congratulations.

CHAIRPERSON NICHOLS: Okay. With that, did you properly close the record or did I never do that? Well, I should have.

The record is closed for this agenda item, but again, it's going to be reopened when the 15-day notice of public availability is issued.

So once again, we will not be receiving comments after today on this item. But after the 15-day notice there will be an opportunity for comment on the 15-day notice items. And they will be responded to in the Final Statement of Reasons for the regulation, which will also

come back to the Board. And we're planning on doing these again in tandem so this rule accompanies the low carbon fuel standard rule and that will keep everything neat. So we have a before us resolution Number 15-5. And do I have a motion?

BOARD MEMBER BERG: So moved.

BOARD MEMBER SHERRIFFS: So moved.

BOARD MEMBER RIORDAN: A second.

CHAIRPERSON NICHOLS: A second, Mrs. Riordan.

All in favor, please say aye.

(Unanimous aye vote)

(Dr. Balmes not present at vote)

CHAIRPERSON NICHOLS: Any opposed? Any abstentions? Okay. Great. Good work.

This really is a culmination of a lot of work, but it isn't over. There's more still to be done. But we're well on our way. So thanks to all. Before we can adjourn, we do have to make time for any public comment. There's no general public comment today. All right. Then we are adjourned.

BOARD MEMBER GIOIA: Chair Nichols, I certainly would be remiss given the team of today's hearing thanking Mr. Corey on several accounts. I want to add to that at the previous meeting last month staff gave a very detailed presentation on our 2015 priorities which I think we all

appreciated.

I made the comment after the presentation and I think it was some public testimony that it would be nice to see some accounting of what we are doing to advance environmental justice kind of cross-pollinated across all the programs and rulemakings and the policies that deal with the Air resources Board. I just wanted to thank them because I'm in receipt of a slide he took it very seriously and sent me a slide doing exactly what I had suggested.

So I wanted to thank you, Richard, for doing that and I think it demonstrates how serious not just Richard but all of our staff take that particular aspect of what we do here.

BOARD MEMBER GIOIA: Can you send that slide to all of us, Richard?

EXECUTIVE OFFICER COREY: Will do. It will be posted as well.

CHAIRPERSON NICHOLS: Oh, good. Everybody will be able to take advantage of it. Thank you all. Safe travel.

(Whereupon the Air Resources Board adjourned at 4:06 p.m.)

CERTIFICATE OF REPORTER

I, TIFFANY C. KRAFT, a Certified Shorthand Reporter of the State of California, and Registered Professional Reporter, do hereby certify:

That I am a disinterested person herein; that the foregoing hearing was reported in shorthand by me, Tiffany C. Kraft, a Certified Shorthand Reporter of the State of California, and thereafter transcribed into typewriting.

I further certify that I am not of counsel or attorney for any of the parties to said hearing nor in any way interested in the outcome of said hearing.

IN WITNESS WHEREOF, I have hereunto set my hand this 4th day of March, 2015.

TIFFANY C. KRAFT, CSR, RPR
Certified Shorthand Reporter
License No. 1227

Comment Letter 9_T_ADF_ALA Responses

ADF T9-1 The comment states that the proposal successfully addressed the need for cleaner alternatives to harmful fossil fuels while also ensuring that no additional harm is caused. The commenter also adds their appreciation that both the proposal and staff's presentation includes compliance strategies to maximize the greenhouse gas and particulate benefits of biodiesel. Thank you for your comment. A pathway for certification of additional in-use options has been included in the ADF Regulation to allow testing of innovative methods to offset NOx emissions including novel additives, blendstocks, or production methods. It is ARB staff's hope that this will permit the exploration of additional opportunities to decrease NOx and particulate matter levels in in the future.

Comment Letter 14_T_ADF_DTF Responses

ADF T14-1 The comment notes that using emission control systems for diesel engines as a NOx mitigation measure is a precedent-setting policy change. The commenter takes note of this change and points out that the change may be relied upon in the future to help meet the Governor's 50/50/50 by 30 goals. In fact, the ADF Regulation does not require the use of vehicle hardware in any way. Rather, it anticipates and protects against potential effects from the use of specific fuels due to other regulations. The technology used in new technology diesel engines (Selective catalytic reduction or SCR) results in no difference in NOx emissions between biodiesel and conventional diesel at least up to B20. As such, when vehicle miles traveled by the engines using this technology reach a tipping point, identified in the proposed ADF Regulation as 90 percent of the total VMT, the in-use specifications are no longer necessary for biodiesel. Staff sees this as evaluating representative engines and expected use trends rather than using the engine as a mitigation strategy.

Comment letter code: 1_F_ADF_WSPA

Commenter: Catherine Reheis-Boyd

Affiliation: Western States Petroleum Association

The following letter was submitted to the ADF Docket during the 15-day comment period.

This page intentionally left blank.

1_F_ADF
_WSPA

Western States Petroleum Association
Credible Solutions • Responsive Service • Since 1907

Catherine H. Reheis-Boyd
President

June 5, 2015

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

Submitted via web: http://www.arb.ca.gov/regact/2015/adf2015/adf15dayregchanges.pdf

Re: **Public Hearing to Consider the Proposed Regulation on the Commercialization of Alternative Diesel Fuels**

The Western States Petroleum Association (WSPA) appreciates the opportunity to submit written comments for the record on the above proposed rulemaking. WSPA is a non-profit trade association representing twenty-five companies that explore for, produce, refine, transport and market petroleum, petroleum products, natural gas and other energy supplies in California, and four other western states.

We understand that at the July 23/24 Board Hearing, the Board will consider final re-adoption of the Low Carbon Fuel Standard (LCFS) Regulation as well as adoption of the Alternative Diesel Fuel (ADF) Regulation. We also understand that staff has jointly progressed these two rulemakings and considers them intimately connected as a joint regulatory action "package" to address Court requirements emanating from the July 15, 2013 State of California Court of Appeal, Fifth Appellate District (Court) opinion in POET LLC versus California Air Resources Board (2013) 218 Ca.App4th661. The judge's opinion was that CARB did not adequately address biodiesel NOx emissions that could potentially result from LCFS implementation. The ADF regulation represents staff's proposed solution to address California Environmental Quality Act deficiencies associated with biodiesel NOx impacts. WSPA provided separate comments on the two concurrent rulemakings for the February 19, 2015 Board Hearing and will provide separate comments on staff's proposed modifications to each of the two regulations prior to the July 23/24 Board Hearing by their respective deadlines for public comment. We regret the unavoidable overlap that is likely to be in our respective comment submissions.

1415 L Street, Suite 600, Sacramento, California 95814
(916) 498-7752 ▪ Fax: (916) 444-5745 ▪ Cell: (916) 835-0450
cathy@wspa.org ▪ www.wspa.org

Our comments below represent WSPA's input to staff's proposed modifications to the ADF regulation presented to the Board on February 19. At that Hearing, the Board directed the Executive Officer to determine if additional conforming modifications to the regulation were appropriate and to make any proposed modified regulatory language available for public comment, with any additional supporting documents and information, for a period of at least 15 days in accordance with Government Code 11346.8. Staff released their proposed modifications to the ADF Rule on May 22, 2015 in what will be referred in the balance of our comments as the "ADF 15-Day Package."

WSPA has worked with ARB over the past few years on the ADF regulation and previously commented that staff's approach in the proposed regulation is the best based on the large number of issues and considerations. Based on the absence of controversial issues (by any of the participating stakeholders) remaining following the Board's initial consideration of the proposed ADF rule on February 19 and subsequent staff workshop on items under consideration for inclusion in the 15-Day package, we expected staff's revisions to be largely non-substantive, i.e., focusing on minor technical and administrative "clean-up" issues. This is true for most of the proposed modifications contained in the ADF 15-Day Package and WSPA is providing limited comments on those revisions. However, we find that the proposed revisions in the ADF 15-Day package include several significant changes that will impact the regulation's effectiveness in limiting NOx emissions from biodiesel blends, and have the potential to substantially increase the compliance burden for our industry which, in fact, may be hard-pressed to accommodate staff's apparent intent to track biodiesel down to each individual sale of a biodiesel blend at retail. WSPA is also concerned with staff's "Additional Analysis to be Added to the Record" in that staff's calculation of the overall NOx impact of the regulation reflects a revised set of assumptions regarding the distribution and use of Renewable Diesel (RD) in the state that are based on limited short-term data that are inconsistent with historical fuel distribution practices in the state, and thus, should not be relied upon as representative of future expectations.

ADF F1-1

ADF F1-2

We are prepared to work with staff as implementation issues arise in the coming years.

Sincerely,

Key Points / Highlights

WSPA supports practical compliance solutions that are tied to commercially proven and available technology, are consistent, and are readily verifiable. As such we oppose:

- Any proposal, such as the one incorporated in the newly introduced limited producer/importer exemption that calls for fuel suppliers to offer unmitigated NOx biodiesel on a regional basis, which has the potential to increase NOx emissions.
- Any proposal that calls for fuel suppliers to monitor fuel use in conjunction with exemptions in order to ensure volumetric or regional restrictions of such exemptions are met (i.e., How can a fuel supplier ensure where a fuel will be used once it is sold?)
- The use of additives at levels not currently recommended by SAE (Society of Automotive Engineers) or engine manufacturers or thoroughly vetted through the Multimedia Evaluation process.

ADF F1-3

WSPA's key comments are summarized below. More detailed discussion on individual sub-topics is provided in the balance of our submission.

- Multi Media Evaluation Reports

  The Biodiesel Multimedia Working Group's recommendations include a provision/condition that fuel formulations and additives that were not included within the scope of this multimedia evaluation must be reviewed by the MMWG for consideration of appropriate action. Similarly, knowledge gaps associated with environmental impacts of additives used in biodiesel are essentially the only meaningful concern indicated by the Working Group which apparently had no clear understanding of what additives may be used in biodiesel and whether the types, concentrations and use specifications differed substantially from those employed in conventional diesel.

  The significance of these caveats involving the use of additives in the MME reports is particularly noteworthy for WSPA members who have previously pointed out to CARB staff that a thorough assessment of DTBP (di-tert-butyl- peroxide), the NOx reduction additive that staff has included as a NOx mitigation measure in the proposed ADF regulation, has yet to be conducted. While air emissions impacts were considered for the use of DTBP, there is no documentation in the MME that other potential impacts of DTBP were evaluated, including, but not limited to:

  - Full multimedia evaluation of environmental impacts (e.g. fate and transport and non-combustion air emissions),
  - Toxicological impacts,
  - Safety impacts (e.g. peroxide stability and interactions with other additives such as anti-oxidants), and,
  - Materials compatibility impacts (e.g. OEM approval, metallurgical compatibility in distribution storage, piping, and fueling equipment).

  ADF F1-4

  We include by reference herein, our comments on this issue submitted as part of the 45-day package. We note that the State Water Resources Control Board's (SWRCB) review was limited

  ADF F1-5

to the differences between biodiesel and CARB diesel[1]. In addition, the Department of Toxic Substance Control (DTSC) performed fate and transform studies with biodiesel, CARB diesel, and biodiesel blends, and with two additives (a biocide and antioxidant). However, they did not test a biodiesel blend with DTBP. The DTSC also noted: "If new or different additives from those tested are proposed for use, appropriate evaluation through the MMWG process should occur."

While DTBP is clearly being proposed for use, it does not appear that either a SWRCB or DTSC review of biodiesel blends containing DTBP was performed as part of the MME. Both agencies clearly indicated that newly proposed additives would need further evaluation, but there is no discussion in the MME as to why DTBP was not included in their reviews.

ADF F1-5 cont

Review of the MMWG response to Peer Review comments, indicate that the SWRCB evaluation assumed that the additives used in biodiesel and biodiesel blends will employ the same additives currently used in CARB diesel, and recommended that other additives used be evaluated separately by the MMWG[2]. As stated in our previous comments, DTBP (as proposed by staff) will be used for a purpose other than the one it was originally intended for (which was cetane enhancement) and at levels (0.25-1.00 volume percent) substantially higher than the range that it is typically used for cetane enhancement (0.1-0.3 volume percent – SAE Technical Series Paper No. 982574). The DTSC's response to Peer Review comments indicate that it is important to understand the real life fate and transport behaviors associated with additive packages relevant to biodiesel/CARB diesel blends.[3] We once again request that ARB fully re-examine the use of DTBP as proposed, to ensure the MMWG examines all potential impacts associated with its use, and feel this request is consistent with the recommendations included in the MME.

ADF F1-6

- Definitions (Par 2293.2)
  - B5 and B20 - The "B" designation normally means the volume of biodiesel blended, not a range of contents. We would prefer that the "B" definition be defined as ranges (e.g. B0 to B5 & B6 to B20). For example, in the current language biodiesel containing slightly over 5% biodiesel would be designated as B20.

ADF F1-7

  - "Renewable Hydrocarbon Diesel"- we would prefer that the definition includes a reference either to the definition of "Hydrocarbon" or includes the wording "elemental composition primarily of hydrogen and carbon" in the definition. We also have concerns with the definition indicating that a fuel additive may be defined as "Renewable Hydrocarbon Diesel" as currently written.

ADF F1-8

  - New Technology Diesel Engine (NTDE) – The definition should be left broad enough to allow for NOx control technologies beyond selective catalytic reduction. We do not believe that staff wants to limit DECS technology to SCR technology for NOx control as other NOx reduction technologies may be developed in the future.

ADF F1-9

[1] 2015 Biodiesel MME (Page 12, Section B).
[2] 2015 Biodiesel MME (Appendix J, Page 31, Response to Comment E-9).
[3] 2015 Biodiesel MME (Appendix J, Page 23, Response to Comment D-1).

- Phase-In Requirements (Par. 2293.5)

  - On Par 2293.5(a)(1)(I): We ask that staff consider including flash point and conductivity (for safety considerations), as well as cetane number or derived cetane number (for performance considerations). We would prefer that ARB reference the appropriate test methods for properties as part of the regulatory language. **ADF F1-10**

  - On Par 2293.5(a)(1)(K): Staff should consider consulting with vehicle manufacturers for a "take no exception" statement to address compatibility concerns, if ADF is being considered as a neat fuel. **ADF F1-11**

  - On Par 2293.5(b)(3)(C): Staff should clarify that the statement "The Executive Officer shall disapprove a proposed pilot program" refers to a Stage 2 pilot program. **ADF F1-12**

  - On Par 2293.5(b)(5): WSPA supports the proposed staff addition to require all applicants with an approved Stage 2 Executive Order to conduct a Multimedia evaluation of the ADF that complies with Health and Safety Code Section 43830.8, including Tier I-III reports (as necessary) and any additional information that the Executive Officer may require to address comments/concerns raised by the Multimedia Working Group or the California Environmental Policy Council. **ADF F1-13**

  - On Par 2293.5(c)(1) and 2293.5(d): WSPA understands that, if additional offsetting strategies/mitigations are required an ADF/ADF blend falls under Stage 3A and, if no such controls are required, it may be designated under Stage 3B. As such the "when considering offsetting factors" language in Paragraph 2293.5(c)(1) appears unnecessary and could be struck. **ADF F1-14**

- In Use Requirements for Specific ADFs Subject to Stage 3A (Par. 2293.6)

  - WSPA supports staff's proposed modification to allow the use of two additional analytical test methods (ASTM D7170-14 and ASTM D7668-14a) for the determination of biodiesel cetane number. **ADF F1-15**

  - WSPA believes that additional definition is required in defining the specific timetable associated with the sunset of biodiesel in-use requirements. We understand the "trigger" is vehicle miles travelled (VMT) by New Technology Diesel Engines (NTDE) reaching 90%. We also understand the new language in the ADF 15-Day package indicating the need for an Executive Order as an official signal that the in-use requirements are no longer in force. However, there is no indication as to how frequently staff will be examining the most recent NTDE market penetration data (WSPA suggest annually), or by when should that examination be completed (WSPA suggests by the end of the first quarter of the following year, i.e., March 31), or how quickly the Executive Officer should issue the sunset order once the threshold is met (WSPA recommends 30 days after the annual assessment is completed, i.e., by April 30 of the following year). **ADF F1-16**

- The Fleet Exemption outlined in Par. 2293.6(5)(A) provides no specific procedures or protocols for facilities to include misfueling of vehicles. In WSPA's view this provides excessive latitude for fleet operators and increases the potential likelihood for abuses of the latitude afforded by this exemption. If both vehicles covered under the exemption as well as legacy vehicles not covered under the exemption are to be refueled at the same facility, staff needs to specify more concrete, robust and enforceable measures to prevent misfueling. It is questionable in our opinion whether this can be effectively accomplished without significant incremental effort by the Fleet operator (i.e., a simple pump label will not do) that the proposed exemption language does not provide in any way. **ADF F1-17**

- The Limited Producer/Importer Exemption outlined in Par. 2293.6(5)(C) is problematic as presented and WSPA is opposed to this exemption. We understand that it is limited to producer/importers that were already blending B6-B20 in 2014 (at least 750,000 gallons that year) and that the volume they will be able to blend in the future is capped at the level they blended in 2014. But the exemption includes no requirement for 90% of the fleet utilizing the fuel covered by the exemption to be light or medium duty vehicles or NTDE heavy duty vehicles. Staff has attempted to protect the South Coast and San Joaquin Valley but it is difficult for one to envision how the restriction of use in those areas could possibly be enforced. Only an attestation of the owner or operator of each fleet that buys the exempted fuel is required and nothing more. The producer/importer is somehow expected to obtain the records of use from their customers and keep track of volumes to ensure annual caps are not exceeded. We can only wonder how they are to do that without real time access to their customers' records and what the recourse would be, if after the end of the year, they discover that their customers sold more of the exempted fuel than they should have. This change is not trivial and arguably lies outside the scope of the type of revision to be included in the ADF 15-Day Package. While staff may argue that the volume cap limits to 2014 levels provides some degree of protection to limit the attendant NOx increase, the fact remains that this new exempt**ADF F1-18**ion may allow uncontrolled biodiesel to be used in unknown volumes which, coupled with the lack of enforceability, could result in an adverse NOx impact that is difficult to estimate but could be significant. Our comments on staff's treatment of the additional air quality impacts can be found in the discussion of the "Additional Analysis to be Added to the Record" that can be found below.

  We believe that the Developmental Fuel Waivers for Biodiesel should be eliminated now that it is a Stage 3A fuel and request that staff clarify their position on this issue. **ADF F1-19**

- Par. 2293.6(a)(6) highlights staff's proposal to conduct a biodiesel review of in-use requirements on or before 12/31/2019. While WSPA does not have access to the corresponding program review schedule and timetable of the LCFS regulation (staff has not released the LCFS 15-Day package at the time these ADF 15-Day Package comments are being prepared), we recommend that the number of and timetable for interim and/or full program reviews for ADF and LCFS are fully aligned given the close integration between these regulations. **ADF F1-20**

- Specifications for Alternative Diesel Fuels (Par. 2293.7)

  The definition section of the rule defines Biodiesel as meeting ASTM D6751. However, this section also outlines specifications for Biodiesel in Table A.3 which is redundant information. We would prefer that Par. 2293.7 just reference D6751. ADF F1-21

- Reporting and Recordkeeping (Par. 2293.8)

  - 2293.8(b)(2)(B)(4): This section requires more reporting by importers than is necessary for the program. Given that NOx control is not required for biodiesel blends up to B5, the reporting requirement should be limited to be B6-B20 blends. ADF F1-22

  - 2293.8(b)(2)(C): Reporting monthly volumes adds unnecessary complexity to reporting requirements without increasing the quality of information. We recommend reporting quarterly volumes rather than monthly. This simplifies reporting requirements and reduces the total volume of data ARB must review. This approach is also consistent with the structure of reporting for the LCFS. Furthermore, reporting could be further simplified by limiting reporting to those volumes in excess of specified control levels rather than reporting all ADF volumes. ADF F1-23

  - 2293.8(b)(3)(C-D): There are two specific references to "statement on the invoices" in these paragraphs. This contrasts with normal requirements to include statements on "product transfer documents," allowing regulated parties the flexibility of choosing the most efficient means of communicating the required information. We request that these two paragraphs be changed to refer to "statement on product transfer documents." ADF F1-24

  - 2293.8(b)(3)(E)(1): This paragraph requires retailers to maintain records of the carbon intensity of fuel sold. This is not information that is currently tracked all the way to the retail level. Fungible fuels having different carbon intensities are co-mingled in terminal tanks as well as other points in the supply chain upstream of the terminal. It is therefore impractical to require the tracking of carbon intensity all the way to the retail site. This is not required under the LCFS and would involve significant added complexity and recordkeeping and documentation. The carbon intensity of the fuel in question also has no practical application to the ADF program, given that carbon intensity is not an indicator of blending level allowed or NOx control required. Including this provision in the final regulations would add a significant level of complexity to the data tracking requirements throughout the supply chain solely to meet these recordkeeping requirements, which have no apparent purpose under the ADF program. ADF F1-25

- Appendix 1 of Subarticle 2: In Use Requirements for Pollutant Emissions Control

  In revising the requirements for certification testing of ADFs or ADF blends resulting in emissions equivalence with CARB Diesel, staff needs to revisit the following provisions for clarification and/or alteration:

Appendix 1 – Table A.7 - We would prefer to replace Table A.7 with reference to ASTM D7467 Table 1 properties as the candidate fuel property reporting requirement. ADF F1-26

In Appendix A – Table A.8, the fuel specification for "unadditized cetane number" should be updated to be consistent with the regulatory language (cetane number less than or equal to 56 for Low Saturation Level Biodiesel). ADF F1-27

In Appendix 1(a)(2)(B)(1) - The candidate fuel requirements are unclear. It seems that, if the applicant is attempting to certify a candidate fuel blend such as biodiesel with a "heightened fuel specification" or biodiesel produced utilizing a specified production technology, the candidate fuel blend shall consist of a 20% percent blend of the fuel blendstock with CARB Diesel. Staff should clarify what is meant by "heightened fuel specification" as this terminology is not defined elsewhere in the proposed regulation nor employed anywhere else where the meaning can be inferred. Regardless, it is unclear to us why a 10% blend of the fuel blendstock could not be tested and a 20% blend must be employed. Lastly, the use of "CARB Diesel" is confusing given the change in definition of CARB diesel in Par.2293.2. Does staff really intend to allow the candidate test fuel to include up to 5% biodiesel plus RD plus GTL, etc., as long as the candidate fuel properties outlined in Table A.7 are met? ADF F1-28

WSPA continues to maintain that the proposed ADF regulation should adequately address GTL fuels as a potential NOx reduction option (in addition to DTBP). While CARB has assessed the NOx reduction potential of such fuels in the same studies used to establish the characteristics of RD and although earlier versions of the proposed ADF regulation included treatment of GTL fuels, both the January 2, 2015 ADF ISOR and the ADF 15-Day Package are silent on the rationale behind staff's decision to withdraw specific mention of GTL fuels as potential NOx mitigation options. WSPA believes staff should address this matter, preferably in a separate section under Appendix 1 of Subarticle 2, e.g., by adding a section (b) to this Appendix. In doing so, we believe CARB should specify GTL fuel parameters needed for qualification as a NOx mitigation option (e.g., cetane number, aromatics content, PAH content, API gravity), and indicate the minimum volumetric ratio of GTL to biodiesel necessary for mitigation (4 vol/vol). ADF F1-29

- <u>Additional Analysis to be Added to the Record</u>

As staff's summary of revisions included in the ADF 15-Day Package indicates, additional air quality analyses were performed in response to:

- Updated volumes in the LCFS illustrative compliance scenario
- The previously referenced new producer/importer exemption added in Par. 2293.6(a)(5)(C), and
- Re-analysis of certain assumptions involving the method of introduction and distribution of RD in the market through 2023.

In staff's opinion, the combined impact of these does not change "the significance determinations in the draft Environmental Analysis that was prepared for the proposed ADF and LCFS regulations" that the Board considered in the February 19th Hearing. The NOx ADF F1-30

increase from Biodiesel shown for each year (2015-2023) in Table 1: Updated ADF NOx Analyses is invariably lower than the corresponding figures that were reported in the ISOR, Appendix B, Table B1.

In essence, staff added an exemption that directionally increases NOx. Its impact is not reported as a separate line item but is presumably small enough to be more than compensated by the change in the assumed pathway of RD into the market. In the ISOR, staff had assumed that 40% of RD would be imported into the refineries where it would be used to blend CARB diesel and, thus, no credit would accrue for that RD volume to offset biodiesel NOx increases. In the 15-Day package, staff has essentially fixed the annual volume of RD going to the refineries (at 48 million gallons per year - MMGY) through 2023. As the total volume of RD into the state grows to 300 MMGY in 2017, 400 MMGY in 2020 and 600 MMGY in 2023, the volume of RD into refineries stays at 48 MMGY. On a percentage basis, staff's assumption in the 15 Day package means that 16% of the total RD volume into CA will go into refineries in 2017, 12% in 2020 and 8% in 2023.

Clearly the availability of this incremental RD volume provides ample NOx reductions (in staff's calculations) to offset any projected NOx increase from biodiesel or the exemptions provided. But the basis behind the change in staff's assumptions is flawed and fails to recognize the logistical features and limits of the state's fuel distribution system. Staff examined 2014 LRT data and found that only 5% of the RD volume that came into California in 2014 was purchased by refiners with LCFS obligation. Staff interpreted this to mean that refiners are still using RD as a diesel blendstock but no longer purchasing the fuel with obligation. Staff also highlighted an increase in the use of unblended RD (R100) by end users, either through fleet purchase or through retail sales.

ADF F1-30 cont.

While the 2014 breakdowns that staff relied upon can be assumed to be correct, the reliance on data from 2014 to predict the outlook through 2023 is ill-advised. This is because 2014 was a year where all stakeholders were essentially "on hold," waiting to see how the LCFS regulation would evolve as part of the re-adoption process. The relatively modest required 1% CI reduction target required for 2014 apparently did not provide sufficient incentive for refiners to insist on transfers of RD "with obligation" into their facilities. LCFS credit markets were slow, practically illiquid. According to staff's own projections and statements through the workshops leading to February 19, this will all change once the LCFS regulation is re-adopted. There is no reason to believe that the volume of RD received in refineries (with obligation) will not track with the total volume of RD receipts into the state. It is difficult to imagine how the state's infrastructure can accommodate 250-550 MMGY of RD entering the diesel pool downstream of the refineries, while also handling another 160-185 MMGY of biodiesel at the same time. It would be worthwhile for staff to double check their assumptions in this regard with CEC staff who may be better able to advise on appropriate distribution of volumes of RD entering the system.

WSPA requests that staff present stand-alone analysis of the impact of the newly proposed producer/importer exemption, i.e., using the actual 2014 data but the 2015+ biodiesel and RD projections and distribution system breakdowns employed in the ISOR. WSPA would also like to see staff perform sensitivity analyses to develop the net NOx impact for 2015-2023 as the percentage of RD received into CA refineries is increased between 20% and 80% of the total RD volume. WSPA also requests that staff perform sensitivity analysis to develop the net NOx

impact for 2015-2023 if the total volumes of RD into the state fall short of staff's projections and are closer to those predicted by the BCG analyses.

ADF F1-30 cont.

Comment Letter 1_F_ADF_WSPA Responses

ADF F1-1

The comment states that the 15-day changes would impact the effectiveness of the regulation in limiting NOx emissions from biodiesel blends. The comment does not specifically state which provisions the commenter believes would impact the regulation's effectiveness. The air quality impacts of the 15 day changes were included in the Final EA; the EA concludes that the ADF Regulation would have a beneficial impact to air quality.

The comment states that some provisions in the 15-day changes may increase the compliance burden for industry based on tracking of individual retail sales of biodiesel blends. The 15-day package included changes to clarify that records of transactions are required when biodiesel ownership is transferred. However, regulated parties are not required to track the biodiesel once that transfer occurs. For example, if a producer sells to a blender, the producer must keep records of that transaction, but is not required to track to whom the blender transfers ownership of that fuel.

ADF F1-2

The comment states that the additional analysis in the 15-day notice included revised assumptions that are based on limited data and thus should not be extrapolated into the future. The revised analysis updates the original assumptions based on a better understanding of the use of renewable diesel in refineries and consideration of the most recent data that became available after release of the original analysis. The revised analysis is based on the best available data and improves on the original analysis. ARB views the other options as inferior -- stay with the assumptions in the original analysis, which are called into question by recent data from refiners, or choose a different assumption that would be less representative of the actual conditions of the fuels market. Additionally, all assumptions can be revisited as part of the regulation review required to be completed on or before December 31, 2019.

ADF F1-3

The comment asserts that the limited producer/importer exemption proposed as part of 15-day changes has the potential to increase NOx emissions by offering unmitigated NOx biodiesel on a regional basis. The limited producer/importer exemption only allows exemptions for volumes of fuel that were being used in 2014, and has a cap based on 2014 volumes. Therefore the exemption would not cause emissions increases above the current conditions of 2014, as any emissions associated with this exemption were already occurring in 2014.

The commenter is opposed to the limited producer/importer exemption proposed as part of 15-day changes due to what the commenter feels are impractical fuel monitoring requirements. The limited producer/importer exemption is not a mandatory provision and any monitoring and adherence with volume and regional restrictions would only be required for producers or importers who decide to take advantage of this voluntary exemption process. It should be noted that ARB has enforcement authority to ensure that the engines subject to the exemption are operating according to the terms of the exemption.

The commenter is opposed to the use of additives not approved by SAE or engine manufacturers or vetted through the multimedia evaluation process. ARB does not require additives to be approved by SAE or engine manufacturers, however, ARB does include engine performance in its analysis. Please see response to **ADF 1-6**.

ADF F1-4

The comment states that the recommendations by the Multimedia Working Group (MMWG) include a condition that fuel formulations and additives not included within the scope of the multimedia evaluation be reviewed by the MMWG for consideration of appropriate action. The comment also states that knowledge gaps associated with the environmental impacts of biodiesel additives were essentially the MMWG's only meaningful concern, and that the MMWG had no clear understanding of what additives may be used in biodiesel and whether the types, concentrations, and use specifications differed substantially from those used in conventional diesel.

The California Environmental Policy Council (CEPC or Council)'s Resolution[14] directs the MMWG to review new additives that may be introduced into commerce in the future to comply with the ADF Regulation and not included within the scope of the multimedia evaluation, and to determine whether further evaluation is warranted, and if so, make recommendations regarding any further action by the Council. To further clarify the condition to the CEPC's determination that the use of biodiesel in California consistent with

[14] California Environmental Policy Council, Resolution. June 2015. http://calepa.ca.gov/CEPC/2015/Resolution.pdf

the proposed ADF Regulation would not pose a significant adverse impact on public health or the environment compared to CARB diesel fuel, the following is the condition statement in the Resolution:

> "*WHEREAS, new fuel formulations and new additives that may be introduced into commerce in the future to comply with the ADF Regulation, and were not included within the scope of these multimedia evaluations, will be reviewed by the MMWG to determine whether further multimedia evaluation is warranted, and if so, to make recommendations regarding any further action by the Council*;"

Therefore, although the commenter's initial statement was based on the MMWG's proposed recommendations to the CEPC, the CEPC addressed the issue in its final determination.

Regarding knowledge gaps, additives for various biodiesel blends were identified as a knowledge gap during Tier I of the multimedia evaluation process. Therefore, various fuel additives were tested during Tier II of the evaluation, including DTBP and other approved additives commonly used in CARB diesel. ARB has proceeded based on available information.

Regarding the previously raised comment and request for a thorough re-evaluation of DTBP, including a full multimedia evaluation of environmental impacts, such an evaluation of DTBP is beyond the scope of the biodiesel multimedia evaluation. DTBP is not required by the regulation, nor expected to be used extensively, as suggested by comments received, including ADF 7-5. We also note that the U.S. EPA is likely to require additional studies of DTBP should a manufacturer propose additional use of the additive. California Health and Safety Code (HSC) section 43830.8 does not require a full multi-media evaluation of DTBP because fuel specifications are not being established for DTBP under the proposed regulation.

Regarding fuel additives in general, all proposed additives produced and commercially distributed for use in highway motor vehicles are required to meet federal requirements and health effects testing under section 211 of the Clean Air Act. Please also see response **ADF 1-6**.

ADF F1-5 The comment states that a SWRCB and DTSC review of biodiesel blends containing DTBP was not performed. Please see responses **ADF F1-4** and **ADF 1-6**.

The comment also incorporates comments submitted as part of the 45-day record, which are addressed in comment letter **13_OP_ADF_WSPA**.

ADF F1-6 The comment requests ARB to fully re-examine the use of DTBP to ensure the MMWG examines all potential impacts associated with its use. Please see responses **ADF F1-4** and **ADF 1-6**.

ADF F1-18 The comment states that the limited producer/importer exemption may be difficult to implement and enforce, the difficulty of producer/importer tracking of volumes sold, and the potential for exempted biodiesel to be sold in largely non-NTDE fleets (resulting in NOx emissions). Section 2293.6 (a)(5)(F) specifically calls out the enforcement authority that ARB has for this provision. Please see response **ADF F1-3**. Since the volumes are capped at 2014 levels, any emissions from these sales would be occurring in 2014. The comment also questions whether the addition of this exemption can properly be added as a so-called 15-day change. Please see response **ADF F5-6**.

ADF F1-29 The comment states that the ADF Regulation should include GTL (Gas to liquid diesel) as a NOx mitigation option. Please see response to comment **ADF 13-18**.

ADF F1-30 The comment asserts that ARB staff's additional analysis included in the 15-day notice is flawed and suggests that staff misinterpreted the data used to inform their assumptions. The comment also suggested that the true reason for the change in obligated purchase of renewable diesel being that 2014 was an "on hold" year for refiners. This, however, does not change staff's observation that more renewable diesel is being used at high blends without entering refineries. If anything, it may suggest that staff's estimates for renewable diesel entering California were low, which would lead to lower NOx emissions in the analysis. It is worth noting that the estimates of future renewable diesel use in California were developed in consultation with staff from the California Energy Commission. Staff believes the additional analysis included in the 15-day notice was both transparent and reasonable in light of the newly available data. The additional analysis used the best available data and utilized the knowledge gained in the current year of reporting. However, staff would revisit

these assumptions as part of the regulation review to be completed by December 31, 2019.

The comment also requests that staff present a stand-alone analysis and sensitivity analysis of the impacts of the limited producer/importer exemption. Additionally, the comment requests the analyses for the amount of renewable diesel that enters refineries and their impacts on the additional analysis included in the 15-day notice. The inputs for the additional analysis included in the 15-day notice were the updated 2014 data and assumptions, and used the same methodology as what was laid out in Appendix B of the ADF staff report. Any interested stakeholder who would like to carry out their own sensitivity analysis or stand-alone analysis of individual changes may do so, using these resources. Staff used transparent and reasonable inputs to the calculation to determine the effect that all of the 15-day changes would have on the NOx analysis and does not plan to do additional analysis on this item. Running wide ranges of scenarios that are not based on the actual fuels market would not provide meaningful results based on the current state of knowledge. Please also see response **ADF F5-1**.

This page intentionally left blank.

Comment letter code: 5_F_ADF_POET

Commenter: Joshua Willter

Affiliation: POET LLC

The following letter was submitted to the ADF Docket during the 15-day comment period.

This page intentionally left blank.

5_F_ADF
_POET

Additional Analysis Required Under the California Environmental Quality Act, the Administrative Procedures Act, and the Health & Safety Code

On December 30, 2014, CARB circulated for public review an Initial Statement of Reasons (the "ISOR") and an Environmental Analysis ("EA") for CARB's proposed Regulation on the Commercialization of Alternative Diesel Fuels (the "ADF regulation"). Following a February 19, 2015, public hearing on the ADF regulation, the Board directed staff to consider modifications to the ADF regulation, and respond to environmental comments.

CARB released proposed modifications to the ADF regulation through its May 22, 2015, Notice of Public Availability of Modified Text and Availability of Additional Documents (the "15-Day Notice"). According to the 15-Day Notice, the proposed modifications include, among other things, changes to the baselines used for multimedia evaluations, a requirement that environmental risk be evaluated by CARB staff for the pilot program, and an exemption for producers or importers allowing sales of B6 to B20 in areas other than the South Coast or San Joaquin Air basins. The 15-Day Notice does not provide any analysis of these impacts, or evidentiary support, but instead finds they "do not change the significance determinations in the draft Environmental Analysis that was prepared for the proposed ADF and proposed LCFS regulations, and previously circulated for public comment." (*Id.* at 11.)

As a result of these, and other, defects, Growth Energy submits the following comments on the proposed modifications to the ADF regulation under the California Environmental Quality Act, the California Administrative Procedures Act, and the Health & Safety Code.

A. The Information Provided By CARB Is Insufficient to Analyze The Modifications Reflected in the 15-Day Notice

1. The Analyses Supporting the Conclusions Stated in the 15-Day Notice Have Not Been Disclosed, in Violation of CEQA

An EIR – or its functional equivalent, like the EA here – should "include detail sufficient to enable those who did not participate in its preparation to understand and to consider meaningfully the issues raised by the proposed project." (*Laurel Heights Improvement Ass'n v. Regents of Univ. of Calif.* (1988) 47 Cal.3d 376, 405.) CARB is required to make a good faith attempt to find out and disclose all that it reasonably can. (See, e.g., *Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 428; *Berkeley Keep Jets Over the Bay Comm. v. Bd. of Port Comm'rs* (2001) 91 Cal.App.4th 1344; *Citizens for Preserve the Ojai v. County of Ventura* (1985) 176 Cal.App.3d 421, 431.)

Further, an unsubstantiated conclusion that an impact is not significant, without supporting information or explanatory analysis, is insufficient; the reasoning supporting the determination of insignificance must be disclosed. (*City of Maywood v. Los Angeles Unified School District* (2012) 208 Cal.App.4th 362, 393; *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099, 1111; *Citizens to Preserve the Ojai v. County of Ventura* (1985) 176 Cal.App.3d 421, 432.)

CARB violated CEQA by failing to provide this information. The Notice of Public Availability of Modified Text and Availability of Additional Documents (the "15-Day Notice") reveals that the proposed modifications to the ADF regulation (specifically, the producer/exporter exemption) would create "additional air quality impacts," (15-Day Notice at 5), including "NOx increases from biodiesel . . . ." (*Id.* at 11.) The 15-Day Notice also reveals that CARB staff "reduced the total [renewable diesel] volume expected to provide NOx emissions reductions" due to inaccurate assumptions made in the ISOR. (*Id.* at 12.) Despite these admissions, the 15-Day Notice states, "Staff has determined that the combined effects of [the proposed] changes do not change the significance determinations in the draft Environmental Analysis that was prepared for the proposed ADF and proposed LCFS regulations, and previously circulated for public comment." (*Id.* at 11.)

The 15-Day Notice, however, provides no information showing how CARB reached its conclusions regarding the NOx impacts of the proposed modifications, and in particular its bare conclusion that the modifications would not "change the significance determinations" in the draft EA. Nor is there any information showing how CARB quantified the admitted increases in NOx. There is also no information as to what diesel sources are included in CARB's emissions "inventory." As explained in an accompanying declaration prepared by an expert with relevant knowledge of the issues on which the 15-Day Notice touches, due CARB's failure to "provide [such] detailed information," "it was not possible . . . to review the data and assumptions used by CARB," nor was the expert able "to reach a conclusion about the accuracy of the analysis that was purported to have been performed or the conclusions drawn from the analysis by CARB." (Declaration of Lyons ["Decl. Lyons"] ¶ 7.) Because CARB staff has not provided information necessary to evaluate the conclusions in the 15-Day Notice, the EA should be revised and updated to provide this fundamental information, and recirculated for public review and comment.

ADF F5-1

2. The Rulemaking File Continues to Be Incomplete, Frustrating the Public's Attempts to Review CARB's Conclusions

In its comments on the ISOR and the EA for the ADF regulation, Growth Energy informed CARB that it was unable to perform a complete evaluation of the ADF regulation because important information was not included in the rulemaking file.

For example, CARB failed to include the materials required under AB 1085 in the rulemaking file, including information relating to air emissions, health impacts, and economic impacts. An example of a CARB rulemaking that contains this information is

ADF F5-2

located at http://www.arb.ca.gov/msprog/ordiesel/offroad_1085.htm. This information continues to be absent from the rulemaking file.

Because a multimedia evaluation was required as part of the instant rulemaking, the rulemaking file must also include all documents associated with the multimedia evaluation, which have not been made available to the public. Because the multimedia evaluation presumably relies upon some – albeit unspecified – information, the information forming the basis of the conclusions in the evaluation necessarily includes "data and factual information . . . on which the agency is relying." (Govt. Code, § 11347.3, subd. (b)(7).) Further, because CARB is legally required to prepare a multimedia evaluation, the information underlying the analysis in the multimedia evaluation constitutes "information, statement[s], report[s], or data that the agency is required by law to consider or prepare in connection with . . . a regulation." (*Id.*, subd. (b)(11).)

ADF F5-2 cont.

There is likewise no information in the rulemaking file sufficient to explain how CARB staff reached the conclusion that the proposed modifications "do not change the significance determinations in the draft Environmental Analysis that was prepared for the proposed ADF and proposed LCFS regulations, and previously circulated for public comment." (15-Day Notice at 11.) Plainly, such information includes at the very least "data and factual information . . . on which the agency is relying," (Govt. Code, subd. (b)(7)), or the "information, statement, report, or data that the agency is required by law to consider or prepare in connection with . . . a regulation." (*Id.*, subd. (b)(11).)

Because the rulemaking file does not contain all necessary information, CARB has violated Section 11347.3 of the Government Code.[1]

3. CARB's Interpretation of Section 11347.3, Subdivisions (b)(6), (b)(7), and (b)(11) Is Too Narrow

CARB also appears to assert that, to satisfy Section 11347.3, Subdivisions (b)(6), (b)(7), and (b)(11) of the Government Code, CARB need only include in the rulemaking file the four documents specifically mentioned in Paragraph 5 of the Peremptory Writ of Mandate issued in the matter of *POET, LLC v. California Air Resources Board, et al.*, Fresno County Superior Court, Case No. 09-CECG-04659. That is not accurate. Section 11347.4, subdivision (b)(6) requires CARB to include "[a]ll data and other factual information, any studies or reports, and written comments submitted to the agency in connection with the adoption, amendment, or repeal of the regulation." (Govt. Code § 11347.3, subd. (b)(6).) Likewise, subdivision (b)(7) requires the include of "[a]ll data and factual information . . . on which the agency is relying . . . ." (*Id.*, subd. (b)(7).) Further, Subdvision (b)(11) requires the inclusion of "[a]ny other information,

ADF F5-3

[1] Growth Energy notes that the 15-Day Notice for the Low Carbon Fuel Standard released on June 4, 2015, at page 12 references several documents to be included in the rulemaking file that was submitted to CARB by its consultants. It is implausible that similar documents somehow do not exist relating to the 15-Day Notice for the ADF regulation.

ADF F5-2 cont.

statement, report, or data that the agency is required by law to consider or prepare in connection with . . . a regulation." (*Id.*, subd. (b)(11).)

All information required under Subdivisions (b)(6), (b)(7), and (b)(11) must be included, not just the four documents specifically identified in the Peremptory Writ of Mandate.

ADF F5-3 cont.

B. The 15-Day Review Period Provides Insufficient Time for Commenting Parties to Evaluate the Modifications to the Proposed ADF Regulation; CARB Should Recirculate the EA

Fifteen calendar days provides insufficient time for the public to review CARB's modifications to the ADF regulation for several reasons.

First, the 15-Day Notice not only includes substantial modifications to the ADF regulation, but also extensive Multimedia Evaluations for both Biodiesel and Renewable Diesel. These documents total several hundreds of pages, much of which is highly technical data. This review is also being conducted concurrently with the 15-day notice for the related LCFS regulation, with its own short comment period. Fifteen days is insufficient for technical experts with relevant knowledge of the subject matter of the ADF regulation and the 15-Day Notice; certainly, a member of the public with no technical or legal background could not meaningfully be asked to provide comments on CARB's modifications within the timeframe allotted.

ADF F5-4

The prejudice caused by the short review period provided in the 15-Day Notice is exacerbated by the fact that many of the conclusions in the 15-Day Notice regarding the ***recognized*** environmental effects of the ADF regulation have been provided without supporting information or documentation, as explained above. In addition to the fact that the failure to include this analysis violates CEQA, (see *supra*, § A(1)), the failure to include this information makes it nearly impossible to even attempt to reconstruct CARB's analysis within the short amount of time provided.

C. The EA Should Be Revised to Evaluate Potential Increases in NOx Emissions, and Recirculated

CARB should recirculate the EA to provide the public sufficient opportunity to evaluate the new impacts associated with the proposed modifications, as well as significant new information showing the ADF regulation will have greater impacts than previously disclosed.

The 15-Day Notice includes a new exemption for the use of B6 to B20 fuels in older heavy-duty vehicles under Section 2293.6(a)(5)(C) of the ADF regulation. (15-Day Notice at 5.) These fuels, however, generally result in greater NOx emissions, which will increase the negative air quality impacts of the ADF regulations,, as CARB itself concedes. (See 15-Day Notice at 5 [noting the addition of an exemption for certain B6 to B20 sales "could result in additional air quality impacts . . . ."].) The exemption could also create localized increases in NOx emissions outside of the South Coast Air Basin or San

ADF F5-5

Joaquin Valley Air Basin. "Although the South Coast and San Joaquin Valley Air Basins experience the highest ozone levels in the state, there are many other areas in non-attainment of the federal and state standards where increased NOx emissions could create adverse impacts on air quality." (Decl. Lyons ¶ 8; see also *id.* ¶ 9 [showing estimated statement emissions in Table 1 of the 15-Day Notice [0.95 tons per day] is far greater than threshold of significance used by the Sacramento Metropolitan Air Quality Management District [0.0325 tons per day]].) These impacts are not analyzed in either the 15-Day Notice or the EA.

ADF F5-5 cont.

In addition, the new exemptions were not outlined or suggested in any way in the notice of proposed rulemaking and its supporting materials published in December. Because these changes were neither "nonsubstantial" nor sufficiently related to the original notice, they cannot be adopted by way of a 15-day notice. (Govt. Code § 11346.8, subd. (c); 1 Cal. Code Regs. § 40, 42; see also Decl. Lyons ¶ 6.) This completely unexpected change in the proposed ADF regulation is a substantial nonconformity with the requirements of the Administrative Procedure Act and is prejudicial, given its potential impact on the environmental impacts of the ADF regulation.

ADF F5-6

The 15-Day Notice also reveals increases in previously disclosed impacts. For example, the 15-Day Notice states that biodiesel adaptation will be lower than previously estimated, resulting in increased NOx impacts from biodiesel, and smaller statewide reductions of NOx compared to the original regulation. (See 15-Day Notice at 12.)

ADF F5-7

Further, a review of the Multimedia Evaluation discloses numerous material inconsistencies between that document and the EA, all of which call into question both the adequacy of CARB's analysis, and the integrity of CARB staff's conclusion that the ADR regulation (either as originally proposed or as modified) will not result in significant increases in NOx emissions. For example, the Multimedia Analysis does not include material information (that *was* included with the ISOR) that tended to suggest a link between the ADF and increased NOx emissions, and the ISOR and the Multimedia Evaluation use different baselines for the analysis of biodiesel [the ISOR assumes 65 million gallons of existing usage, while the Multimedia Evaluation assumes no biodiesel usage].

For example, the Multimedia Evaluation omits a finding that "NOx emission increases due to soy biodiesel are statistically significant"; the increases, expressed in tons per day, in NOx emissions due to the ADF shown in Tables 7.1 and B-1 of the ISOR; the Supplemental Statistical Analysis presented in Appendix G of the ISOR; peer review papers contradicting CARB's claims regarding the impact of biodiesel on NOx emissions from NTDEs; and documents presented during the public review process that contradict CARB's findings. (Decl. Lyons ¶¶ 15-16.)

ADF F5-8

In addition, because of these discrepancies, the findings in the EA – including the finding that the proposed ADF regulation will not result in significant impacts to the environment – are not supported by substantial, credible evidence. (See, e.g., *Preserve Wild Santee v. City of Santee* (2012) 210 Cal.App.4th 260, 283-84 [finding that

ADF F5-9

unexplained discrepancy precluded the existence of substantial evidence of adequate water supply] [citing *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 439].)

Plainly, new information has been disclosed that effects the conclusions in the EA. Among other things, the 15-Day Notice reveals a substantial increase in the severity of environmental impact (*i.e.*, NOx emissions). No mitigation has been adopted to reduce this impact to a less-than-significant level. Further, the fact that the 15-Day Notice contains no information to support CARB's conclusions demonstrates CARB's analysis is so fundamentally and basically inadequate and conclusory in nature that public comment on these issues is essentially meaningless. (See *Laurel Heights Improvement Ass'n v. Regents of Univ. of Calif.* (1993) 6 Cal.4th 1112, 1130; *cf.* CEQA Guidelines, § 15088.5(a).)

ADF F5-9 cont.

Despite this, the EA was not modified or recirculated for public review. CARB cannot comply with CEQA unless it updates the analysis in the EA, and recirculates the revised EA for a full 45-day public review, to which the staff must respond and which the Board must consider prior to any regulatory approval.

D. CARB Should Revise its Pilot Program to Ensure the Potential Environmental Effects of New Fuels Will Be Properly Evaluated

The ADF regulation contemplates that proposed alternative diesel fuels, other than biodiesel, will be introduced through a pilot program, and evaluation by CARB staff, prior to the entry of the fuel into the market.

In the 15-Day Notice, CARB has modified the pilot program to, among other things, add "significant adverse environmental impacts as a reason for disapproving a proposed pilot program." (15-Day Notice at 3.) This modification raises several concerns:

1. The Proposed Modifications Impermissibly Allow CARB to Defer Analysis and Mitigation of Environmental Effects

Except under unusual circumstances not present here, CEQA prohibits an agency from deferring analysis of environmental impacts and mitigation. "CEQA contemplates consideration of environmental consequences at the 'earliest possible stage,'" (*Rio Vista Farm Bureau v. County of Solano* (1992) 5 Cal.App.4th 351, 370 [quoting *Leonoff v. Monterey County Bd. of Supers.* (1990) 222 Cal.App.3d 1337, 1346]), and the "requirements of CEQA cannot be avoided by piecemeal review which results from chopping a large project into many little ones—each with a minimal potential impact on the environment—which cumulatively may have disastrous consequences." (*EPIC v. Dept. of Forestry & Fire Prot.* (2008) 44 Cal.4th 459, 503.)

ADF F5-10

An agency likewise may not defer mitigation, which "occurs when an EIR" or functional equivalent "puts off analysis or orders a report without either setting standards or demonstrating how the impact can be mitigated in the manner described in the"

environmental document. (*City of Long Beach, supra*, 176 Cal.App.4th at 915.) Thus, a mitigation measure that merely calls for a mitigation plan to be devised based on future studies or analysis is legally inadequate if it does not include performance standards that would mitigate the significant impact. (*Comms. for a Better Env., supra*, 184 Cal.App.4th at 95; *Endangered Habitats, supra*, 131 Cal.App.4th at 794 [rejecting mitigation requiring submission of acoustical analysis and approval of mitigation measures recommended by analysis because no mitigation criteria or potential mitigation measures were identified].)

ADF F5-10 cont.

In this case, CARB is essentially seeking to defer analysis of the environmental impacts of a candidate ADF to a later date. If the candidate ADF has such impacts, ARB staff is able to "consider the effects of offsetting factors," and adopt "conditions of use." In other words, instead of analyzing the full impacts of fuels that are alternatives to diesel fuels on the front end, CARB is allowing the Executive Officer, without performance standards, to both analyze potential impacts of candidate ADFs and consider mitigation (*i.e.*, "offsetting factors" and "conditions of use"). CARB cannot defer analysis of alternative diesels in this manner, and must instead provide the Executive Officer with reasonable performance standards to govern the review of new candidate ADFs.

2. The Proposed Modification Constitutes Impermissible Piecemealing of Environmental Review

The "requirements of CEQA cannot be avoided by piecemeal review which results from chopping a large project into many little ones—each with a minimal potential impact on the environment—which cumulatively may have disastrous consequences." (*Envt'l Prot. Info. Ctr. v. Calif. Dept. of Forestry & Fire Prot.* (2008) 44 Cal.4th 459, 503.) CEQA, therefore, "forbids 'piecemeal' review of the significant environmental impacts of a project." (*Berkeley Keep Jets Over the Bay Comm. v. Bd. of Port Comm'rs* (2011) 91 Cal.App.4th 1344, 1358.) Rather, when a lead agency undertakes the environmental review process, the lead agency must review and consider the "*whole* of the action," (CEQA Guidelines, § 15378 [emphasis added]), and consider "the effects, both individual and *collective*, of all activities involved in [the] project." (Pub. Resources Code, § 21002.1, subd. (d).) It is only through a complete and accurate "view of the project may affected outsiders and public decision-makers balance the proposal's benefit against its environmental cost, consider mitigation measures, assess the advantage of terminating the proposal . . . and weigh other alternatives in the balance." (*Berkeley Keep Jets, supra*, 91 Cal.App.4th at 1358.)

ADF F5-11

As explained above, the Executive Officer will be reviewing the environmental impacts of candidate ADFs as applications are filed, without the benefit of performance standards or other criteria for the review. In other words, the impacts of the individual candidate ADFs will be reviewed on a case-by-case basis. While the individual impacts of such candidate ADFs may not be significant standing alone, the effects of such candidate ADFs in the *aggregate* may be significant. CARB should be required to analyze candidate ADFs as a whole, and provide the Executive Officer with performance standards to ensure a significant increase in NOx emissions will not occur.

3. The Proposed Modifications Constitute an Impermissible *Post Hoc* Environmental Review that CARB May Not Delegate to the Executive Officer

CEQA prohibits the delegation of important functions, including review and consideration of an EIR or its equivalent, to a person or entity ***other than*** the body with final decision making authority over the project. (CEQA Guidelines, § 15025.) Thus, the decision-making body with final authority over project approval must also be the entity that certifies the EIR or functional equivalent. (*Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296, 307 [holding that board of supervisors with decision-making approval over the project "cannot delegate the responsibility" to certify the EIR "to the staff of the planning commission"]; *Kleist, supra,* 56 Cal.App.3d at 772, 779 [invalidating EIR where city council that approved the project delegated certification of the related EIR to planning board created by city ordinance]; *El Morro Community Assoc. v. Dept. Parks & Recr.* (2004) 122 Cal.App.4th 1341, 1350-51 [explaining that *Sundstrom* and *Kleist* "hold the decision maker may not delegate CEQA approval to a non-decision maker," but distinguishing those cases because "Deputy Director" who certified the EIR was also "designee to approve the project"].) The reason is clear: the environmental review document "cannot serve its informational function unless it is reviewed and considered by the governmental body which takes action having an effect upon the environment." (*Kleist, supra,* 56 Cal.App.3d at 779; see also *POET, LLC v. Calif. Air Resources Board* (2013) 217 Cal.App.4th 1214.)

ADF F5-12

Here, the Executive Officer intends to review future candidate ADFs, and determine whether those candidate ADFs will have negative environmental effects. While CARB may not be required to speculate regarding the specific characteristics of any particular fuel, as the ISOR (and the comments submitted by Growth Energy and others) itself reveals, CARB *can* evaluate the potential effects of such fuels at a general level, and adopt performance standards (*i.e.*, no increase in NOx emissions) to help govern the subsequent environmental review. By waiting until *after* the ADF regulation is approved to review even generalized effects without establishing performance standards, however, CARB is impermissibly delegating the environmental review processes to a non-decisionmaker, and allowing the environmental review to occur *after* project approval. This procedure violates CEQA.

E. CARB's Analysis of the Air Quality Impacts of the Proposed ADF Regulation Impermissibly Contemplates the Use of Different Baselines for Biodiesels and Other Alternative Diesel Fuels

Neither CARB's 15-Notice nor the "Updated ADF NOx Analysis" presented in Table 1 of the notice address one of the primary flaws in CARB's environmental analysis. Specifically, CARB has used "a baseline for determining the significance of increased NOx emissions from biodiesel use where 65 million gallons of biodiesel are already in-use to conclude" the ADF regulation will not have a significant impact on the environment. (Decl. Lyons ¶ 11; see also ISOR at 47 ["The net impacts of the proposal reduce NOx impacts from biodiesel, even assuming increased biodiesel

ADF F5-13

volumes over the subsequent years. Estimated impacts under the proposal are less than the baseline (current year) and will continue to decrease as NTDE use increases in California."].)

For fuels other than biodiesel, however, both the ISOR and the 15-Day Notice use a baseline that assumes the ADF regulation does not exist. (Decl. Lyons ¶ 11.)

CARB cannot evaluate the impacts of biodiesel and other alternative diesels on different playing fields by providing different environmental baselines. (See, e.g., *Woodward Park Homeowners Ass'n, Inc. v. City of Fresno* (2007) 150 Cal.App.4th 683, 707-10.) This is particularly true here, where a later baseline would obscure the impacts of biodiesel (a significant source of increased NOx emissions).

In short, all alternative diesels should be evaluated under the same rules, and using the same environmental baseline. Without this even playing field, the proposed modifications violate CEQA.

ADF F5-13 cont.

F. CARB Violated Section 57004 of the Health & Safety Code By Failing to Conduct a Peer Review of the ADF Regulation

Section 57004 of the Health & Safety Code provides that CARB shall not "take any action to adopt the final version of a rule unless" it undertakes a peer review to evaluate the scientific basis for the rule. (Health & Safety Code, § 57004(d).) That section requires: (1) that CARB "submit[] the scientific portions of the proposed rule, along with a statement of the scientific findings, conclusions, and assumptions on which the scientific portions of the proposed rule are based and the supporting scientific data, studies, and other appropriate materials, to the external scientific peer review entity for its evaluation," and (2) the peer reviewer "prepares a written report that contains an evaluation of the scientific basis of the proposed rule." (*Id.*)

CARB violated Section 57004 because it did not engage any expert to undertake a peer review of the ADF regulation. While CARB apparently takes the position that it retained peer reviewers for the Multimedia Evaluations on the two fuels, that is not sufficient, as those Multimedia Evaluations relate to the fuels, and not the ADF regulation. They are likewise not the type of peer review contemplated for the enactment of a regulation under Section 57004.

ADF F5-14

Further, many aspects of the ADF regulation would benefit greatly from the inclusion of comments from an independent peer reviewer. For example, one highly controversial issue associated with the ADF regulation is the fact that NOx increases still occur below B5, as explained in the analysis submitted by Robert Crawford on behalf of Growth Energy.

Another significant issue is the data indicating the ADF regulation would cause large increases in NOx emissions due to NTDEs associated with increased biodiesel usage. Despite these contested issue, there is no peer review on either point.

Because CARB did not conduct ***any*** peer review of the "scientific basis" for the ADF regulation – let alone a peer review of the more controversial scientific issues raised by the public – CARB has failed to comply with Section 57004 of the Health & Safety Code.

ADF F5-14 cont.

These failures can and should be readily corrected in short order. CARB need only postpone the currently rulemaking process by 60-90 days, which should not jeopardize its intended effective date for the proposed ADF regulation. If CARB does not engage in this process, it will constitute a prejudicial abuse of discretion.

STATE OF CALIFORNIA

BEFORE THE AIR RESOURCES BOARD

Declaration of James M. Lyons

I, James Michael Lyons, declare as follows:

1. I make this Declaration based upon my own personal knowledge and my familiarity with the matters recited herein. It is based on my experience of nearly 30 years as a regulator, consultant, and professional in the field of emissions and air pollution control. A copy of my résumé can be found in Attachment A.

2. I am a Senior Partner of Sierra Research, Inc., an environmental consulting firm located at 1801 J Street, Sacramento, California owned by Trinity Consultants, Inc. Sierra specializes in research and regulatory matters pertaining to air pollution control, and does work for both governmental and private industry clients. I have been employed at Sierra Research since 1991. I received a B.S. degree in Chemistry from the University of California, Irvine, and a M.S. Degree in Chemical Engineering from the University of California, Los Angeles. Before joining Sierra in 1991, I was employed by the State of California at the Mobile Source Division of the California Air Resources Board (CARB).

3. During my career, I have worked on many projects related to the following areas: 1) the assessment of emissions from on- and non-road mobile sources, 2) assessment of the impacts of changes in fuel composition and alternative fuels on engine emissions including emissions of green-house gases, 3) analyses of the unintended consequences of regulatory actions, and 4) the feasibility of compliance with air quality regulations.

4. I have testified as an expert under state and federal court rules in cases involving CARB regulations for gasoline, Stage II vapor recovery systems and their design, factors affecting emissions from diesel vehicles, evaporative emission control system design and function, as well as combustion chamber system design. While at Sierra I have acted as a consultant on automobile air pollution control matters for CARB and for the United States Environmental Protection Agency. I am a member of the American Chemical Society and the Society of Automotive Engineers and have co-authored nine peer-reviewed monographs concerned with automotive emissions, including greenhouse gases and their control. In addition, over the course of my career, I have conducted peer-reviews of numerous papers related to a wide variety of issues associated with pollutant emissions and air quality.

5. This Declaration summarizes the results of my review of the CARB Notice of Public Availability of Modified Text and Availability of Additional Documents for the Proposed Regulation on the Commercialization of Alternative Diesel Fuels (the ADF Regulation) dated May 22, 2015, and the California Environmental Protection Agency's Staff Report, Multi-Media Evaluation of Biodiesel, Prepared by the Multimedia Working

Group and dated May 2015, which has been added by CARB to the ADF rulemaking file. I have performed this critical review as an independent expert for Growth Energy. If called upon to do so, I would testify in accord with the facts and opinions presented here.

6. Based on my review of the changes proposed to the ADF regulation by CARB, the new exemption from mitigation requirements for B6 to B20 fuels provided through Section 2293(a)(5)(C) creates the potential for significant increases in NOx emissions from vehicles operating in areas outside the South Coast or San Joaquin Valley Air Basins. I have participated in every aspect of the development of the ADF regulation in which a member of the public was allowed by CARB to participate. The new exemption could not reasonably have been anticipated, based on the notice of proposed rulemaking and the supporting materials made available in December 2014.

7. CARB staff agrees on page 11 of the notice that the new exemption could result in increased NOx emissions. However, CARB staff claims on pages 11 to 13 of the notice that the agency has conducted "additional analysis" of NOx emissions related to a number of new issues, including the new exemption that will be added to the ADF Regulation record, and concluded that the overall impact of the ADF regulation on NOx emissions will be smaller than it originally estimated. Unfortunately, CARB has failed to provide the detailed information required for public review and comment. As a result, it was not possible for me to review the data and assumptions used by CARB staff, nor to reach a conclusion about the accuracy of the analysis that was purported to have been performed or the conclusions drawn from the analysis by CARB.

8. The notice claims, based on undisclosed "additional analysis," that increased emissions due to the new exemption will be mitigated on a statewide basis averaged over an entire year. Even assuming the "additional analysis" is correct, higher NOx emissions could occur due to the new exemption in areas outside the South Coast or San Joaquin Valley Air Basins which are not in attainment with federal and state ambient air quality standards for ozone. Although the South Coast and San Joaquin Valley Air Basins experience the highest ozone levels in the state, there are many other areas in non-attainment of the federal[1] and state[2] standards where increased NOx emissions could create adverse impacts on air quality.

ADF F5-15

9. CARB should be required to provide the necessary data to perform a careful assessment. Increased NOx emissions resulting from the new exemption could potentially be significant. This can be seen through a comparison of the criteria used to assess air quality impacts in areas of California outside the South Coast and San Joaquin Air Basins and the increases in NOx emissions estimated to result from biodiesel use. Using the Sacramento Metropolitan Air Quality Management District as an example,[3] the significance threshold for NOx emissions projects subject to CEQA is 65 pounds per day

ADF F5-16

[1] See http://www.arb.ca.gov/desig/adm/2013/fed_o3.pdf
[2] See http://www.arb.ca.gov/desig/adm/2013/state_o3.pdf
[3] See http://airquality.org/ceqa/ceqaguideupdate.shtml

or 0.0325 tons per day. Using the data in the row labeled "Emission Inventory (Diesel TPD)" in Table 1 of the CARB Notice, 0.0325 tons per day can be compared to both the 0.95 ton per day estimate for 2016 statewide increases in NOx due to the ADF regulation in Table 1 of the notice, and also the difference between that value and the 1.27 ton per day value that was CARB's original estimate. Clearly, if the new exemption results in the use of even a small amount of biodiesel in the Sacramento area without mitigation, the increase in NOx emissions could be significant. Further, similar situations where significant increases in NOx emissions occur in other ozone non-attainment areas outside of the South Coast and San Joaquin Air Basins can be expected.

ADF F5-16 cont.

10. The only way to ensure that increased NOx emissions due to the new exemption would not potentially lead to adverse air quality impacts in areas where it is allowed, and thus mitigate impacts to NOx caused by the exemption, would be to require that appropriate amounts of renewable diesel biodiesel are used in the same location and at the same time as the biodiesel provided for under the new exemption. The only way to ensure this would happen would be to require blending of renewable diesel into the biodiesel blends allowed under the new exemption. There is no such requirement in the ADF regulation.

ADF F5-17

11. Another major problem with CARB's "Updated ADF NOx Analysis" presented in Table 1 of the Notice is that CARB has failed to address a key flaw in its analysis of the adverse environmental impacts of biodiesel. This flaw relates to using a baseline for determining the significance of increased NOx emissions from biodiesel use where 65 million gallons of biodiesel are already in-use to conclude, as stated on page 47 of the Initial Statement of Reasons for the ADF regulation, that:

> *The net impacts of the proposal reduce NOx impacts from biodiesel, even assuming increased biodiesel volumes over the subsequent years. Estimated impacts under the proposal are less than the baseline (current year) and will continue to decrease as NTDE use increases in California.*

ADF F5-18

The correct baseline that is used everywhere else in the ISOR, as well as in the Multi-Media Evaluation and by the Peer Reviewers of that evaluation, is CARB diesel fuel containing **no** biodiesel. Given that the purpose of the ADF regulation is to establish specifications for fuels like biodiesel while identifying and ensuring mitigation of adverse environmental impacts, the no biodiesel baseline is clearly the correct baseline. Based on CARB's own "Updated ADF NOx Analysis," use of this baseline shows unmitigated NOx increases of about one ton per day statewide in California in 2015, 2016, and 2017, and at lower levels through 2020, despite its flaws. Further, as shown in my previous declaration, submitted to CARB prior to the ADF and LCFS public hearings in February 2015, the likely increases in NOx emissions are much larger and can be expected to continue indefinitely into the future.

When viewed in the context of the proper baseline, the data presented in Table 1 of the notice show that the proposed ADF regulation, even after CARB's update of its analysis, fails to mitigate increased NOx emissions due to biodiesel use. That CARB has erred in

establishing the baseline for analysis of biodiesel NOx impacts is support by the ADF regulation itself, as sections 2293.5(a)(3)(C), 2293.5(b)(3)(C), 2293.5(b)(5)(B), 2293.5(b)(5)(D), and 2293.5(b)(6)(B), make it clear that increased emissions from an ADF will not be included in baseline. Rather, the baseline required to be used has to reflect conditions in place before the use of the ADF.

ADF F5-18 cont.

12. Notwithstanding the above, CARB's "additional analysis" is also fatally flawed for all of the other reasons set forth in my previous declaration and its attachments dated February 17th 2015, which was filed as part of Growth Energy's comments during the original 45 day comment period on the ADF regulation.

ADF F5-19

13. Turning to the Staff Report on the Multimedia Evaluation of Biodiesel that has only recently become available for public comment and is now being included in the ADF regulation record, I have reviewed the air quality assessment that is reported to have been prepared by CARB staff, and have found it to be both inconsistent with the analysis presented in the ADF ISOR as well as fatally flawed in that it fails to consider all of the available information regarding the impact of biodiesel on NOx emissions from what CARB refers to as New Technology Diesel Engines (NTDEs). As a direct result, the Supplemental External Scientific Peer Review of the air quality impacts of biodiesel is also flawed.

14. The primary conclusion of the Multimedia Evaluation of Biodiesel with respect to air quality is:

> *Based on a relative comparison between biodiesel and CARB diesel (containing no biodiesel), ARB staff concludes that with in-use requirements biodiesel, as specified in the multimedia evaluation and proposed regulation, does not pose a significant adverse impact on public health or the environment from potential air quality impacts.*

ADF F5-20

This statement clearly highlights the fundamental inconsistency between the baseline used in the ISOR analysis of air quality impacts, where the baseline included biodiesel use, and the baseline identified in the Multimedia Evaluation Staff Report which included no biodiesel. As noted above, the appropriate baseline is the one identified in the Multimedia Evaluation Staff Report.

15. Another major inconsistency between the Multimedia Evaluation and the ISOR is the fact that CARB failed to include much of the information found in Chapters 6 and 7, and in Appendices B and G of the ISOR, all of which addresses the impact of biodiesel on emissions and air quality in the Multimedia Evaluation. Key information omitted includes:

ADF F5-21

- The finding that NOx emission increases due to soy biodiesel are statistically significant based on all data considered on page 40 of the ISOR;

- The ton per day increases in NOx emissions due to the ADF shown in Tables 7.1 and B-1 of the ISOR;

- The Supplemental Statistical Analysis presented in Appendix G of the ISOR; and

- The following peer reviewed technical papers listed as references 21 through 24 for Chapter 6 of the ISOR, which contradict CARB's claims regarding the impact of biodiesel on NOx emissions from NTDEs:

    - Gysel, Nicholas et al., *Emissions and Redox Activity of Biodiesel Blends Obtained from Different Feedstocks from a Heavy-Duty Vehicle Equipped with DPF/SCR Aftertreatment and a Heavy-Duty Vehicle without Control Aftertreatment*, SAE 2014-01-1400, Published 04/01/2014.

    - McWilliam, Lyn and Zimmermann, Anton, *Emission and Performance Implications of Biodiesel Use in an SCR-equipped Caterpillar C6.6*, SAE 2010-012157 Published, 10/25/2010.

    - Mizushima, Norifumi and Nurata, Yutaka, *Effect of Biodiesel on NOx Reduction Performance of Urea-SCR system*, SAE 2010-01-2278, Published 10/25/2010.

    - Walkowicz, Kevin et al., *On-Road and In-Laboratory Testing to Demonstrate Effects of ULSD, B20, and B99 on a Retrofit Urea-SCR Aftertreatment System*, SAE 2009-01-2733.

ADF F5-21 cont.

CARB's failure to include and fully to address the foregoing information and analysis made it impossible for any external reviewers, who were relying upon CARB for full disclosure of all relevant data and information, to perform a credible scientific review of the emissions and air quality evaluation and the conclusions reached by CARB.

16. Similarly, CARB failed to include data and information directly relevant to the issues of biodiesel impacts on emissions and air quality provided during the public comment period on the ADF regulation in the materials considered in the Multimedia Evaluation Staff Report, and therefore by the external reviewers. Data and information provided during the public comment period that contradict CARB's findings regarding biodiesel NOx impacts on NTDEs that was not made part of the Multimedia Evaluation includes:

ADF F5-22

- "NOx Emission Impacts of Biodiesel Blends," Robert Crawford, Rincon Ranch Consulting, February 17, 2015; and

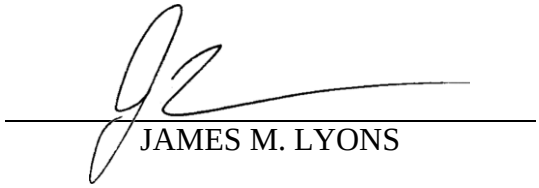
- Declaration of James M. Lyons, February 17, 2015, with attachments.

Again, CARB's failure to include this information also made it impossible for the Peer Reviewers, who were relying upon CARB for full disclosure of all relevant data and information, to perform a credible scientific review of the emissions and air quality evaluation and the conclusions reached by CARB.

ADF F5-22 cont.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed this 8th day of June, 2015 at Sacramento, California.



JAMES M. LYONS

ATTACHMENT A

RÉSUMÉ

sierra research
A Trinity Consultants Company
1801 J Street
Sacramento, CA 95811
Tel: (916) 444-6666
Fax: (916) 444-8373
Ann Arbor, MI
Tel: (734) 761-6666
Fax: (734) 761-6755

Résumé

James Michael Lyons

Education

1985, M.S., Chemical Engineering, University of California, Los Angeles

1983, B.S., Cum Laude, Chemistry, University of California, Irvine

Professional Experience

4/91 to present — Senior Engineer/Partner/Senior Partner
Sierra Research

Primary responsibilities include oversight and execution of complex analyses of the emission benefits, costs, and cost-effectiveness of mobile source air pollution control measures. Mr. Lyons has developed particular expertise with respect to the assessment of control measures involving fuel reformulation, fuel additives, and alternative fuels, as well as accelerated vehicle/engine retirement programs, the deployment of advanced emission control systems for on- and non-road gasoline- and Diesel-powered engines, on-vehicle evaporative and refueling emission control systems, and Stage I and Stage II service station vapor recovery systems. Additional duties include assessments of the activities of federal, state, and local regulatory agencies with respect to motor vehicle emissions and reports to clients regarding those activities. Mr. Lyons has extensive litigation experience related to air quality regulations, product liability, and intellectual property issues.

7/89 to 4/91 — Senior Air Pollution Specialist
California Air Resources Board

Supervised a staff of four professionals responsible for identifying and controlling emissions of toxic air contaminants from mobile sources and determining the effects of compositional changes to gasoline and diesel fuel on emissions of regulated and unregulated pollutants. Other responsibilities included development of new test procedures and emission standards for evaporative and running loss emissions of hydrocarbons from vehicles; overseeing the development of the state plan to control toxic emissions from motor vehicles; and reducing emissions of CFCs from motor vehicles.

4/89 to 7/89 Air Pollution Research Specialist
California Air Resources Board

Responsibilities included identification of motor vehicle research needs; writing requests for proposals; preparation of technical papers and reports; as well as monitoring and overseeing research programs.

9/85 to 4/89 Associate Engineer/Engineer
California Air Resources Board

Duties included analysis of vehicle emissions data for trends and determining the effectiveness of various types of emissions control systems for both regulated and toxic emissions; determining the impact of gasoline and diesel powered vehicles on ambient levels of toxic air contaminants; participation in the development of regulations for "gray market" vehicles; and preparation of technical papers and reports.

Professional Affiliations

American Chemical Society
Society of Automotive Engineers

Selected Publications (Author or Co-Author)

"Development of Vehicle Attribute Forecasts for 2013 IEPR," Sierra Research Report No. SR2014-01-01, prepared for the California Energy Commission, January 2014.

"Assessment of the Emission Benefits of U.S. EPA's Proposed Tier 3 Motor Vehicle Emission and Fuel Standards," Sierra Research Report No. SR2013-06-01, prepared for the American Petroleum Institute, June 2013.

"Development of Inventory and Speciation Inputs for Ethanol Blends," Sierra Research Report No. SR2012-05-01, prepared for the Coordinating Research Council, Inc. (CRC), May 2012.

"Review of CARB Staff Analysis of 'Illustrative' Low Carbon Fuel Standard (LCFS) Compliance Scenarios," Sierra Research Report No. SR2012-02-01, prepared for the Western States Petroleum Association, February 20, 2012.

"Review of CARB On-Road Heavy-Duty Diesel Emissions Inventory," Sierra Research Report No. SR2010-11-01, prepared for The Ad Hoc Working Group, November 2010.

"Identification and Review of State/Federal Legislative and Regulatory Changes Required for the Introduction of New Transportation Fuels," Sierra Research Report No. SR2010-08-01, prepared for the American Petroleum Institute, August 2010.

"Technical Review of EPA Renewable Fuel Standard Program (RFS2) Regulatory Impact Analysis for Non-GHG Pollutants," Sierra Research Report No. SR2010-05-01, prepared for the American Petroleum Institute, May 2010.

"Effects of Gas Composition on Emissions from Heavy-Duty Natural Gas Engines," Sierra Research Report No. SR2010-02-01, prepared for the Southern California Gas Company, February 2010.

"Effects of Gas Composition on Emissions from a Light-Duty Natural Gas Vehicle," Sierra Research Report No. SR2009-11-01, prepared for the Southern California Gas Company, November 2009.

"Technical Review of 2009 EPA Draft Regulatory Impact Analysis for Non-GHG Pollutants Due to Changes to the Renewable Fuel Standard," Sierra Research Report No. SR2009-09-01, prepared for the American Petroleum Institute, September 2009.

"Effects of Vapor Pressure, Oxygen Content, and Temperature on CO Exhaust Emissions," Sierra Research Report No. 2009-05-03, prepared for the Coordinating Research Council, May 2009.

"Technical Review of 2007 EPA Regulatory Impact Analysis Methodology for the Renewable Fuels Standard," Sierra Research Report No. 2008-09-02, prepared for the American Petroleum Institute, September 2008.

"Impacts of MMT Use in Unleaded Gasoline on Engines, Emission Control Systems, and Emissions," Sierra Research Report No. 2008-08-01, prepared for McMillan Binch Mendelsohn LLP, Canadian Vehicle Manufacturers' Association, and Association of International Automobile Manufacturers of Canada, August 2008.

"Attachment to Comments Regarding the NHTSA Proposal for Average Fuel Economy Standards Passenger Cars and Light Trucks Model Years 2011-2015, Docket No. NHTSA-2008-0089," Sierra Research Report No. SR2008-06-01, prepared for the Alliance of Automobile Manufacturers, June 2008.

"Evaluation of California Greenhouse Gas Standards and Federal Energy Independence and Security Act – Part 1: Impacts on New Vehicle Fuel Economy," SAE Paper No. 2008-01-1852, Society of Automotive Engineers, 2008.

"Basic Analysis of the Cost and Long-Term Impact of the Energy Independence and Security Act Fuel Economy Standards," Sierra Research Report No. SR 2008-04-01, April 2008.

"The Benefits of Reducing Fuel Consumption and Greenhouse Gas Emissions from Light-Duty Vehicles," SAE Paper No. 2008-01-0684, Society of Automotive Engineers, 2008.

"Assessment of the Need for Long-Term Reduction in Consumer Product Emissions in South Coast Air Basin," Sierra Research Report No. 2007-09-03, prepared for the Consumer Specialty Products Association, September 2007.

"Summary of Federal and California Subsidies for Alternative Fuels," Sierra Research Report No. SR2007-04-02, prepared for the Western States Petroleum Association, April 2007.

"Analysis of IRTA Report on Water-Based Automotive Products," Sierra Research Report No. SR2006-08-02, prepared for the Consumer Specialty Projects Association and Automotive Specialty Products Alliance, August 2006.

"Evaluation of Pennsylvania's Implementation of California's Greenhouse Gas Regulations on Criteria Pollutants and Precursor Emissions," Sierra Research Report No. SR2006-04-01, prepared for Alliance of Automobile Manufacturers, April 12, 2006.

"Evaluation of New Jersey's Adoption of California's Greenhouse Gas Regulations on Criteria Pollutants and Precursor Emissions," Sierra Research Report No. SR2005-09-03, prepared for the Alliance of Automobile Manufacturers, September 30, 2005.

"Evaluation of Vermont's Adoption of California's Greenhouse Gas Regulations on Criteria Pollutants and Precursor Emissions," Sierra Research Report No. SR2005-09-02, prepared for the Alliance of Automobile Manufacturers, September 19, 2005.

"Assessment of the Cost-Effectiveness of Compliance Strategies for Selected Eight-Hour Ozone NAAQS Nonattainment Areas," Sierra Research Report No. SR2005-08-04, prepared for the American Petroleum Institute, August 30, 2005.

"Evaluation of Connecticut's Adoption of California's Greenhouse Gas Regulations on Criteria Pollutants and Precursor Emissions," Sierra Research Report No. SR2005-08-03, prepared for the Alliance of Automobile Manufacturers, August 26, 2005.

"Evaluation of New York's Adoption of California's Greenhouse Gas Regulations On Criteria Pollutants and Precursor Emissions," Sierra Research Report No. SR2005-07-04, prepared for the Alliance of Automobile Manufacturers, July 14, 2005.

"Review of MOVES2004," Sierra Research Report No. SR2005-07-01, prepared for the Alliance of Automobile Manufacturers, July 11, 2005.

"Review of Mobile Source Air Toxics (MSAT) Emissions from On-Highway Vehicles: Literature Review, Database, Development, and Recommendations for Future Studies," Sierra Research Report No. SR2005-03-01, prepared for the American Petroleum Institute, March 4, 2005.

"The Contribution of Diesel Engines to Emissions of ROG, NOx, and PM2.5 in California: Past, Present, and Future," Sierra Research Report No. SR2005-02-01, prepared for Diesel Technology Forum, February 2005.

"Fuel Effects on Highway Mobile Source Air Toxics (MSAT) Emissions," Sierra Research Report No. SR2004-12-01, prepared for the American Petroleum Institute, December 23, 2004.

"Review of the August 2004 Proposed CARB Regulations to Control Greenhouse Gas Emissions from Motor Vehicles: Cost Effectiveness for the Vehicle Owner or Operator – Appendix C to the Comments of The Alliance of Automobile Manufacturers," Sierra Research Report No. SR2004-09-04, prepared for the Alliance of Automobile Manufacturers, September 2004.

"Emission and Economic Impacts of an Electric Forklift Mandate," Sierra Research Report No. SR2003-12-01, prepared for National Propane Gas Association, December 12, 2003.

"Reducing California's Energy Dependence," Sierra Research Report No. SR2003-11-03, prepared for Alliance of Automobile Manufacturers, November 25, 2003.

"Evaluation of Fuel Effects on Nonroad Mobile Source Air Toxics (MSAT) Emissions: Literature Review, Database Development, and Recommendations for Future Studies," Sierra Research Report No. SR2003-10-01, prepared for American Petroleum Institute, October 3, 2003.

"Review of Current and Future CO Emissions from On-Road Vehicles in Selected Western Areas," Sierra Research Report No. SR03-01-01, prepared for the Western States Petroleum Association, January 2003.

"Review of CO Compliance Status in Selected Western Areas," Sierra Research Report No. SR02-09-04, prepared for the Western States Petroleum Association, September 2002.

"Impacts Associated With the Use of MMT as an Octane Enhancing Additive in Gasoline – A Critical Review", Sierra Research Report No. SR02-07-01, prepared for Canadian Vehicle Manufacturers Association and Association of International Automobile Manufacturers of Canada, July 24, 2002.

"Critical Review of 'Safety Oversight for Mexico-Domiciled Commercial Motor Carriers, Final Programmatic Environmental Assessment', Prepared by John A Volpe Transportation Systems Center, January 2002," Sierra Research Report No. SR02-04-01, April 16, 2002.

"Critical Review of the Method Used by the South Coast Air Quality Management District to Establish the Emissions Equivalency of Heavy-Duty Diesel- and Alternatively Fueled Engines", Sierra Research Report No. SR01-12-03, prepared for Western States Petroleum Association, December 21, 2001.

"Review of U.S. EPA's Diesel Fuel Impact Model", Sierra Research Report No. SR01-10-01, prepared for American Trucking Associations, Inc., October 25, 2001.

"Operation of a Pilot Program for Voluntary Accelerated Retirement of Light-Duty Vehicles in the South Coast Air Basin," Sierra Research Report No. SR01-05-02, prepared for California Air Resources Board, May 2001.

"Comparison of Emission Characteristics of Advanced Heavy-Duty Diesel and CNG Engines," Sierra Report No. SR01-05-01, prepared for Western States Petroleum Association, May 2001.

"Analysis of Southwest Research Institute Test Data on Inboard and Sterndrive Marine Engines," Sierra Report No. SR01-01-01, prepared for National Marine Manufacturers Association, January 2001.

"Institutional Support Programs for Alternative Fuels and Alternative Fuel Vehicles in Arizona: 2000 Update," Sierra Report No. SR00-12-04, prepared for Western States Petroleum Association, December 2000.

"Real-Time Evaporative Emissions Measurement: Mid-Morning Commute and Partial Diurnal Events," SAE Paper No. 2000-01-2959, October 2000.

"Evaporative Emissions from Late-Model In-Use Vehicles," SAE Paper No. 2000-01-2958, October 2000.

"A Comparative Analysis of the Feasibility and Cost of Compliance with Potential Future Emission Standards for Heavy-Duty Vehicles Using Diesel or Natural Gas," Sierra Research Report No. SR00-02-02, prepared for Californians For a Sound Fuel Strategy, February 2000.

"Critical Review of the Report Entitled 'Economic Impacts of On Board Diagnostic Regulations (OBD II)' Prepared by Spectrum Economics," Sierra Research Report No. SR00-01-02, prepared for the Alliance of Automobile Manufacturers, January 2000.

"Potential Evaporative Emission Impacts Associated with the Introduction of Ethanol-Gasoline Blends in California," Sierra Research Report No. SR00-01-01, prepared for the American Methanol Institute, January 2000.

"Evaporative Emissions from Late-Model In-Use Vehicles," Sierra Research Report No. SR99-10-03, prepared for the Coordinating Research Council, October 1999.

"Investigation of Sulfur Sensitivity and Reversibility in Late-Model Vehicles," SAE Paper No. 1999-01-3676, August 1999.

"Future Diesel-Fueled Engine Emission Control Technologies and Their Implications for Diesel Fuel Properties," Sierra Research Report No. SR99-08-01, prepared for the American Petroleum Institute, August 1999.

"Analysis of Compliance Feasibility under Proposed Tier 2 Emission Standards for Passenger Cars and Light Trucks," Sierra Research Report No. SR99-07-02, July 1999.

"Comparison of the Properties of Jet A and Diesel Fuel," Sierra Research Report No. SR99-02-01, prepared for Pillsbury Madison and Sutro, February 1999.

"Investigation of Sulfur Sensitivity and Reversibility in Late-Model Vehicles," Sierra Research Report No. SR98-12-02, prepared for the American Petroleum Institute, December 1998.

"Analysis of New Motor Vehicle Issues in the Canadian Government's Foundation Paper on Climate Change – Transportation Sector," Sierra Research Report No. SR98-12-01, prepared for the Canadian Vehicle Manufacturers Association, December 1998.

"Investigation of the Relative Emission Sensitivities of LEV Vehicles to Gasoline Sulfur Content - Emission Control System Design and Cost Differences," Sierra Research Report No. SR98-06-01, prepared for the American Petroleum Institute, June 1998.

"Costs, Benefits, and Cost-Effectiveness of CARB's Proposed Tier 2 Regulations for Handheld Equipment Engines and a PPEMA Alternative Regulatory Proposal," Sierra Research Report No. SR98-03-03, prepared for the Portable Power Equipment Manufacturers Association, March 1998.

"Analysis of Diesel Fuel Quality Issues in Maricopa County, Arizona," Sierra Research Report No. SR97-12-03, prepared for the Western States Petroleum Association, December 1997.

"Potential Impact of Sulfur in Gasoline on Motor Vehicle Pollution Control and Monitoring Technologies," prepared for Environment Canada, July 1997.

"Analysis of Mid- and Long-Term Ozone Control Measures for Maricopa County," Sierra Research Report No. SR96-09-02, prepared for the Western States Petroleum Association, September 9, 1996.

"Technical and Policy Issues Associated with the Evaluation of Selected Mobile Source Emission Control Measures in Nevada," Sierra Research Report No. SR96-03-01, prepared for the Western States Petroleum Association, March 1996.

"Cost-Effectiveness of Stage II Vapor Recovery Systems in the Lower Fraser Valley," Sierra Research Report No. SR95-10-05, prepared for the Province of British Columbia Ministry of Environment Lands and Parks and the Greater Vancouver Regional District, October 1995.

"Cost of Stage II Vapor Recovery Systems in the Lower Fraser Valley," Sierra Research Report No. SR95-10-04, prepared for the Province of British Columbia Ministry of Environment Lands and Parks and the Greater Vancouver Regional District, October 1995.

"A Comparative Characterization of Gasoline Dispensing Facilities With and Without Vapor Recovery Systems," Sierra Research Report No. SR95-10-01, prepared for the Province of British Columbia Ministry of Environment Lands and Parks, October 1995.

"Potential Air Quality Impacts from Changes in Gasoline Composition in Arizona," Sierra Research Report No. SR95-04-01, prepared for Mobil Corporation, April 1995.

"Vehicle Scrappage: An Alternative to More Stringent New Vehicle Standards in California," Sierra Research Report No. SR95-03-02, prepared for Texaco, Inc., March 1995.

"Evaluation of CARB SIP Mobile Source Measures," Sierra Research Report No. SR94-11-02, prepared for Western States Petroleum Association, November 1994.

"Reformulated Gasoline Study," prepared by Turner, Mason & Company, DRI/McGraw-Hill, Inc., and Sierra Research, Inc., for the New York State Energy Research and Development Authority, Energy Authority Report No. 94-18, October 1994.

"Phase II Feasibility Study: Heavy-Duty Vehicle Emissions Inspection Program in the Lower Fraser Valley," Sierra Research Report No. SR94-09-02, prepared for the Greater Vancouver Regional District, September 1994.

"Cost-Effectiveness of Mobile Source Emission Controls from Accelerated Scrappage to Zero Emission Vehicles," Paper No. 94-TP53.05, presented at the 87th Annual Meeting of the Air and Waste Management Association, Cincinnati, OH, June 1994.

"Investigation of MOBILE5a Emission Factors, Assessment of I/M Program and LEV Program Emission Benefits," Sierra Research Report No. SR94-06-05, prepared for American Petroleum Institute, June 1994.

"Cost-Effectiveness of the California Low Emission Vehicle Standards," SAE Paper No. 940471, 1994.

"Meeting ZEV Emission Limits Without ZEVs," Sierra Research Report No. SR94-05-06, prepared for Western States Petroleum Association, May 1994.

"Evaluating the Benefits of Air Pollution Control - Method Development and Application to Refueling and Evaporative Emissions Control," Sierra Research Report No. SR94-03-01, prepared for the American Automobile Manufacturers Association, March 1994.

"The Cost-Effectiveness of Further Regulating Mobile Source Emissions," Sierra Research Report No. SR94-02-04, prepared for the American Automobile Manufacturers Association, February 1994.

"Searles Valley Air Quality Study (SVAQS) Final Report," Sierra Research Report No. SR94-02-01, prepared for North American Chemical Company, February 1994.

"A Comparative Study of the Effectiveness of Stage II Refueling Controls and Onboard Refueling Vapor Recovery," Sierra Research Report No. SR93-10-01, prepared for the American Automobile Manufacturers Association, October 1993.

"Evaluation of the Impact of the Proposed Pole Line Road Overcrossing on Ambient Levels of Selected Pollutants at the Calgene Facilities," Sierra Research Report No. SR93-09-01, prepared for the City of Davis, September 1993.

"Leveling the Playing Field for Hybrid Electric Vehicles: Proposed Modifications to CARB's LEV Regulations," Sierra Research Report No. SR93-06-01, prepared for the Hybrid Vehicle Coalition, June 1993.

"Size Distributions of Trace Metals in the Los Angeles Atmosphere," *Atmospheric Environment*, Vol. 27B, No. 2, pp. 237-249, 1993.

"Preliminary Feasibility Study for a Heavy-Duty Vehicle Emissions Inspection Program in the Lower Fraser Valley Area," Sierra Research Report No. 92-10-01, prepared for the Greater Vancouver Regional District, October 1992.

"Development of Mechanic Qualification Requirements for a Centralized I/M Program," SAE Paper No. 911670, 1991.

"Cost-Effectiveness Analysis of CARB's Proposed Phase 2 Gasoline Regulations," Sierra Research Report No. SR91-11-01, prepared for the Western States Petroleum Association, November 1991.

"Origins and Control of Particulate Air Toxics: Beyond Gas Cleaning," in Proceedings of the Twelfth Conference on Cooperative Advances in Chemical Science and Technology, Washington, D.C., October 1990.

"The Effect of Gasoline Aromatics on Exhaust Emissions: A Cooperative Test Program," SAE Paper No. 902073, 1990.

"Estimation of the Impact of Motor Vehicles on Ambient Asbestos Levels in the South Coast Air Basin," Paper No. 89-34B.7, presented at the 82nd Annual Meeting of the Air and Waste Management Association, Anaheim, CA, June 1989.

"Benzene/Aromatic Measurements and Exhaust Emissions from Gasoline Vehicles," Paper No. 89-34B.4, presented at the 82nd Annual Meeting of the Air and Waste Management Association, Anaheim, CA, June 1989.

"The Impact of Diesel Vehicles on Air Pollution," presented at the 12th North American Motor Vehicle Emissions Control Conference, Louisville, KY, April 1988.

"Exhaust Benzene Emissions from Three-Way Catalyst-Equipped Light-Duty Vehicles," Paper No. 87-1.3, presented at the 80th Annual Meeting of the Air Pollution Control Association, New York, NY, June 1987.

"Trends in Emissions Control Technologies for 1983-1987 Model-Year California-Certified Light-Duty Vehicles," SAE Paper No. 872164, 1987.

Comment Letter 5_F_ADF_POET Responses

ADF F5-1

The comment notes that on page 5, Item 8 of the Notice of Public Availability of Modified Text and Availability of Additional Documents on the Proposed Regulation on the Commercialization of Alternative Diesel Fuels (15-day Notice), a new exemption could result in additional air quality impacts. The full text of this item is provided as follows:

> Section 2293.6(a)(5)(C) was added to provide an exemption for producers or importers who are disproportionately impacted by restrictions on B6 and B20 sales. The exemption allows sales of B6 and B20 to be exempted from the in-use requirements as long as the fuel is supplied to fleets that do not operate heavy duty non-NTDE vehicles in the South Coast or San Joaquin Air Basins except during a declared state of emergency. Applications for this exemption must be submitted by January 1, 2017 and are limited to those producers or importers that sold a minimum of 750,000 gallons of B100 fuel in 2014, of which at least 40 percent was ultimately sold as B6 and B20 blends. This exemption could result in additional air quality impacts, which are described below under the heading "Additional Analysis to be Added to the Record."

The referenced "additional air quality impacts," do not include any impacts that were not previously analyzed in the draft EA. Any additions would still result in emissions below the baseline level. Similarly, the statement does not indicate any changes in the significance conclusions in the Draft EA for the proposed LCFS and ADF Regulations. Rather, the meaning of "impacts" in this context relates to an effect on modeling calculations. The intent is to disclose that calculations have been revised as a result of adding the proposed exemption to the rule-making. The revisions to calculations do not alter the environmental impacts or significance conclusions presented in the Draft EA.

Revisions to air quality calculations were based on updated baseline fuel volumes, revised assumptions related to the quantity of renewable diesel that would go to refineries, and new exemptions proposed in the 15-day revisions. Section H of the 15-day Notice, "Additional Analysis to be Added to the Record," describes updates to the NOx emissions associated with the proposed ADF Regulation. As described, new estimates in renewable diesel volumes became available for 2014, while the

most recent data at the time of the Draft EA preparation was from 2013. Calculations from these 2014 volume updates resulted in a small decrease in NOx emissions from biodiesel and as such less NOx benefits, when compared to values reported in the ISOR and Draft EA; however, the revised values still demonstrate that a net reduction in NOx emissions would occur with implementation of the proposed regulations, and thus the environmental impact conclusion for the purposes of CEQA (i.e., for the LCFS and ADF EA) would remain beneficial.

The comment states that the EA should be revised and updated to provide this new information, and recirculated for public review and comment. CEQA Guidelines Section 15088.5 (a), explains that recirculation is required when significant new information becomes available about a project, and gives the following examples:

1) A new significant environmental impact would result from the project or from a new mitigation measure proposed to be implemented.
2) A substantial increase in the severity of an environmental impact would result unless mitigation measures are adopted that reduce the impact to a level of insignificance.
3) A feasible project alternative or mitigation measure considerably different from others previously analyzed would clearly lessen the environmental impacts of the project, but the project's proponents decline to adopt it.
4) The draft EIR was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded.

There would be no new significant impacts or substantially more severe significant impacts; new mitigation measures are not required; and overall the Draft EA met the requirements set forth under ARB's certified regulatory program and complies with CEQA. Thus, the addition of the limited producer/exporter exemption to the regulation would not result in changes to the EA that warrant recirculation.

ADF F5-2

This comment states that certain information required to be included in the rulemaking file, or required to be made available pursuant to AB 1085, was not included or made available.

AB 1085, which is codified at Health and Safety Code section 39601.5, requires that certain information relied upon for proposed regulations be made available to the public before the start of the

public comment period. This provision does not require that the information be posted on ARB's website, though ARB has on occasion posted some of the materials described in section 39601.5 on a webpage created to hold AB 1085 materials. For the ADF rulemaking, as with other rulemakings, ARB complied with section 39601.5 by making its entire rulemaking file available for public inspection prior to the start of the 45-day comment period on the ADF Regulation. The Notice of Public Hearing, dated December 30, 2014, invited interested parties to contact ARB to inspect the rulemaking file, which contained the material that section 39601.5 requires be made available prior to the start of the public comment period.

Documents relied upon for the multimedia evaluation of biodiesel and renewable diesel were likewise included in the rulemaking file that was made available to the public. Reports that include multimedia evaluation documents, peer review comments and responses, and other materials submitted to the California Environmental Policy Council were duly noticed by ARB as additions to the rulemaking file that could be commented on by members of the public as part of ARB's notice of 15-day changes and availability of additional documents, dated May 22, 2015.

ADF F5-3

This comment states that compliance with the Administrative Procedure Act requires ARB to include more than the four documents that were specifically identified in a court order as needing to be included in the LCFS rulemaking file. ARB agrees with this statement, and included the required documents and many more documents in the rulemaking file, in compliance with the Administrative Procedure Act requirements.

ADF F5-4

The comment states that the 15-Day review period does not provide sufficient time for commenting parties to evaluate the modifications to the proposed ADF Regulation.

The 15-day comment period is consistent with Government Code section 11346.8.

In response to comments related to environmental effects associated with the 15-day Notice, please see response to comment **ADF F5-1**. As stated above, the changes associated with the 15-day Notice do not require recirculation of the EA.

ADF F5-5

The comment states that the EA should be recirculated because significant new information shows that the proposed ADF

Regulations would have greater impacts than previously disclosed. Specifically, the exemption was noted as a cause of greater NOx emissions.

The results of additional air quality analysis were considered in the 15-day notice, and showed that a net reduction in NOx emissions would still occur and, therefore, air quality impacts would remain beneficial. Please see response to comment **ADF F5-1**, **ADF F5-3**, **and ADF F5-18**.

ADF F5-6 The comment states that changes to the new exemptions in the ADF's biodiesel provisions that were included in the May 22, 2015 notice of proposed rulemaking were not insubstantial and were not sufficiently related to the original notice issued for the ADF Regulation, and would have potential environmental impacts. In response to environmental impacts associated with the 15-day Notice, please see response to comment **ADF F5-1**. ARB disagrees that the changes were not sufficiently related to the original notice issued by ARB. The December 30, 2014 notice informed the public of proposed requirements for the use of biodiesel and exemptions to those requirements. Changes to the biodiesel requirements themselves or to the exemptions to those requirements are sufficiently related to the notice. The notice broadly describes the provisions as follows:

> The proposed regulation also includes in-use requirements and fuel specifications for biodiesel as the first commercial alternative diesel fuel under the proposed regulation. The proposed biodiesel provisions are designed to ensure fuel quality, safeguard against potential increases in NOx emissions, and maintain enforceability of these requirements.

The notice did not identify details of the biodiesel requirements or what exemptions to those requirements were proposed by staff. Changes to the requirements and the exemptions to those requirements were sufficiently related to the notice's statement that ARB would consider new requirements for the fuel.

ADF F5-7 The comment notes that there would be greater NOx impacts from biodiesel, and smaller statewide reductions of NOx compared to the original regulation. Please see response to comment **ADF F5-1**.

ADF F5-8 The comment addresses consistency between MME and ISOR. The MME and the EA appropriately use different baselines as

required under the Multimedia requirements of HSC 43830.8 and CEQA Guidelines, respectively. The MME is required to compare the new fuel to the fuel it replaces; therefore CARB diesel without biodiesel was selected as the appropriate baseline for the purposes of the MME. For a discussion on the CEQA baseline please see **ADF 17-9**. More generally, the MME process does not duplicate the CEQA process, so it follows that there are differences between the MME for biodiesel and the EA prepared pursuant to CEQA. The MME involves a highly technical media-based inquiry that focuses on potential impacts from fuel specifications and fuel properties. The agencies involved in the evaluation decide what potential impacts warrant in-depth analysis as the evaluation progresses, with only a few types of impacts that are statutorily required to be examined in all evaluations.

The comments states that the data used in the MME is materially different from the data used in the ADF EA, specifically regarding data suggesting a statistically significant increase in NOx with biodiesel use. The documents relied upon for the ADF rulemaking, including the ADF ISOR, were referenced in the biodiesel MME, and were made available to the peer reviewers. Although the declaration by Jim Lyons submitted during the 45-day comment period was not specifically submitted to the peer reviewers, that declaration was available as a public document, and from all appearances, the analysis in the declaration relied upon the same studies cited in the ADF staff report and biodiesel MME. Please also see response **ADF 13-34**, which contains a reference to **ADF 8-1**.

For further response regarding review papers and other documents presented during the public review process, please see responses to comments **LCFS 46-235** through **LCFS 46-238** and **ADF 17-19** through **ADF 17-23**.

ADF F5-9

The comment states that the finding that the proposed ADF Regulation would not result in significant impacts is not supported by substantial, credible evidence, and cites two court opinions as supporting that opinion. ARB disagrees with this statement. In particular, the comment raises concerns about alleged discrepancies between the EA analysis with data compiled by ARB, and information and calculations from a comment letter submitted during public circulation of the Draft EA. The fact that a commenter disputes ARB's analysis does not translate into a discrepancy between ARB's own analyses of the proposed regulations, as the comment suggests. Please see Draft EA responses to comments

LCFS 46-235 through **LCFS 46-238** and **ADF 17-19** through **ADF 17-23** for a discussion related to the commenter's analysis of potential NOx emissions.

For the purposes of CEQA, substantial evidence is defined as "enough relevant information and reasonable inferences from … information that a fair argument can be made to support a conclusion, even though other conclusions might also be reached (CEQA Guidelines 15384[a])." The information provided in the Draft EA was based on the best available information and was compiled and analyzed by experts. Furthermore, the analysis was based on facts, reasonable assumptions predicated upon facts, and expert opinions supported by facts, which is consistent with the CEQA Guidelines definition of substantial evidence (CEQA Guidelines Section 15384[b]). For instance, Appendix B of the ISOR provides data, methodology, and assumptions associated with NOx impacts that could result from implementation of the proposed ADF Regulation.

Furthermore, CEQA Guidelines Section 15151 states that "[d]isagreement among experts does not make an EIR inadequate, but the EIR should summarize the main point of disagreement among the experts. The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure." The main points of disagreement associated with the commenter's previously submitted letter are described in responses to comments **LCFS 46-235** through **LCFS 46-238** and **ADF 17-19** through **ADF 17-23**.

In response to suggestions that the EA should be revised and recirculated, please see response to comment **ADF F5-1**.

ADF F5-10

The comment states that analysis of impacts associated with candidate alternative diesel fuels is improperly deferred, providing as evidence several cases that address piecemeal review, future studies or analysis, and rejection of feasible mitigation measures. The commenter seems to consider deferred analysis to be a potential issue due to Section 2293.5 of the proposed ADF Regulation, which addresses the phase-in requirements for new alternative diesel fuels.

ARB disagrees. ARB first notes that the "candidate ADF" referred to in the comment could be a fuel that ***currently does not exist and has yet to be invented even as a concept.*** In the absence of the ADF regulation, such a fuel could be invented in the future and

be used in unlimited quantities, whereas under the ADF, such a fuel's use would be limited and its effects must be studied.

Regarding the commenter's concern that the future analyses required by ADF lack sufficiently specific performance criteria, we note that the commenter suggests none. The ADF Regulation requires that prior to commercial-scale sales, the fuel must not result in adverse environmental effects greater than the fuel it is replacing (i.e., diesel). Absent a specific fuel or a specific environmental impact, the task of setting precise limits is impossible. Hypothetically, the ADF could have forbidden approval of new fuels that result in more than X grams of NOx per mile driven. Thus a new fuel with zero NOx emissions but copious plutonium emissions would pass – an absurd result. The future analysis must be sufficiently broad and flexible to address fuels that have not yet been conceived or produced.

The three-stage process created by the ADF Regulation addresses unknown future fuels in a thorough, stepwise fashion, avoiding absurd results. Under Stage 1, an evaluation of the chemical and physical properties of the fuel, as well as any available data associated with air emissions, would be used to determine if it could be evaluated under Stage 1.Testing would generate empirical data under real-world conditions to quantify the environmental and human health benefits of using new alternatives diesel fuels; determine whether these fuels have adverse environmental impacts relative to the effects of currently used, conventional diesel; and identify any vehicle/engine performance issues.

Stage 2 of the phase-in requirements, "Development of a Fuel Specification," would allow for limited, use of an alternative diesel fuel that has met the requirements of the Stage 1 pilot program. During development of a fuel specification, candidate fuels would undergo additional emissions and performance testing in a multimedia evaluation process to better characterize potential implications for air quality, the environment, and vehicular performance. This testing and assessment would be conducted pursuant to statute-directed, multimedia, evaluation procedures, leading to the development of a fuel specification. The multimedia evaluation would be the basis for determining, among other things, if a candidate fuel has potential adverse effects on air quality from criteria air pollutant emissions, and if mitigation requirements need to be considered (e.g., blending).

Under Stage 3 of the proposed ADF Regulations, there could be

two pathways for final evaluation before considering approval of the proposed fuel for commercial use. The Stage 3A pathway would apply to candidate alternative diesel fuel or candidate alternative diesel fuel blend has potential adverse emissions impacts. The Stage 3B pathway would be used for fuels that Stage 1 and 2 evaluations indicate would have no potential adverse emissions impacts, or impacts to public health or the environment.

If a fuel is subject to Stage 3B requirements, no statistically-significant adverse air emissions have been identified in the results of Stage 1 and Stage 2 evaluations. No further evaluation is required. Prior evaluations demonstrate that there is no foreseeable potential for an adverse environmental impact. In this case, the Executive Officer has the authority to decide whether to approve the proposed fuel for commercial use.

Fuel Specifications

The primary objective of the proposed ADF Regulation is to establish a comprehensive path to bring new or emerging diesel fuel substitutes to the commercial market in California. While it also establishes specific rules governing the use of biodiesel fuel to ensure its use would meet the program goals of protecting public health and the environment, it is not intended to determine the precise specifications for all candidate alternative diesel fuels. The specifications of alternative diesel fuels would be developed through the multimedia evaluation.

Health and Safety Code Section 43830.8 requires that ARB may not adopt any regulation that establishes a specification for motor vehicle fuel unless that regulation, and a multimedia evaluation conducted by affected agencies and coordinated by the state board, are reviewed by the California Environmental Policy Council established pursuant to subdivision (b) of Section 71017 of the Public Resources Code. The evaluation is based on the best available scientific data, written comments submitted by any interested person, and information collected by the state board. The state board prepares a written summary of the multimedia evaluation, which undergoes external scientific peer review (Health and Safety Code Section 57004).

Piecemealing Environmental Review

The comment expresses concern that CEQA review is piecemealed. Piecemeal CEQA review refers to splitting a large

project into small pieces. Inappropriately breaking apart, or piecemealing, the elements of a project description for environmental review violates CEQA, because the whole of the project needs to be evaluated. Environmental impacts may appear to be minimized if analyzed in pieces, while effects of greater consequence than reported would become apparent when examining the whole project. As discussed above, the proposed ADF Regulation is evaluated as a whole, including the phase-in requirements for new fuels where the proposed fuels are evaluated in a step-wise fashion with greater detail at each step. The stages of the phase-in requirements are extensive and result in a comprehensive evaluation. The steps include preliminary analysis, a thorough multimedia evaluation process, and, if needed, a rulemaking process. The EA addresses the whole of the project, at a programmatic level, in accordance with CEQA Guidelines Section 15168. As stated on page 4 of the Draft LCFS and ADF EA:

> 4. The level of detail of impact analysis is necessarily and appropriately general, because the nature of the proposed LCFS and ADF Regulations is programmatic. Furthermore, industry decisions regarding the specific location and design of new facilities and other infrastructure undertaken in response to the proposed regulations are speculative, if not impossible, to predict with precision, given the influence of other business and market considerations in those decisions and the numerous locations where those facilities might be built. Specific development projects undertaken in response to the proposed LCFS and ADF Regulations would undergo required project level environmental review and compliance processes.

Thus, because the Draft LCFS and ADF EA provides an overall, programmatic analysis to address the whole of the project, and because subsequent CEQA review may occur as appropriate for later activities that implement the proposed regulation, it is not a piecemealed environmental review.

The comment suggests that the phase-in requirements constitute deferred analysis. As discussed above, the proposed ADF Regulation contains phase-in requirements that would allow for commercialization of alternative diesel fuels. This staged approach would include additional environmental review, in compliance with CEQA, as necessary.

Because the potential alternative diesel fuels are unknown at this

time, the analysis is not deferred. It is not deferred analysis because it consists of a series of actions that are intended to determine if any adverse impact on the environmental or public health would result from use of a proposed alternative diesel fuel. To become commercialized, the fuel must not result in adverse environmental effects greater than the fuel it is replacing (i.e., diesel). In the case that in-use requirements are necessary, such as for biodiesel, rule-making activities would proceed.

ADF F5-11

The comment states that the phase-in requirement provided in the proposed ADF Regulation would result in improper piecemealing, which could overlook an aggregate significant impact of the entire project. The comment states that performance standards should be set that would ensure that significant increases in NOx emissions would not occur. Please see response to comment **ADF F5-10**, where performance standards associated with candidate alternative diesel fuels are discussed.

As described above, piecemealing is a concept in which a project description is divided into smaller parts, and analyzed as such, resulting in the potential to miss significant effects that would be apparent if the whole project is analyzed. It is most important under CEQA when the whole of the project would result in a significant environmental effect. The comment contends that this improper approach to CEQA review is being used for the proposed ADF Regulation, because it would allow for future alternative diesel fuels to be considered on the commercial market. If fact, the proposed regulation establishes a conservative, environmentally protective, step-wise approach to evaluate proposed new fuels, which covers the whole of the process from application to approval of a new alternative diesel fuel. Also, notably, under the existing regulatory framework, the process of reviewing and approving alternative diesel fuels is not prescribed or limited as to potential emissions, and does not control fuel content, efficiency, or effects on engine performance. The proposed regulation would result in a substantial improvement in environmental protection, compared to existing regulatory conditions.

Implementation of the proposed ADF Regulation would require extensive testing that would consist of a small-scale pilot program; larger-scale, peer-reviewed multimedia evaluations; and consideration of offsetting market, technology, and other existing factors associated with any potential pollutant emissions. If fuel specification and in-use requirements were needed to eliminate or

reduce the adverse air quality effects to less-than-significant levels, they would be subject to rulemaking activities with subsequent CEQA review. Fuels that would not result in the potential for adverse emissions impacts would still be subject to reporting and recordkeeping activities. Thus, the testing and evaluation process included in the proposed regulation is a comprehensive start-to-finish review framework for proposed new ADFs with a multi-stage, environmentally protective approach, and does not piecemeal environmental evaluation. If a candidate alternative diesel fuel is determined to result in a significant environmental effect, it would be disqualified from proceeding through to the next step of the approval process during the Stage 1, pilot program, or Stage 2, multimedia evaluation. The disqualification would occur because the Executive Officer must assess compliance with the environmental performance standard that significant environmental effects are not evident, based on the evaluation in each stage.

ADF F5-12

The comment states that because the Executive Officer would review future candidate alternative diesel fuels to determine if they would have negative environmental effects, it would be improperly delegating authority.

ARB's Executive Officer is authorized by statute to take final action on many issues within the Board's jurisdiction. Health and Safety Code section 29515(a) authorizes the board to delegate any duty to the executive officer that it deems appropriate, and Health and Safety Code section 39516 further provides that any power, duty, purpose, function, or jurisdiction that the board may lawfully delegate to the executive officer is conclusively presumed to have been delegated in the absence of board action to reserve that power, duty, etc. to itself. Board approval of the ADF Regulation as proposed by staff would provide express delegation by the board to the Executive Officer of authority to approve Stage 1, Stage 2, and Stage 3 approvals, and this delegation is consistent with provisions of law that define the Executive Officer's authority.

During Stage 1 and Stage 2, the Executive Officer would be implementing the testing evaluation process contained within the proposed ADF Regulation that would be adopted by the Board. The regulation does not require Board approval at these points in the process, so the Executive Officer's actions are fully covered by a previous Board action (i.e., approval of the regulation). If the Executive Officer approves the entry of a proposed fuel into the Stage 1 or Stage 2 processes, it would be a discretionary action

that would require CEQA review.

The CEQA review for approval to enter testing at Stage 1 or Stage 2 would be a later activity consistent with the adopted regulation and analyzed in light of the program-level evaluation within this EA. CEQA and CEQA Guidelines requirements for compliance would be followed. The nature of the CEQA review would be based on CEQA Guidelines Sections 15162 – 15164 regarding supplemental review, and Section 15168, describing the treatment of later activities after a program environmental document. If the Executive Officer finds that the Stage 1 or Stage 2 testing and evaluation is consistent with the regulation and does not result in any new significant effect or substantially more severe significant effect identified in the EA, then the CEQA compliance for approval to enter the stage can be covered entirely by reference to this EA. If minor, additional technical information is needed, an addendum to the EA may be prepared. Recognizing that for both Stage 1 and Stage 2, the Executive Officer must make a determination, as an environmental performance standard, that there is no evidence indicating a significant environmental effect may occur, more extensive CEQA review would not be expected (i.e., in accordance with the regulation, the proposed fuel would be disqualified from further testing, if this determination could not be made).

Under Stage 3 of the proposed ADF Regulations, there could be two outcomes. Stage 3A applies to fuels that could result in adverse air emissions; and Stage 3B results in fuels that would result in no potential adverse emissions.

If a fuel is subject to Stage 3A, ARB staff would be directed to conduct an evaluation to consider the effects of offsetting factors and the resultant effects that the use of the candidate alternative diesel fuel would have on criteria, toxic, or other air pollutants and resultant effects on air quality to set standards that would preclude any adverse effects on air quality. Offsetting factors could be marketplace, technology, or other conditions that would influence fuel emissions in commercial use. In the case that offsetting factors would not preclude any adverse effects on air quality, in-use requirements or other fuel specifications may be developed. In the case that these specifications are determined to be necessary, the fuel would go through the rulemaking process, which includes noticing, public hearing(s), and decision for approval by the Board. CEQA compliance in accordance with ARB's certified regulatory program would also occur for the rulemaking process.

If a fuel is subject to Stage 3B requirements, no potentially significant adverse air emission impacts have been identified. It has also passed through the Stage 2 multimedia evaluation with a conclusion that no other significant effects would occur. In this case, approval of the fuel for commercial use would be a discretionary action under CEQA that would not cause significant environmental effects. As a result, it may be eligible for a Class 8 categorical exemption for actions taken by a regulatory agency to protect the environment (CEQA Guidelines Section 15308) and/or a determination that it is within the program of the regulation evaluated in this EA (pursuant to CEQA Guidelines Section 15168). Also, in accordance with the proposed regulation, it would not go through formal rulemaking procedures and would, instead, be approved the Executive Officer.

ADF F5-13

The comment asserts that biodiesel is subject to a different baseline from other alternative diesel fuels. The commenter then states that the evaluation of impacts of biodiesel and other alternative diesels on different baselines would obscure the impacts of biodiesel. The CEQA Guidelines state that the baseline for determining the significance of environmental impacts would normally be the existing conditions at the time the environmental review is initiated (CEQA Guidelines 15125 (a)). In regards to biodiesel, determinations in the EA are based on a comparison of the potential environmental consequences of the proposed regulations with the existing regulatory setting and physical conditions in 2014 (see response to comments **ADF 17-9** and **LCFS 46-54** for more information). Impacts of future ADFs would similarly be evaluated under CEQA against a baseline of the current environmental conditions, at the time in which the environmental analysis begins. This approach complies with baseline requirements under CEQA and the CEQA Guidelines.

ADF F5-14

The comment suggests that ARB violated Health and Safety Code 57004 by not conducting a peer review of the regulation. ARB staff disagrees, as the ADF regulation did adhere to statutory requirements. The statutory requirement HSC 57004 required a peer review to be conducted on the scientific basis of a regulation. The multimedia evaluations for biodiesel and renewable diesel contain the scientific basis of the ADF regulations, which did undergo peer review pursuant to HSC 57004.

ADF F5-15

The comment claims that insufficient data was provided to support the NOx analysis in the 15-day notice. Please see response **ADF**

F5-1.

The comment claims that the limited producer/importer exemption proposed as part of 15-day changes could not have been reasonably anticipated based on the December 2014 notice of proposed rulemaking. The 15-day change in the exemption provision was sufficiently related to the original notice to be included as a revision to the regulation originally proposed. Please see response to **ADF F5-6.**

Please see response to **ADF F5-6** and **ADF F1-3**.

ADF F5-16

The comment states that necessary data to perform an assessment of the air quality impacts of the limited producer/importer exemption proposed as part of 15-day changes were not provided. Please see response **ADF F5-1**.

The comment states that the limited producer/importer exemption proposed as part of 15-day changes could adversely affect local air quality, using Sacramento as an example. Please see response **ADF F1-3 and F1-18.**

ADF F5-17

The comment claims that the only way to mitigate potential increased NOx emissions as a result of the limited producer/importer exemption proposed as part of 15-day changes would be to require per gallon blending of renewable diesel with any of the exempted biodiesel. Staff disagrees that there is potential for emissions increases since the exemption is limited to volumes that were used in 2014, and therefore disagrees that blending of renewable diesel with biodiesel is warranted. Please see response **ADF F1-3.**

ADF F5-18

The comment states that the NOx analysis in the 15-day notice is flawed because of the baseline it uses, and because NOx impacts from biodiesel must be evaluated against a baseline that includes no use of biodiesel. This comment confuses the existing-conditions baseline required by CEQA, which staff used in its staff report and EA, with the baseline applied during multimedia evaluations, which compare the alternative diesel fuel impacts to those of CARB diesel that it replaces. Please see response **ADF F5-8** and **ADF 17-4**.

ADF F5-19

The comment states that the NOx analysis in the 15-day notice is flawed due to reasons submitted in the 45-day comment period. Please see responses **ADF 17-18** through **ADF 17-23**.

ADF F5-20 The comment states that the baselines of the ADF Regulation and the biodiesel multimedia evaluation are inconsistent. Please see response to **ADF F5-8**.

ADF F5-21 The comment states that the data used in the MME is inconsistent with the data used in the ADF ISOR, specifically regarding data suggesting a statistically significant increase in NOx with biodiesel use. Please see response to **ADF F5-8**.

ADF F5-22 The comment states that records submitted as part of the 45-day comment period were not included in the MME staff report and should have been. Please see response to **ADF F5-8**.

This page intentionally left blank.

3. REFERENCES

1. Durbin, T.D. et al. *CARB Assessment of the Emissions from the Use of Biodiesel as a Motor Vehicle Fuel in California "Biodiesel Characterization and NOx Mitigation Study."* October 2011.

2. Durbin, T.D. et al. *CARB B20 Biodiesel Preliminary and Certification Testing.* July 2013.

3. Durbin, T.D. et al. *CARB Assessment of the Emissions from the Use of Biodiesel as a Motor Vehicle Fuel in California "Biodiesel Characterization and NOx Mitigation Study."* October 2011.

4. Durbin, T.D. et al. *CARB B20 Biodiesel Preliminary and Certification Testing.* July 2013.

5. Ginn, T.R. et al. *California Biodiesel Multimedia Evaluation Tier I Report*. September 2009.

6. Ginn, T.R. et al. *California Biodiesel Multimedia Evaluation Tier II Report on Aquatic Toxicity*, *Biodegradation, and Subsurface Transport Experiments.* January 2012.

7. Ginn, T.R. et al. *California Biodiesel Multimedia Evaluation Final Tier III Report*, June 2014.