Air Resources Board

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TO: Mary D. Nichols
Chairman

Honorable Board Members

FROM: James N. Goldstene
Executive Officer

DATE: May 19, 2010

SUBJECT: LOW CARBON FUEL STANDARD REGULATION UPDATE

This memorandum provides an update on the work associated with the Low Carbon Fuel Standard (LCFS) since the Air Resources Board (ARB/Board) approved the regulation April 23, 2009 by Resolution 09-31.

Following the Board's approval of the regulation, staff focused on completing the rulemaking process. The Office of Administrative Law (OAL) has reviewed and approved all facets of the Low Carbon Fuel Standard (LCFS) regulation and, as of April 15, 2010, it is now effective. As specified in the regulation, 2010 is a reporting year, with the first substantive requirements beginning in 2011. While significant work remains to be done, staff believes that the LCFS regulation is on pace for implementation in 2011.

The substantial effort necessary to complete the rulemaking package impacted staff's ability to fully address each of the follow-up items directed in the Resolution. However, staff has made progress in a number of areas and continues to work with stakeholders on program implementation. Attachment A discusses the status of major ongoing activities. In summary, staff has:

- Initiated an Expert Workgroup to address land use and other indirect effects;
- Issued guidelines for the development of new pathways, including an assessment of fuels that are likely to have no or minimal land use effects (See Attachment B);
- Initiated and continued the development of a web-based Reporting Tool for fuel producers to submit all requested data electronically;
- Issued a regulatory advisory in December 2009 to delay the first reporting period consistent with the ongoing development of the web-based Reporting Tool;

- Established a voluntary process for biorefineries to document a fuel's carbon intensity and physical pathways;
- Developed a working group to address sustainability issues and prepared a sustainability workplan (See Attachment C);
- Continued efforts to develop air quality guidance for the siting of biorefineries; and
- Continued the development of fuel specifications for E85, compressed natural gas, and biodiesel/renewable diesel for presentation to the Board later this year.

Recently, researchers from Purdue University released a new report on indirect land use work that was done for Argonne National Laboratory. We are currently reviewing that work. In that work, the researchers varied a number of parameters, which resulted in a range of values that are 1/2 to 1/3 lower than ARB's published average value. However, the values generated were generally within the range of results that ARB found in running various sensitivities. The Purdue work will be folded into our ongoing evaluation of the indirect land use analysis through the ARB's Expert Workgroup. In the Expert Workgroup, national and international experts, including representatives from Purdue University and biofuel producers, are evaluating the major parameters that can affect the results. We expect to present a report on this evaluation by the end of the year.

The regulation requires two reviews of the LCFS program: the first to be completed and presented to the Board by January 1, 2012, and the second by January 1, 2015. An advisory panel to assist with the reviews must be formed by July 1, 2010, with representatives of the California Energy Commission, the California Public Utilities Commission, fuel providers, storage and distribution infrastructure owner/operators, consumers, engine and vehicle manufacturers, environmental justice organizations, environmental groups, academia, public health, and others. Staff is currently in the process of developing the advisory panel.

We will continue to provide updates to the Board as the overall effort progresses. If you have any questions or would like to discuss progress on the LCFS further, please contact me at (916) 445-4383 or jgoldste@arb.ca.gov.

Attachments

Attachment A

Summary of Progress on the Implementation of the Low Carbon Fuel Standard

Attachment A
Summary of Progress on the Implementation of the Low Carbon Fuel Standard

This attachment provides detail on the progress that staff has made on the Low Carbon Fuel Standard (LCFS) since the Air Resources Board (ARB/Board) approved the regulation in April 2009. This update focuses on the status of activities identified in Resolution 09-31 (the Resolution), but also includes updates on other significant activities.

In addition to commencing work on the Resolution items, staff has completed the LCFS rulemaking process. This included a substantial effort preparing the Final Statement of Reasons (FSOR) for the Office of Administrative Law (OAL). Among other requirements, the FSOR must include written responses to every written and oral comment submitted during the formal public comment periods. The FSOR was over 1,000 pages and was submitted to OAL in two parts. The first part, and main submittal, addressed virtually all of the provisions of the regulation; OAL approved this submittal on January 12, 2010, and the regulation became effective on the same day.[1] The second part addressed the addition of two fuel pathways (i.e., conversion of Midwest soybeans to biodiesel and conversion of Midwest soybeans to renewable diesel) and a severability clause to the regulation. OAL approved this submittal on April 15, 2010, and these parts of the regulation became effective on the same day.[2] Consequently, the regulation is now fully effective.[3]

As the rulemaking process concluded, staff shifted efforts to focus on the Resolution items, and progress continues to be made in this area. We have organized this document by ten topic areas for which progress on the Board's direction as well as other LCSF implementation milestones are provided. The topics areas discussed in the remainder of this document are as follows:

I. Expert Workgroup
II. Guidelines for New Pathways
III. Reporting Tool
IV. Sustainability
V. Biorefinery Registration
VI. Air Quality Guidance for Siting Biorefineries
VII. Rulemakings for Fuel Specifications
VIII. Provisions for Regulated Parties of Electricity
IX. Credits for Off-Road Electric Vehicles
X. Other Activities

[1] http://www.arb.ca.gov/regact/2009/lcfs09/lcfsfsor.pdf
[2] http://www.arb.ca.gov/regact/2009/lcfs09/lcfsfsorsupp2.pdf
[3] The regulation is codified at title 17, California Code of Regulations, section 95480-95490

Since the Board approved the LCFS regulation, staff has held two public workshops, conducted individual meetings with stakeholders, and consulted with other agencies such as the California Energy Commission (CEC) and the California Public Utilities Commission (CPUC). Public comments concerning the above topics are posted online for public review.[4]

I. Expert Workgroup

In the Resolution, the Board directed the Executive Officer to convene an Expert Workgroup to assist the Board in refining and improving the land use and indirect effect analysis of transportation fuels. This workgroup will evaluate key factors that might impact the land use values for biofuels including agricultural yield improvements, co-product credits, land emission factors, food price elasticity, and other relevant factors. The Executive Officer is coordinating this effort with similar efforts by the U.S. Environmental Protection Agency, European Union, and other agencies pursuing an LCFS.

Staff initiated efforts to convene the LCFS Expert Workgroup in August 2009. A preliminary proposal for the workgroup was shared with stakeholders and discussed during a workshop in August 2009. This proposal contained staff's recommendations for the structure of the workgroup, the proposed member criteria and selection process, and potential topics for discussion. Subsequent member recruitment efforts took into consideration stakeholder feedback on the preliminary proposal.

The official solicitation for members was released on September 17, 2009. We also received member nominations from several stakeholders including BP America, Illinois Corn Growers Association, California Grain and Feed Association, Brazilian Sugarcane Industry Association, California Department of Food and Agriculture (CDFA), and Conoco Phillips. For these recommendations, only those that submitted applications were considered.

The Expert Workgroup was established in February 2010. The workgroup is comprised of 30 members (see Table 1), including eight representatives of other agencies involved in LCFS-type activities. Technical expertise to tackle major issues of concern was a key consideration in our selection of members. The individuals invited to participate in the Expert Workgroup are world class specialists and represent a breadth of experience in their respective disciplines. The selected individuals come from diverse stakeholder groups such as government agencies, academic institutes and national laboratories, the biofuel and oil industries, and environmental groups.

[4] http://www.arb.ca.gov/lispub/comm/bccommlog.php?listname=lcfs09

Table 1. Low Carbon Fuel Standard Expert Workgroup Members List

Name	Affiliation
Robert Fletcher (chair)	Air Resources Board
James Duffy (co-chair)	Air Resources Board
Robert Larson	U.S. Environmental Protection Agency
Vincent Camobreco	U.S. Environmental Protection Agency
Michelle Manion	Northeastern States for Coordinated Air Use Management
Jim McKinney	California Energy Commission
Paul Wuebben	South Coast Air Quality Management District
Paul Hodson	European Union
Jay E. Noel	Representing CDFA (Cal/Poly)
Don O'Connor	Representing CDFA (S&T Consultants)
Zia Haq	US Department of Energy
Harry Baumes	US Department of Agriculture
Bruce Babcock	Iowa State University
Uwe Fritsche	Oeko-Institut, Germany
Holly K. Gibbs	Stanford University
Angelo C. Gurgel	Universidade De Sao Paulo, Brazil
Stephen R. Kaffka	University of California, Davis
Keith Kline	Oak Ridge National Laboratory
Seth Meyer	University of Missouri
Steffen Mueller	University of Illinois at Chicago
Michael O'Hare	University of California, Berkeley
John Sheehan	University of Minnesota
Wally Tyner	Purdue University
Sonia Yeh	University of California, Davis
Blake Simmons	Sandia National Laboratories
Richard Nelson	Kansas State University
Jeremy I. Martin	Union of Concerned Scientists
Phil Heirigs	Chevron Global Downstream LLC
Jesper Hedal Kløverpris	Novozymes A/S, Denmark
Mark Stowers	POET, LLC

The first meeting of the Expert Workgroup was held on February 26, 2010. The meeting was open to the public and webcast. Members of the public provided insightful comments during designated periods. The workgroup members identified the most critical topics to address for the coming meetings. Eight working subgroups were formed with each subgroup focusing on one of the following topics:

- Elasticity Values
- Co-Product Credits
- Land Cover Types
- Uncertainty
- Indirect Effects of Fuels Other than Biofuels
- Carbon Emission Factors
- Time Accounting
- Comparative and Alternative Modeling Approaches

As part of their work, the subgroups' responsibilities include identifying the sources of data, evaluating key assumptions including how the assumptions can be validated, and establishing what boundaries to place on such data. Their work is also expected to include specific recommendations to facilitate continued improvements to the LCFS regulation. Each subgroup developed a workplan[5] that was discussed at the April 8, 2010, meeting of the Expert Workgroup. Over the next six months, the subgroups will focus on implementing their respective workplans while periodically discussing progress at subsequent meetings of the Expert Workgroup.

Additional meetings of the workgroup will be held every 4 to 6 weeks through the end of the year. The meetings will be public and will be webcast. A facilitator from California State University, Sacramento, assists in running the meetings. A draft report of findings is expected by mid-October 2010. Based on the findings of the Expert Workgroup, staff will return to the Board in December 2010 with regulatory amendments or recommendations, if appropriate, on approaches to address issues identified.

In early April, researchers from Purdue University (Purdue) released a new report on indirect land use work that was done for Argonne National Laboratory. We are currently reviewing that work. In that work, the Purdue researchers varied a number of parameters, which resulted in a range of values that are 1/2 to 1/3 lower than ARB's published average value. However, the values generated were generally within the range of results that ARB found in running various sensitivities.

The Purdue work will be folded into our ongoing evaluation of the indirect land use analysis through the ARB's Expert Workgroup. On April 20, we sent this and another Purdue paper that was published in March to the Expert Workgroup and associated list serve and posted the papers on our website. At the next Expert Workgroup meeting in June, Purdue researchers will make a presentation on their work so that all members will have an understanding of what they did and what assumptions they have made.

For more information on the Expert Workgroup, see the following link:
http://www.arb.ca.gov/fuels/lcfs/workgroups/ewg.

II. Guidelines for New Pathways

The Board directed the Executive Officer to develop guidelines to assist fuel providers in applying for new pathways and subpathways. The guidelines give fuel providers the information they need in order to work effectively with staff to add additional fuel pathways to the LCFS lookup table(s).

The first draft of the guidelines was presented for comment at a workshop held in August 2009. The comments received were incorporated into a revised version and made available for public comment at a workshop in January 2010. Based on additional comments received, staff revised the guidelines and posted a new version dated

[5] http://www.arb.ca.gov/fuels/lcfs/workgroup/expertworkgroup.htm

March 25, 2010. Revisions to the document will be made on an ongoing basis to reflect experience gained from the review of pathway applications as well as the availability of new studies. The guidelines document is included as Attachment B.

The guidelines document contains information on the following:

- Procedures to establish new fuel pathways (Methods 2A and 2B);
- Procedures to determine land use changes or other indirect effects;
- Identification of fuels and feedstocks with little or no land use change impacts;
- ARB priorities for further development of pathways;
- Considerations applicable to a future certification program (so that pathway approval does not require rulemaking); and
- Approaches to evaluate high carbon intensity crude oil

The Environmental Defense Fund submitted comments requesting the guidelines document be used as a tool to develop a database of field level characteristics that facilitate overall fuel emissions reductions. Staff is evaluating the feasibility of this and whether it can be done as part of this activity or as part of the sustainability effort.

Also, an informal workgroup consisting of representatives from the oil industry, environmental associations, academia, and other government agencies has been established to further develop approaches to evaluate the carbon intensities of crude oils. Recommendations from this workgroup will be incorporated into the guidelines document.

III. Compliance Reporting Tool

As specified in the regulation, 2010 was designed to be a reporting year. In this year, staff would work with stakeholders to establish procedures for reporting information and identify any regulatory changes that were necessary to ensure a smooth transition to compliance with the substantive requirements beginning in 2011. An integral part of this effort is the development of a web-based reporting tool for fuel producers to use in reporting the information necessary to establish compliance with the carbon intensity requirements. This tool is referred to as the LCFS Compliance Reporting Tool (Reporting Tool).

The Reporting Tool will allow regulated parties to submit all requested data electronically. Regulated parties will be able to use the Reporting Tool to electronically manage accounts, enter or import fuel data, submit electronic reports and corrections, and track credits and deficits. The major components of the Reporting Tool have been developed but have not yet been completely tested and there are a number of interface and reporting functions that still need to be developed and tested.

ARB staff began internal testing of the Reporting Tool in late January 2010. Industry user acceptance testing is scheduled to begin in May 2010. The current contract used to develop the Reporting Tool ended in late January. A Request for Quotation has been

developed and has been posted on BidSync (a website for government contracts). Staff expects that a new contract will begin in May. The new contract will allow contractors to complete Phase I of the project, which includes all functionality for the regulated party to report the necessary information and limited functionality for ARB administration. Phase II includes the maintenance and operation of the regulated party interface and development of the full ARB administrative pages. Phase III, anticipated to begin later in 2010, will include additional functionality for credit trading that will be integrated into the regulated party-facing pages developed in Phase I.

As the web-based tool is not completed, a regulatory advisory was issued in December 2009 that provided a grace period to regulated parties. To ensure that regulated parties have sufficient time and opportunity to become familiar with the Reporting Tool and use it to submit their reports, additional time is provided pursuant to the advisory. Staff is working closely with the fuel providers on identifying and addressing data reporting requirements and may recommend regulatory amendments as appropriate in December 2010. In addition, staff is working with stakeholders to develop a second advisory that will further extend the grace period for reporting in 2010 as we continue to develop the compliance reporting tool.

IV. Sustainability

As part of the resolution, the Board directed staff to work with the Interagency Forest Work Group, appropriate state agencies, environmental advocates, regulated parties, and other interested stakeholders to prepare a workplan for developing sustainability provisions to be used in implementing the LCFS regulation. The workplan is to provide a framework for how sustainability provisions could be incorporated and enforced in the LCFS program, and was to include a schedule for finalizing feasible and appropriate sustainability provisions by no later than December 2011

Staff has worked with the stakeholders and drafted a sustainability workplan, provided as Attachment C. In addition, staff has established an informal workgroup to help develop the draft sustainability provisions. As the draft provisions are developed, they will be made available for comment at public workshops, culminating in recommendations on sustainability provisions to be presented to the Board.

In a related effort, staff will address the use of woody biomass for biofuel production. While the federal Renewable Fuel Standard (RFS2) excludes biomass from federal lands as being eligible "renewable biomass," staff has not followed that approach; excluding federal forests would take more than half of California's potential forest biomass off the market. Furthermore, because of the variety of forests found in the State, having one fuel pathway for woody-biomass biofuels would be impractical. Therefore, staff proposes to develop a procedure through which woody-biomass project proponents can calculate their carbon intensities for LCFS compliance. The environmental sustainability of a specific project would be addressed in a similar fashion.

V. Biorefinery Registration

To facilitate consistency in the reporting of carbon intensities, staff developed a voluntary process to register facilities that produce ethanol or biomass-based diesel fuel under the LCFS program. The purpose of the registration process is to document a fuel's carbon intensity and initial demonstration of physical pathway (route of fuel transportation from point of production to California) for biofuels transported to California from biofuel producers that may not be subject to reporting requirements. This information will be used by regulated parties to assist with their reporting requirements. Specifically, regulated parties with an obligation to reduce the carbon intensity of their fuels under the LCFS program will have an incentive to buy fuels with lower carbon intensity to meet regulatory requirements.

In February 2010, ARB began registering facilities that produce biofuels such as ethanol or biomass-based diesel fuel that may be sold in California. As part of this effort, biofuel producers provide information about their facility including plant processes, feedstocks, and any co-products produced in order to identify the appropriate CI, using values from the LCFS Lookup Table. The registration form also allows the biofuel producers to show the route, mode of transportation, and documents showing an actual delivery of fuel to California to provide an initial demonstration of the physical pathway. As of mid-April, about 35 facilities had submitted registration forms.

VI. Air Quality Guidance for Siting Biorefineries

The Board directed the Executive Officer to work with local air districts, regulated parties, environmental organizations, public health experts and other stakeholders to develop a "best practices" guidance document. This document is intended for use by siting authorities when they are considering the siting of biofuel and other fuel production facilities in California to assess and mitigate air quality impacts of these facilities. The guidance is non-regulatory and is intended to be an informational document that could assist regulatory agencies and others in making permitting decisions. It will also provide information so that biorefineries are constructed and operated in a way that minimizes air quality impacts.

The primary purpose of the guidance document is to identify the lowest permitted emission levels for individual pieces of process equipment used at biorefineries. The document could be used as a starting point in permit evaluations, but is not intended to substitute for air district case-by-case permitting decisions or establish new best available control technology emission levels.

While the document will focus on stationary sources of emissions, staff will also provide general guidance on available measures for mitigating mobile source emissions at biorefineries, which would typically include strategies to reduce the air quality impacts of vehicle traffic to and from these sites.

Staff has formed a workgroup with representation from the air districts, industry, and environmental and health-based organizations that is providing technical-level review and input to staff during the development of the guidance. The workgroup has met six times to date and staff will continue to convene as needed.

The American Lung Association, Center for Energy Efficiency and Renewable Technology, Coalition for Clean Air, and the Environmental Defense Fund encourage staff to accelerate completion of the document. In addition, they requested that staff consider special provisions for single or clustered biofuel facilities in areas that are already disproportionately affected by pollution, potential impacts on the guideline of ongoing work to identify "disadvantaged" communities, limits on toxic air pollutant emissions, and specific recommendations on land use practices and distance parameters to avoid increasing health impacts in local communities. Staff will continue to work with all stakeholders, including the local air districts, in addressing these and other issues.

As part of considering the above recommendations, staff has collected and is in the process of reviewing data from in-state and out-of-state biorefinery air quality permits and environmental impact reports; local, state, and federal best available control technology clearinghouses; adopted and proposed air district rules, guidance, and policies that address emissions from equipment used at biorefineries; and land use planning documents. Staff is also in the process of following up on source test results and vendor guarantees to the extent that they may help support the achievability of permitted emission levels. This data is integral to the formation of the guidelines; however, the process of obtaining the data is time consuming and has resulted in a delay in completing the first draft of the guidelines. Staff expects to release a draft document in the late summer or fall, with presentation of the document to the Board in December 2010.

VII. Rulemakings for Fuel Specifications

The LCFS, itself, is not a fuel specification. Any fuel that plays a role in the LCFS and is not already subject to a fuel specification will have to undergo its own fuel specification process. The following is a brief description of the fuel specification rulemakings that will occur in 2010. It is expected that these rulemakings will be presented to the Board this fall. These fuels, in most cases, are necessary to meet the goals of the LCFS.

Specifications for biodiesel/renewable diesel are being developed to preserve the benefits of California diesel. In an effort to facilitate meeting the LCFS goals, staff is also preparing recommended amendments to the E85 (gasoline with 85% ethanol) specifications. Finally, to provide additional flexibility while preserving the emissions benefits, staff is developing amendments to the compressed natural gas motor vehicle specifications.

VIII. Provisions for Regulated Parties of Electricity

In the Resolution, the Board directed staff to continue working with the CPUC, electric utilities, oil refiners, and other stakeholders to review the provisions applicable to regulated parties for electricity and propose amendments, if appropriate, to the LCFS regulation. As a result, staff held meetings and workshops with the CEC, the CPUC, the California Electric Transportation Commission, third party electricity providers, refiners, utilities, and the public to discuss related issues.

In the meantime, the CPUC initiated a rulemaking process to consider alternative-fueled vehicle tariffs, infrastructure, and policies to support California's greenhouse gas emissions reduction goals.[6] The rulemaking schedule contains three phases; CPUC expects Phases 1 and 2 to be complete within the next 18 months. Staff is participating in the process and will identify potential LCFS regulatory changes based on the outcome of the CPUC rulemaking.

Several environmental organizations including the Center for Energy Efficiency and Renewable Technology, Friends of the Earth, and the Natural Resources Defense Council provided comments suggesting that ARB staff participate closely in the CPUC rulemaking proceedings which are considering plug-in vehicles, utilities, and third-party infrastructure providers. The environmental organizations would also like ARB staff to consider how the LCFS could be structured to incent better environmental outcomes, promote electric transportation, ensure electric transportation load is managed with minimal adverse impact to the grid, and minimize costs of electric transportation to utility customers. Staff will continue to participate with the CPUC and consider options for addressing these issues in the LCFS.

In addition, revised regulatory language has been suggested by environmental groups and others that would modify the hierarchy of recipients of LCFS credits generated by electricity regulated parties. Suggested language varies significantly in who would be the primary recipient of credits. Staff is working to reconcile the suggested language and will continue to consider options to develop the most equitable credit assignment for regulated parties.

Finally, the LCFS regulatory language for electricity transportation fuel was modified in a 15-day change notice. The modified language added the requirement for regulated parties to use meters to measure fuel use if the meters are installed In addition, an allowance was made for approving alternative estimation methods to be used prior to January 1, 2015, at which time meters will be required in all cases.

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[6] CPUC – "Assigned Commissioner's Scoping Memo," January 12, 2010; http://docs.cpuc.ca.gov/efile/RULC/112302.pdf

IX. Credits for Off-road Electric Vehicles

In the Resolution, the Board directed the Executive Officer to work with electric utilities, environmental advocates, and other stakeholders to further evaluate the feasibility of generating credits for electricity used in non-road transportation sources. These include new categories and applications of electric forklifts and other similar non-road vehicles and equipment. Staff made presentations at public workshops in August 2009 and January 2010 on the work done to date evaluating inventory information, reviewing regulatory and grant program requirements, and acquiring information from the Industrial Truck Association.

Staff will develop criteria for LCFS credits from off-road electric transportation, such as forklifts, scrubbers, and sweepers using this information. Resolving on-road electric vehicle issues, where we expect the majority of electricity credits to be generated, is the current priority. We expect to propose criteria for LCFS credits from off-road electric vehicles by the end of 2010.

X. Other Activities

The Resolution also directed staff to coordinate LCFS implementation with other activities to reduce greenhouse gas emissions, especially in the development of a cap-and-trade program, and to ensure that the use of electricity as a transportation fuel is appropriately encouraged. Staff is coordinating with the Office of Climate Change regarding the development of the cap-and-trade program. This is critical as the LCFS is based on reducing the carbon intensity of transportation fuels on a full lifecycle basis and does not include a cap on emissions from the use of such fuels. The initial activities regarding the appropriate use of electricity as a transportation fuel are discussed in section IX. In addition, LCFS staff is coordinating with staff developing the Renewable Electricity Standard proposal.

Finally, the Resolution directed staff to develop a fee schedule associated with the process to modify the carbon intensity lookup table by adding new or modified pathways. The information necessary to develop and propose such a fee is being compiled in preparation for discussion at a future public meeting.

Attachment B

Establishing New Fuel Pathways Under the California Low Carbon Fuel Standard Procedures and Guidelines for Regulated Parties

Establishing New Fuel Pathways under the California Low Carbon Fuel Standard

Procedures and Guidelines for Regulated Parties

March 25, 2010

Table of Contents

Establishing New Fuel Pathways under the California Low Carbon Fuel Standard

Procedures and Guidelines for Regulated Parties

I. Introduction

On April 23, 2009 the California Air Resources Board (ARB/Board) approved the California Low Carbon Fuel Standard (LCFS).[1] The LCFS establishes a compliance schedule which requires fuel providers to reduce the carbon intensity of the fuels they provide each year between 2011 and 2020. The 2020 carbon intensity level is ten percent below the baseline 2010 level. "Carbon intensity" is the total greenhouse gas emissions from the production, transport, storage, dispensing and use of a fuel. It is expressed as grams of carbon-dioxide-equivalent per mega joule of fuel energy (gCO_2e/MJ) In the context of the LCFS, the term 'carbon intensity' refers to the full lifecycle greenhouse gas emissions associated with a specific fuel 'pathway '

The LCFS requires regulated fuel providers to determine the carbon intensity of the fuel they provide, and to report that information to ARB using the procedures described in the LCFS regulation, and summarized in this guidance document. Once a provider's fuel carbon intensity has been approved by the Executive Officer, ARB uses that information to determine whether providers are in compliance with the regulation. Most transportation fuels sold in California are subject to the provisions of the LCFS. Exceptions are made for very low-volume, non-biomass-based fuels, and fuels used in aircraft, racing vehicles, military vehicles, certain locomotives, and certain ocean-going vessels. Regulated parties must report the carbon intensities of the fuels they provide using a table of Board-approved carbon intensity values (a "lookup table") found in §95486(b)(1) of the LCFS Regulation. The first set of fuel carbon intensities added to the lookup table were developed by ARB staff, and approved by the Board. The ARB developed a set of core fuel pathways in order to facilitate the implementation of the LCFS: implementation could have been substantially delayed if providers currently supplying fuel to the California market were required to obtain approval for their pathways before they could begin reporting under the regulation. Carbon intensities outside of the core set developed by staff, however, will primarily be the responsibility of fuel providers. The guidelines appearing in this document give fuel providers information they need in order to work effectively with staff to add additional fuel pathways to the LCFS lookup table(s).

II. Establishing New Fuel Pathways

Regulated parties may use one of two methods to determine the fuel carbon intensities they report under the LCFS. Under Method 1, regulated parties select carbon intensity values from the fuel carbon intensity lookup table found in §95486(b)(1) of the LCFS Regulation. Under Method 2, any person or group, whether a regulated party or not, may seek Board or Executive Officer approval of additional fuel pathways or sub-

[1] CCR Title 17, §95480, 95480 1, 95481, 95482, 95483, 95484, 95485, 95486, 95487, 95488, and 95489

pathways. If a proposed pathway or sub-pathway is approved, it is added to the lookup table, and becomes available to all regulated parties. The use of a new pathway or sub-pathway may begin as soon as it has been added to the lookup table.

In general, a fuel provider will determine and report a fuel carbon intensity as follows:

1. Determine the direct life cycle carbon intensity of the fuel using the CA-GREET model (see Section II B, below).
2. Consult the LCFS lookup table to determine whether it contains a reportable pathway value. A fuel provider may report using a value from the lookup table if
   - The pathway from which the lookup table value was derived is generally the pathway the fuel provider used to produce the fuel. A carbon intensity from a hydrogen pathway, for example, may not be used to report the carbon intensity of a renewable biodiesel fuel
   - The lookup table carbon intensity is closer to the provider's carbon intensity value than any other candidate value, without being lower than the provider's value.
3. If a reportable value is found in the lookup table, the provider may report that value to the ARB, subject to the approval of the Executive Officer. This would constitute a Method 1 report
4. If no reportable value exists in the lookup table, the provider must apply to the Executive Officer for a new pathway or sub-pathway under Method 2B. The Lookup Table will not contain a reportable value if the provider's fuel was produced using a new pathway that is not yet represented in the lookup table.
5. If the provider locates a reportable value in the look-up table, but is not satisfied with that value, he or she may (if certain conditions are met) apply for a new sub-pathway value using Method 2A.

Method 2 is subdivided into Methods 2A and 2B. Under Method 2A, regulated parties may apply for the addition of new sub-pathways to the lookup table. A sub-pathway is a modified versions of a pathway currently present in the table. New sub-pathways are added when a fuel provider can demonstrate that a new or improved fuel production, transport, storage, and/or dispensing process significantly reduces the lifecycle carbon intensity of the existing pathway. Method 2B provides for the establishment of an entirely new fuel pathway. Such a pathway could yield an entirely new class of fuel, or it could describe an entirely new process for producing an existing fuel

The purpose of this document is to provide regulated parties who wish to add new or modified pathways to the LCFS lookup table with the guidance they need to efficiently and effectively complete the application process. One of the stated goals of the LCFS is to incentivize the development of lower carbon fuels for the California transportation market. As those fuels become available, their pathways must be added to the lookup table before they can begin earning credits for fuel providers. As such, ARB staff has designed the application process to be as streamlined as possible, while retaining the

necessary scientific and technical rigor. Regulated parties who closely follow these procedures can expect the full and timely cooperation of ARB staff in processing and evaluating their applications.

A. Overview of The Method 2A and 2B Application Processes

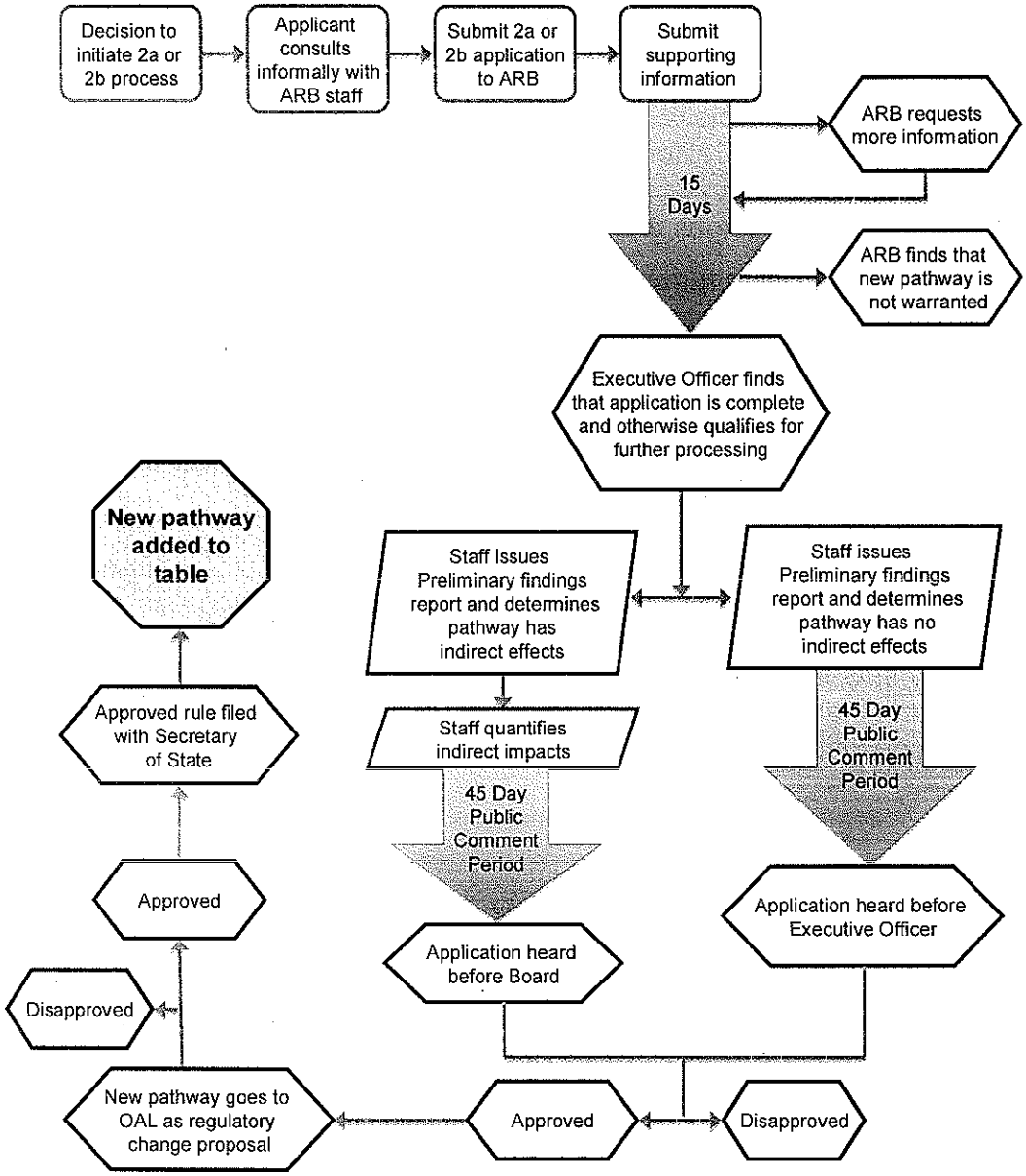
The LCFS fuel pathway lookup table is included in the LCFS regulation. The general process for revising or amending California regulations is as follows:

- Release the proposed changes to the public for a 45-day comment period;
- Conduct a public hearing to formally consider adoption of the proposed changes;
- If the proposed changes are approved by the rulemaking entity (the Board, in this case), they are forwarded to the Office of Administrative Law for consideration;
- Only after the Office of Administrative Law approves the proposed rules, and those rules are filed with the Secretary of State, do they become effective.

In the case of modifications to the LCFS lookup table, the Board has delegated certain authorities to the Executive Officer: so long as the proposed lookup table revisions do not involve new or revised indirect land use change emissions (or emissions from other indirect effects), the public hearing to consider those revisions may be held before the Executive Officer. Whenever a Method 2A or 2B application involves new or changed indirect effects, including land use change, the regulatory hearing must be conducted before the Board, as described in Section III, below.

A schematic of the application and approval processes is shown in Figure 1.

Figure 1: Schematic of the Method 2A and 2B Application and Approval Process



B. Method 2A Application Procedures

Under Method 2A, regulated parties may apply for the establishment of a new fuel sub-pathway. A regulated party may apply for a new sub-pathway if supplies a currently regulated fuel, but does so using a process that is similar—but not identical—to an existing process. A process improvement in which natural gas or coal requirements are significantly reduced by a conversion to combined heat and power could, for example, produce enough of a carbon intensity reduction to warrant the establishment of new sub-pathway (a change of at least five gCO2e/MJ is required, as described below). A

sub-pathway is created by incrementally modifying an existing pathway rather than by developing an entirely new pathway (which would be covered under Method 2B). A sub-pathway is created by re-calculating the lifecycle carbon intensity of an existing fuel pathway by revising one or more of the inputs to the models used to calculate fuel carbon intensity. The LCFS regulation requires the use of the California Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (CA-GREET) model to calculate 'direct' pathway emissions (emissions generated by the production, transportation, storage, and dispensing of the fuel). Land use change impacts are evaluated using the Global Trade Analysis Project (GTAP) model (or an equivalent estimation method). Although applicants are required to calculate revised direct emissions using CA-GREET, the ARB is responsible for estimating land use change emissions, as described in section III, below.

Applicants estimate direct pathway emissions by revising CA-GREET input values to reflect revised fuel production, transport, storage, and/or dispensing processes Proposed modifications can only be approved if they are supported by appropriate scientifically defensible documentation, and meet other criteria, as described below.

The following discussion focuses primarily on the formal application, evaluation, and decision process. In order to expedite the application process, however, applicants are strongly urged to meet with ARB staff prior to initiating a Method 2A application. At a pre-application meeting, the prospective applicant can describe the proposed sub-pathway in detail to staff. The applicant may also submit preliminary documentation to staff for review. Staff, in turn, can begin to provide the applicant with a list of the specific types of information it will need in order to evaluate the applicant's proposal. Following the informal meeting, the applicant can continue to provide staff with additional information and to seek staff's guidance during the application development and evaluation processes.

(1) How to Apply

To apply for the establishment of a new sub-pathway, a fuel provider must:

- Fill out and submit a Method 2A application. The application form is a secure web-based application, available at http://www.arb.ca.gov/fuels/lcfs/.[2] It is designed to be completed and submitted on-line. The following information is required:
    - Identification and contact information: the applicant's name, affiliation (usually a fuel production or distribution firm), mailing address, e-mail address, phone number, fax number and LCFS Business Partner identification code (which will be used to identify regulated parties in the LCFS reporting database).

[2] The application form will be added to the web when Guidelines are approved.

- The phone numbers and e-mail addresses of those who will be working with ARB on the development and evaluation of the proposed new sub-pathway.
- The existing fuel sub-pathway (or sub-pathways) to which the proposed new sub-pathway would be most closely related.
- The revised CA-GREET input values that would be used to generate the carbon intensity value for the new sub-pathway.
- The carbon intensity value that results from running CA-GREET using the revised inputs specified in item c, above.
- A detailed discussion of how each revised CA-GREET input relates to the revised physical fuel pathway used to produce the fuel for which a new sub-pathway is being requested. This discussion should begin with a clear and thorough overview of the revised production, storage, transport, and dispensing processes in the new sub-pathway. This overview should fully describe and identify all new equipment used in the proposed new pathway.
- The annual volume of fuel that would be produced using the proposed new sub-pathway.
- The energy content of the fuel that would be produced using the proposed new sub-pathway. The lower heating value, in units of mega joules, should be reported.
- Compositional differences, if any, between the fuel that will be produced using the proposed sub-pathway, and the fuel produced using the most closely related sub-pathway (or sub-pathways). If compositional differences are identified, the GHG and criteria pollutant impacts of those differences (if any) must be fully described.
- The range of production volumes over which the proposed pathway carbon intensity value is valid. Energy-based, per-unit GHG emission levels will not always be constant over all production volumes. The sub-pathway application must specify the production volume range to which the proposed carbon intensity value applies. The applicant must submit documentation supporting this applicability range. Data and documentation submission requirements are described below.
- The potential land use change impacts (if any) associated with the proposed sub-pathway. The applicant should state whether or not the proposed sub-pathway is likely to generate the same land use change impacts as the existing sub-pathway to which it is most closely related. A brief discussion for the rationale behind this conclusion should then be provided. As described in Section III, below, ARB will make the final land use change impact determination. Note that applicants may submit applications for sub-pathways that differ from similar sub-pathways only in the area of potential land use change emissions. Such sub-pathways will only be approved if the process changes which reduce land use change

impacts are verifiable, durable, and capable of being easily monitored (see Section III).

- Submit documentation supporting the establishment of the proposed new sub-pathway. The information submitted will be used to determine whether the proposed sub pathway meets ARB's minimum requirements for substantiality and scientific defensibility. As such, it is only necessary to document those aspects of the proposed sub-pathway that are different from the most closely related existing pathway. It is not necessary to document pathway elements that are unchanged from the corresponding elements in the existing pathway Electronic files should be submitted using the secure LCFS file upload service available at the application web site (https://www.arb.ca.gov/fuels/lcfs/). ARB requests that as many files as possible be submitted in electronic form. Spreadsheets and similar files that contain calculated values must be submitted with all formulas intact and accessible to ARB evaluators. The files submitted will be preserved in their original forms for reference purposes. ARB evaluators will use copies of the original submissions in the evaluation process. Applicants are asked to submit the following documentation, at a minimum. Any additional documentation that directly supports the proposed new sub-pathway should also be submitted.
    - The official manufacturer's technical specifications of new equipment that contributes to the reported carbon intensity reductions.
    - Technical drawings, schematics, flow diagrams, maps, and other graphical representations describing the proposed process changes.
    - Technical papers reporting the results of pertinent greenhouse gas (GHG) emission studies. These could be articles from peer-reviewed journals, unpublished university or consulting reports, or studies that were prepared under contract to the applicant. If actual historical emissions data are not available, emissions projections are acceptable If projections rather than empirical measurements submitted, they must be clearly identified as projections
    - Emissions monitoring data not otherwise submitted. This could be data from governmental regulatory entities, or data collected by entities testing or using the proposed equipment and processes.
    - Spreadsheets, data files, and similar files documenting the quantitative lifecycle analysis behind the carbon intensity value for the proposed new pathway. Except where it is impossible to do so, the applicant must submit files of this type electronically, via the LCFS upload site. All such files must be submitted in a format that permits full and unimpeded access to all the data, formulas, and calculations they contain. In general, files of this type should be submitted in their native formats CA-GREET files, in particular, must not be converted to any other format If format conversions appear to be warranted in order to permit or improve access, the applicant must obtain ARB approval before proceeding with the proposed conversions.

- A preliminary determination concerning the likelihood that the proposed sub-pathway will create new and significant land use change impacts or other indirect impacts. See section III, below, for a discussion of how to reach a preliminary indirect effects determination, and of ARB's process for evaluating that determination.

Once staff has received the applicant's full submittal package, they will evaluate that information to determine whether the proposal meets the most basic criteria for the establishment of a new sub-pathway. Those criteria include, but are not limited to the following:

- Is the proposed sub-pathway sufficiently distinct from related pathways, or are the proposed process changes too few and/or too minor to constitute a new sub-pathway?
- Are the direct lifecycle emissions from the proposed sub-pathway based only on new direct lifecycle parameters that are subject to evaluation using the GREET model?
- Is the application likely to meet the Method 2A substantiality requirements (discussed below)?
- Is the application likely to meet the Method 2 scientific defensibility requirements (discussed below)?
- Is enough of the submitted material available for public review, or has too much of it been classified as trade secrets?

If the application is found to clearly not meet one or more of these criteria, it will be rejected, and the applicant will be provided with a document describing the basis of the rejection. This document will inform the applicant that rejected applications may be revised and resubmitted.

The purpose of this initial screening step is to identify those packets that are clearly deficient, and that should not continue through the evaluation process. Packets will not be rejected at this stage if they meet this very basic set of criteria.

(2) Evaluation Criteria

The applicant's Method 2A submittal will be evaluated against the following criteria:

- *Substantiality*
  - A new sub-pathway will only be approved if the applicant can demonstrate that the volume of fuel that will be produced using the proposed sub-pathway will rise to at least ten million gasoline-gallon-equivalents per year within about five years from the onset of production. Under some circumstances, such as the need to overcome technical challenges, a somewhat longer time horizon may be acceptable. Before using a time horizon greater than five years, however, the application should obtain

written approval from the Executive Officer. At the applicant's discretion, the production volume analysis may consider all producers likely to use the proposed sub-pathway over the time horizon considered. If the applicant's firm can be shown to be reasonably likely to meet this requirement on its own, the inclusion of additional firms in the analysis will not be necessary. The factors that must be considered in the applicant's production projections are the following:

i. Available feedstock supply

ii. Production plant capacity

iii. Fuel distribution and dispensing system and infrastructure

iv. Supply of vehicles capable of utilizing the fuel produced under the proposed sub-pathway

v. Economics: will production, transportation, and dispensing costs (and any other relevant factors) permit the resulting finished fuel to be affordable to the end consumer (taking into consideration the costs of competing fuels) and sufficiently profitable to producers and suppliers? This analysis must include a sensitivity analysis showing that fuels produced using the proposed pathway can remain competitive in the California market under a wide (but reasonable) range of production costs and competing fuel prices.

- The applicant must demonstrate that the proposed new sub-pathway will yield a carbon intensity improvement of at least five gCO_2e/MJ over the existing sub-pathway to which the proposed sub-pathway most closely related. This carbon intensity improvement is calculated on a 'well-to-tank' (or 'source-to-tank') basis: all fuel lifecycle emissions except those resulting from the combustion of the fuel must be included.

- *Scientific Defensibility*
  - The minimum standard against which the Scientific Defensibility of a proposed new sub-pathway is measured is the robustness of the data and analysis on which the existing values in the lookup table are based. The LCFS regulation states, at §95486(e)(1)(A), that a new pathway is deemed to be scientifically defensible if the carbon intensity value it yields is at least as robust as the values currently in the lookup table. This robustness derives from the strength of the scientific and technical data behind those lookup table values.
  - The regulation provides an example of a method by which the scientific defensibility of a proposed new pathway can be demonstrated: publication of an article describing that pathway in a major, well-established and peer-reviewed scientific journal such as Science, Nature, Journal of the Air and Waste Management Association, or the Proceedings of the National Academies of Science (§95486(e)(1)(B)). Applicants should note, however, that the Executive Officer will consider

articles published in other journals, as well as unpublished reports, submitted by the applicant. Regardless of the source of the article or report, staff will consider the soundness of the data and the strength of the analysis in deciding the value of such sources in meeting the scientific defensibility criterion.

- If the applicant does not publish a description of the proposed new sub-pathway, as described above, staff will evaluate the scientific defensibility of that pathway by, first, verifying all information submitted by the applicant for authenticity. This will consist of checking the information submitted against original sources wherever this is possible (e.g., confirming the authenticity of manufacture's data) Once the authenticity of all submissions has been verified, those submissions will be evaluated to determine whether they adequately support the creation of the proposed new fuel sub-pathway. All calculations will be replicated and evaluated for appropriateness; selected results will be sent to expert third-parties for evaluation; equipment manufacturers will be asked to confirm that the technical specifications submitted are current and still considered to be valid, etc. Because the burden of demonstrating scientific defensibility is on the applicant, issues that arise during the evaluation process will be referred to the applicant for resolution.
- In general, the applicant for a method 2A sub-pathway is only obligated to establish the scientific defensibility of the specific CA-GREET input parameters that will change under the proposed sub-pathway. In some cases, however, it may be necessary to establish a defensible basis for ***not*** changing additional CA-GREET inputs. If, for example, the proposed sub-pathway includes a new combined heat and power component, and no electricity is being generated and sold to the grid, it may not be clear why process energy inputs do not decrease.

- *Other*
  - Before the proposed new sub-pathway can be approved, the Executive Officer must find that the pathway is not already present in the lookup table.
  - Before the proposed new pathway can be approved the, Executive Officer must reach a determination that CA-GREET is capable of being modified to accurately calculate the carbon intensity of the proposed new pathway. If the Executive Officer cannot reach such a finding, the applicant will be required to use Method 1 to determine the carbon intensity of the fuel.
  - The applicant must identify information it considers to be trade secrets in its Method 2A submittal. The pathway application and supporting documentation, except the information that the applicant identifies as consisting of trade secrets, are subject to public disclosure. The Executive Officer shall treat the trade secrets identified by the applicant in accordance with 17 CCR §§ 91000-91022 and the California Public Records Act (Government Code section 6250 et seq.). In deciding on

what information to designate as secret, however, applicants must consider the public nature of the rulemaking process. New sub-pathways can be approved only if enough information is available publicly to justify that approval. Once a sub-pathway is approved and added to the lookup table, other regulated parties may use the new pathway to report their fuel carbon intensities if they can demonstrate that the new pathway best describes their processes Such use by other regulated parties is unrestricted.

- The Executive Officer can request additional information, as needed, in the evaluation of the Method 2A application.
- Any use of carbon intensity values derived from a Method 2A application in any submittal to ARB, including quarterly and annual LCFS compliance reports, before the Board or the Executive Officer issues a written approval of the proposed new pathway constitutes a violation of the LCFS.

(3) Completeness

The Executive Officer has 15 calendar days to determine whether a Method 2A application is complete enough to proceed to a full pathway evaluation. If the Executive Officer determines that an application is sufficiently complete to proceed to a full evaluation, the applicant will be notified of this determination. If an application is deemed to be incomplete, the Executive Officer will notify the applicant in writing of that determination. That notification will identify the deficiencies identified in the application. An applicant notified of a deficiency may submit the missing information. Upon receipt of that information, the Executive Officer will, within 15 days, determine whether the newly submitted information renders the application sufficiently complete to proceed to a full evaluation. If the Executive Officer again finds the application to be incomplete, the notification/re-submittal/re-evaluation process can repeated. Otherwise, the application will move to the full pathway evaluation phase of the process.

Applications approved for a full pathway consideration are posted to ARB's LCFS web site for public review. The public review period will last a minimum of 30 calendar days.

(4) Preliminary Findings

Staff will evaluate the applicant's submittal package and prepare a set of preliminary findings. These findings will be released in the form of a preliminary staff report which will cover the following points, at a minimum.

- The extent to which the proposed CA-GREET input changes accurately describe the process that will actually be used to produce the affected fuel.
- The extent to which the direction and magnitude of the proposed CA-GREET input changes are reasonable and are adequately supported by the information submitted.

- The applicant's ability to meet the substantiality requirements described above.
- The likelihood that the proposed sub-pathway will create new or increased land use change or other indirect impacts.

Once it is approved internally, the preliminary findings document will be released to the applicant for comment. If a final draft acceptable to both staff and the applicant can be prepared, that draft will serve as Initial Statement of Reasons in the subsequent public hearing process (described in the following section). The preliminary findings document will contain staff's findings concerning the indirect impacts (if any) associated with the proposed sub-pathway. If staff finds that the sub-pathway will involve new or revised indirect impacts, those impacts will be quantified using the Global Trade Analysis Project (GTAP) or an equivalent model, and the results will be added to the final draft of the Initial Statement of Reasons. A finding that the proposed sub-pathway will entail new or revised indirect impacts will make it necessary for the public hearing to be held before the Board rather than the Executive Officer.

(5) Public Hearing and Subsequent Rulemaking Process

Regardless of whether a Method 2A application is heard before the Executive Officer or the Board, the formal rulemaking process established under the California Administrative Procedures Act must be followed before the LCFS lookup table can be modified. The steps in the rulemaking process are the following:

- ARB publishes a notice of proposed rulemaking in the California Regulatory Notice Register. The publication of this notice initiates a 45-day comment period on the addition of the proposed sub-pathway to the LCFS lookup table.
- At the end of the 45-day comment period, ARB convenes a public hearing to consider the proposed sub-pathway. If the Initial Statement of Reasons (discussed in the previous section) found that the proposed sub-pathway does not entail new or revised indirect impacts, the proposal will be heard before the Executive Officer. If the Initial Statement of reasons found that new or revised indirect impacts would be involved, the proposal will be heard before the Board.
- The public hearing culminates with a decision on the part of either the Executive Officer or the Board concerning the adoption of the proposed sub-pathway. The possible decisions are approve, disapprove, and approve subject to specified revisions. The applicant will be notified of the outcome in writing, and the results will be posted to the LCFS web site. If an application is not approved, the letter informing the applicant of that finding will describe the basis of the disapproval.
- If approval comes with a requirement for substantive revisions to the sub-pathway proposal, staff and the applicant must complete the required revisions, and initiate a 15-day comment period on those changes. A public hearing is not required following a 15-day comment period, but one may be held

in some cases. ARB is obligated to fully consider all comments received during the comment period in deciding on the proposed revisions.

- ARB must respond to all comments received during the original 45-day comment period, and any subsequent comment periods. Those responses are compiled into a document known as a Final Statement of Reasons.
- The Final Statement of Reasons, and other pertinent rulemaking documents, are submitted to the California Office of Administrative law, which is the body responsible for rendering a final decision on all proposed California regulations.
- Within 30 days the Office of Administrative Law must either approve the proposed rule and forward it to the Secretary of State for publication, or disapprove the proposal and return it to the ARB for correction.
- If the Office of Administrative Law rejects a proposed sub-pathway, ARB has 120 days to correct the problems that triggered the rejection. A 15-day comment period is automatically initiated in this case.

A schematic of the application and approval processes is shown in Figure 1. More than one Method 2 application can move through the system at the same time. Two or more applications may be heard at the same hearing.

C. Method 2B Application Procedures

Under Method 2B, regulated parties may apply to the Executive Officer for the establishment of an entirely new fuel pathway. New pathways are not modifications of existing pathways, as are Method 2A sub-pathways. Pathways approved under Method 2B constitute entirely distinct pathways, and become the first pathways in what may become a new family of sub-pathways. Like Method 2A sub-pathways, Method 2B pathways are created using the ARB's carbon intensity determination tools: CA-GREET and GTAP (or an equivalent model).

A new pathway would be needed if an entirely new fuel formulation were brought to market, or if an entirely new process were used to produce an existing fuel. No pathway currently exists for biodiesel from algae, for example. Before algal biodiesel can be marketed in California, therefore, a supplier of that fuel will need to apply for a new pathway using Method 2B.

The following discussion focuses primarily on the formal Method 2B application, evaluation, and decision process. In order to expedite the application process, however, applicants are strongly urged to meet with ARB staff prior to initiating a Method 2B application. At a pre-application meeting, the prospective applicant can describe the proposed pathway in detail to staff. The applicant may also submit available preliminary documentation to staff for review. Staff, in turn, can begin to provide the applicant with a list of the specific types of information it will need in order to evaluate the applicant's proposal. Following the informal meeting, the applicant can

continue to provide staff with additional information and to seek staff's guidance during the application development process.

A schematic of the application and approval processes is shown in Figure 1.

(1) How to Apply

The Method 2B application process is similar to the Method 2A process. Applicants must:

- Fill out and submit a Method 2B application. The application form is a secure web-based application, available at http://www.arb.ca.gov/fuels/lcfs/.[3] It is designed to be completed and submitted on-line. The following information is required:
    - Identification and contact information: the applicant's name, affiliation (usually a fuel production or distribution firm), mailing address, e-mail address, phone number, fax number and Business Partner identification code (used to identify regulated parties in the LCFS reporting database).
    - The phone numbers and e-mail addresses of those who will be working with ARB on the development and evaluation of the proposed new sub-pathway.
    - A complete description of the proposed new pathway
        - The nature of the fuel (electricity, hydrogen, liquid alcohol, liquid hydrocarbon, compressed hydrocarbon gas, etc.) that would be produced using the proposed new pathway.
        - The feedstock or feedstocks that would be used to produce the proposed fuel. The process of producing, extracting, or otherwise acquiring this feedstock must also be described.
        - The fuel's production, transport, storage, and dispensing processes
        - Characteristics of the vehicles that will use the fuel.
        - Expected production volumes.
        - The CA-GREET input values that would be used to generate the carbon intensity value for the new sub-pathway.
    - A detailed discussion of how each CA-GREET input relates to the physical fuel pathway for which a new lookup table value is being requested.
    - The carbon intensity of the fuel that would be produced using this proposed new pathway, as estimated by CA-GREET.

[3] The application form will be added to the web when Guidelines are approved

- The energy content of the fuel that would be produced using the proposed new sub-pathway. The lower heating value, in units of mega joules, should be reported.
- Compositional differences, if any, between the fuel that will be produced using the proposed sub-pathway, and the fuel produced using the most closely related sub-pathway (or sub-pathways). If compositional differences are identified, the GHG and criteria pollutant impacts of those differences (if any) must be fully described
- The range of production volumes over which the proposed pathway carbon intensity value is valid. Energy-based, per-unit GHG emission levels will not always be constant over all production volumes. The sub-pathway application must specify the production volume range to which the proposed carbon intensity value applies. The applicant must submit documentation supporting this applicability range. Data and documentation submission requirements are described below.
- Competing uses of the feedstock. This requirement applies primarily to fuels that will be produced from feedstocks that have not previously been used for fuel production. If the feedstock to be used for fuel production will be diverted from another use, the quantity that is diverted from the competing use would have to be at least partially replaced with a substitute raw material. The acquisition and use of that substitute material may generate GHG emissions that would be charged to the fuel
- The potential land use change impacts (if any) associated with the proposed pathway. If the land use change impacts of the proposed pathway are expected to be similar to those associated with an existing pathway, the applicant should identify that pathway, and describe why the two are likely to generate similar land use change impacts. In any case, applicants should provide a brief discussion of the rationale behind their conclusions concerning the likely land use change impacts of the pathways they propose. Applicants should be aware that processes and practices having the potential to reduce land use change impacts will be considered by ARB only if they are verifiable, durable, and capable of being easily monitored. As described in Section III, below, ARB will make the final land use change impact determination.

- Submit documentation supporting of the establishment of the proposed new pathway. The information submitted will be use to determine whether the proposed pathway meets the ARB's minimum requirements for scientific defensibility. Electronic files should be submitted using the secure LCFS file upload service available at https://www.arb.ca.gov/fuels/lcfs/. ARB requests that as many files as possible be submitted in electronic form. All spreadsheets and similar files that contain calculated values must be submitted with all formulas intact and accessible to ARB evaluators. The files submitted will be preserved in their original forms for reference purposes. ARB evaluators will use copies of the original submissions in the evaluation process. Applicants are asked to submit

the following documentation, at a minimum. Any additional documentation that directly supports the proposed new sub-pathway should also be submitted.

- The official manufacturer's technical specifications of new equipment that contributes to the GHG reductions from the proposed new pathway
- Technical drawings, schematics, flow diagrams, maps, and other graphical representations describing the proposed process change.
- Technical papers reporting the results of pertinent greenhouse gas (GHG) emission studies. These could be articles from peer-reviewed journals, unpublished university or consulting reports, or studies that were prepared under contract to the applicant. If actual historical emissions data are not available, emissions projections are acceptable. If projections rather than empirical measurements submitted, they must be clearly identified as projections
- Emissions monitoring data not otherwise submitted. This could be data from governmental regulatory entities, or data collected by entities testing or using the proposed equipment and processes.
- Spreadsheets, data files, and similar files documenting the quantitative lifecycle analysis behind the carbon intensity value for the proposed new pathway. Except where it is impossible to do so, the applicant must submit files of this type electronically, via the LCFS upload site. All such files must be submitted in a format that permits full and unimpeded access to all the data, formulas, and calculations they contain. In general, files of this type should be submitted in their native formats. CA-GREET files, in particular, must not be converted to any other format. If format conversions appear to be warranted in order to permit or improve access, the applicant must obtain ARB approval before proceeding with the proposed conversions.
- A preliminary determination concerning the likelihood that the proposed sub-pathway will create new and significant land use change impacts or other indirect impacts. See section III, below, for a discussion of how to reach a preliminary indirect effects determination, and of ARB's process for evaluating that determination.

Once staff has received the applicant's full submittal package, they will evaluate that information to determine whether the proposal meets the most basic criteria for the establishment of a new pathway. Those criteria include, but are not limited to the following:

- Is the proposed new pathway sufficiently distinct from other pathways, or is the proposed process merely a variant of one or more processes used in other pathways?

- Are the direct lifecycle emissions from the proposed sub-pathway based only on new direct lifecycle parameters that are subject to evaluation using the GREET model?
- Is the application likely to meet the Method 2 scientific defensibility requirements (discussed below)?
- Is enough of the submitted material available for public review, or has too much of it been classified as trade secrets?

If the application is found to clearly not meet one or more of these criteria, it will be rejected, and the applicant will be provided with a document describing the basis of the rejection. This document will inform the applicant that rejected applications may be revised and resubmitted

The purpose of this initial screening step is to identify those packets that are clearly deficient, and that should not continue through the evaluation process. Packets will not be rejected at this stage if they meet this very basic set of criteria.

(2) Evaluation Criteria

The applicant's Method 2B submittals will be evaluated against the following criteria:

- *Scientific Defensibility*:
    - The minimum standard against which the Scientific Defensibility of a proposed new sub-pathway is measured is the robustness of the data and analysis on which the existing values in the lookup table are based. The LCFS regulation states, at §95486(e)(1)(A), that a new pathway is deemed to be scientifically defensible if the carbon intensity value it yields is at least as robust as the values currently in the lookup table. This robustness derives from the strength of the scientific and technical data behind the lookup table values.
    - The regulation provides an example of a method by which the scientific defensibility of a proposed new pathway can be demonstrated: publication of an article describing that pathway in a major, well-established and peer-reviewed scientific journal such as Science, Nature, Journal of the Air and Waste Management Association, or the Proceedings of the National Academies of Science (§95486(e)(1)(B)). Applicants should note, however, that the Executive Officer will consider articles published in other journals, as well as unpublished reports, submitted by the applicant. Regardless of the source of the article or report, staff will consider the soundness of the data and the strength of the analysis in deciding the value of such sources in meeting the scientific defensibility criterion.
    - If the applicant does not publish a description of the proposed new pathway, as described above, staff will evaluate the scientific defensibility

of a proposed new pathway by, first, verifying all information submitted by the applicant for authenticity. This will consist of checking the information submitted against original sources wherever this is possible (e.g., confirming the authenticity of manufacture's data). Once the authenticity of all submissions has been verified, those submissions will be evaluated to determine whether they adequately support the creation of the proposed new fuel pathway. All calculations will be replicated and evaluated for appropriateness; selected results will be sent to expert third-parties for evaluation; equipment manufacturers will be asked to confirm that the technical specifications submitted are current and still considered to be valid, etc. Because the burden of demonstrating the scientific defensibility is on the applicant, issues that arise during the evaluation process will be referred to the applicant for resolution.

- In order for the Board or the Executive Officer to approve the proposed new pathway, staff must reach a finding that the proposed CA-GREET input changes accurately describe the process that will actually be used to produce the affected fuels, and that the direction and magnitude of the proposed input changes are reasonable and adequately supported by the information submitted. That finding, if reached, will be documented, and a copy of the document provided to the applicant.

- *Other*
  - Before the proposed new pathway can be approved the Executive Officer must find that the pathway is not already present in the lookup table.
  - Before the proposed new pathway can be approved the Executive Officer must reach a determination that CA-GREET is capable of being modified to accurately calculate the carbon intensity of the proposed new pathway. If the Executive Officer cannot reach such a finding, the applicant will be required to use either Method 1 or Method 2A to determine the carbon intensity of the fuel.
  - The applicant must identify information it considers to be trade secrets in its Method 2B submittal. The pathway application and supporting documentation, except the information that the applicant identifies as consisting of trade secrets, are subject to public disclosure. The Executive Officer shall treat the trade secrets identified by the applicant in accordance with 17 CCR §§ 91000-91022 and the California Public Records Act (Government Code section 6250 et seq.). In deciding on what information to designate as secret, however, applicants must consider the public nature of the rulemaking process. New sub-pathways can be approved only if enough information is available publicly to justify that approval. Once a sub-pathway is approved and added to the lookup table, other regulated parties may use the new pathway to report their fuel carbon intensities if they can demonstrate that the new pathway best describes their processes. Such use by other regulated parties is unrestricted

- The Executive Officer can request additional information, as needed, during the evaluation of the Method 2B application.
- Any use of carbon intensity values derived from a Method 2A application in any submittal to ARB, including quarterly and annual LCFS compliance reports, before the Board or the Executive Officer issues a formal written approval of the proposed new pathway constitutes a violation of the LCFS.
- Unlike Method 2A applications, Method 2B applications are not subject to substantiality requirements.

(3) Completeness

The Executive Officer has 15 calendar days to determine whether a Method 2B application is complete enough to proceed to a full pathway evaluation. If the Executive Officer determines that an application is sufficiently complete to proceed to a full evaluation, the applicant will be notified of this determination. If an application is deemed to be incomplete, the Executive Officer will notify the applicant in writing of that determination. That notification will identify the deficiencies identified in the application. An applicant notified of a deficiency may submit the missing information. Upon receipt of that information, the Executive Officer will, within 15 days, determine whether the newly submitted information renders the application sufficiently complete to proceed to a full evaluation. If the Executive Officer again finds the application to be incomplete, the notification/re-submittal/re-evaluation process can repeated. Otherwise, the application will move to the full pathway evaluation phase of the process.

Applications approved for a full pathway consideration are posted to ARB's LCFS website for public review. The public review period will last a minimum of 30 calendar days.

(4) Preliminary Findings

Staff will evaluate the applicant's submittal package and prepare a set of preliminary findings. These findings will be released in the form of a preliminary staff report which will cover the following points, at a minimum.

- The extent to which the proposed CA-GREET input changes accurately describe the process that will actually be used to produce the affected fuel
- The extent to which the direction and magnitude of the proposed CA-GREET input changes are reasonable and are adequately supported by the information submitted.
- The likelihood that the proposed pathway will create land use change or other indirect impacts.

Once it is approved internally, the preliminary findings document will be released to the applicant for comment. If a final draft acceptable to both staff and the applicant can be prepared, that draft will serve as Initial Statement of Reasons in the subsequent public

hearing process (described in the following section). The preliminary findings document will contain staff's findings concerning the indirect impacts (if any) associated with the proposed sub-pathway. If staff finds that the sub-pathway will involve indirect impacts, those impacts will be quantified using the GTAP or an equivalent model, and the results will be added to the final draft of the Initial Statement of Reasons. A finding that the proposed pathway will entail indirect impacts will make it necessary for the public hearing to be held before the Board rather than the Executive Officer.

(5) Public Hearing and Subsequent Rulemaking Process

Regardless of whether a Method 2B application is heard before the Executive Officer or the Board, the formal rulemaking process established under the California Administrative Procedures Act must be followed before the LCFS lookup table can be modified. The steps in the rulemaking process are the following:

- ARB publishes a notice of proposed rulemaking in the California Regulatory Notice Register. The publication of this notice initiates a 45-day comment period on the addition of the proposed pathway to the LCFS lookup table.
- At the end of the 45-day comment period, ARB convenes a public hearing to consider the proposed pathway. If the Initial Statement of Reasons (discussed in the previous section) found that the proposed pathway does not entail indirect impacts, the proposal will be heard before the Executive Officer. If the Initial Statement of reasons found that indirect impacts would be involved, the proposal will be heard before the Board.
- The public hearing culminates with a decision on the part of either the Executive Officer or the Board concerning the adoption of the proposed pathway. The possible decisions are approve, disapprove, and approve subject to specified revisions. The applicant will be notified of the outcome in writing, and the results will be posted to the LCFS web site. If an application is not approved, the letter informing the applicant of that finding will describe the basis of the disapproval
- If approval comes with a requirement for substantive revisions to the pathway proposal, staff and the applicant must complete the required revisions, and initiate a 15-day comment period on those changes. A public hearing is not required following a 15-day comment period, but one may be held in some cases. ARB is obligated to fully consider all comments received during the comment period in deciding on the proposed revisions.
- ARB must respond to all comments received during the original 45-day comment period, and any subsequent comment periods. Those responses are compiled into a document known as a Final Statement of Reasons.
- The Final Statement of Reasons, and other pertinent rulemaking documents, are submitted to the California Office of Administrative law, which is the body responsible for rendering a final decision on all proposed California regulations.

- Within 30 days the Office of Administrative Law must either approve the proposed rule and forward it to the Secretary of State for publication, or disapprove the proposal and return it to ARB for correction
- If the Office of Administrative Law rejects a proposed pathway, ARB has 120 days to correct the problems that triggered the rejection. A 15-day comment period is automatically initiated in this case.

A schematic of the application and approval processes is shown in Figure 1. More than one Method 2 application can move through the system at the same time. Two or more applications may be heard at the same hearing.

III. Determination of Land Use Change Effects and Other Indirect Effects

Applicants for new pathways and sub-pathways are required to submit a preliminary finding regarding the probability that the pathway they are proposing will create new or additional land use change impacts or other indirect impacts. If new or additional impacts are possible, the applicant must also determine whether they are likely to be significant. Existing indirect effect values (including the zero, or 'no effect,' value) will not be changed to reflect insignificant differences. In making this determination, the applicant should consult section IV, below. Table 1 in that section identifies fuels that ARB has deemed to have negligible or no land use change impacts. In the absence of information to the contrary, the applicant may assume that pathways for the fuels listed in Table 1 entail no significant land use change impacts. The Executive Officer will evaluate the applicant's land-use-change findings, and take appropriate action. If the Executive officer finds that the proposed (Method 2A) sub-pathway generates land use change impacts that are essentially the same as those generated by the most closely related sub-pathway, the proposed sub-pathway will not subject to a land use change evaluation. The Executive Officer's findings are not constrained by the applicant's findings, however: if the two are not in agreement, the Executive Officer's findings shall supersede the applicant's. If the Executive Officer determines that significant land use change impacts are likely, the formal Board Hearing process will be initiated.

At the direction of the Executive Officer, ARB staff will perform all formal land use change impact evaluations. When staff's preliminary assessment indicates that land use change impacts are likely, the magnitude of those impacts will be estimated using the Global Trade Analysis Project (GTAP) model (or an equivalent model). Once approved, land use change estimates can only be modified by subsequent Board action.

Some Method 2 applications will be filed primarily for the purpose of changing or establishing a land use change (or other indirect) carbon intensity value. A producer of corn ethanol may be able to demonstrate, for example, that the use of fractionation results in a significant reduction in land use change impacts over traditional ethanol-production pathways. When corn is fractionated into its primary components, the resulting starch can be processed into ethanol. The other components can then be

utilized in ways that could reduce the land use change impacts of corn ethanol production more do than the co-products associated with current production methods. The reduced land use change emissions of such a pathway could be more important to producers than any changes in the direct life cycle impacts. Another case in which the land use change component might overshadow the direct lifecycle portion of a fuel's carbon intensity is a pathway that utilizes a feedstock deemed to have little or no land use change impacts (Table 1 contains a list of such feedstocks). Due to the negligible or nonexistent land use impacts of such feedstocks, fuels produced from them could have very low carbon intensities.

In order for sub-pathways which include reduced land use change impacts to be approved by the Board, however, the impact reductions must be reasonably permanent, and readily verifiable. Process modifications that can be easily reversed will not be approved. Examples of processes the Board would not consider to be permanent and verifiable include small scale and easily reversible changes to agricultural practices such as the adoption of no-till methods, and the use of lower carbon fuels such as biodiesel in truck fleets capable of running on either biodiesel or petroleum diesel. When changes such as these are adopted a wide scale, however, the Board will consider approving pathways that include them.

When approving pathways and sub-pathways that include improvements that reduce land use change impacts, the Board may impose conditions to aid staff in monitoring the fuel suppliers who use those pathways. They may, for example, require the periodic submission of documents confirming that the claimed improvements are still in place and fully functional.

IV. Fuels Deemed to Have Negligible or No Land Use Change or Other Indirect Effects

On April 23, 2009, the Board approved staff's proposed Low Carbon Fuel Standard, but directed staff to prepare several revisions to that rule, and to take various other actions relative to rule implementation. Among the actions staff was directed to take was the creation of an informal set of "criteria and a list of specific biofuel feedstocks that are expected to have no or inherently negligible land use effects on carbon intensity" (Air Resources Board Resolution 09-31, April 23, 2009, p. 15). The overriding condition that must be met before a fuel can be included on this list is that production of its feedstock must not compete with the production of food. A recent paper published in *Science* (Tillman et al., 2009) also recommends this approach. It places the fuels that meet this criterion into five basic categories:

- Fuel feedstock crops grown on abandoned farmland that is currently degraded. Not only would crops grown in this way not compete with food crops, they could also prove to be environmentally beneficial. They could potentially improve wildlife habitat and water quality, and increase carbon sequestration.
- Crop residues. Although crop residues increase soil fertility, decrease erosion, and improve soil carbon stores when left on fields, some residues can be

removed without compromising these benefits. The removable fraction is capable of supporting the production of significant quantities of biofuels

- Sustainably harvested wood and forest residues. These include the slash that is currently left in place after timber harvesting, residues from milling and pulp production, thinnings from fire prevention operations, as well as wastes from management operations undertaken to reduce competition and hasten the growth of marketable trees. In approving the LCFS, the Board directed the Executive Officer to work with stakeholders to define the terms "biomass" and "renewable biomass." As part of that effort, the Executive Officer is to assess the effects of incentivizing the use of forest biomass as a fuel feedstock, as well as the protections that would be necessary to ensure the sustainable and environmentally beneficial use of forest biomass. The goal of this effort would be to approve pathways for fuels produced from forest biomass, should the use of this feedstock be found to be sustainable and environmentally beneficial. In addition to this state-level effort, Congress is also considering the advisability of forest biomass as a feedstock as it debates a new energy bill[4]. Staff's recommendation to the Board will take into consideration the results of this and other relevant inquiries
- Double and mixed cropping. Biofuel crops that can be grown and harvested between existing food cropping cycles (and which do not interfere with those cycles) meet the criterion established above. The same is true for crops that can be grown along with food crops (such as between food crop rows).
- Municipal and industrial waste streams. Waste streams that include paper products, yard waste, construction wastes, and plastics are viable sources of feedstocks that do not entail land use change impacts.

Table 1 contains both fuels that meet these criteria, as well as other fuels that staff has found to entail no significant land use change effects. Additional fuels may be added to this table when and if staff determines that their land use change impacts are, at most, negligible. The list of candidate fuels currently under consideration are the following:

- Petroleum-based fuels, and fuels produced using petroleum-based process energy, including
    - Fossil CNG and LNG;
    - Electricity from petroleum-powered generation facilities;
    - Hydrogen produced in petroleum-powered facilities
- Nuclear power, as well as fuels produced using nuclear power (i.e., hydrodgen)
- Hydroelectric power, as well as fuels produced using hydroelectric power.
- Hydrogen produced using petroleum or electricity generated using petroleum for process power

Regulated parties wishing to apply for new pathways or sub-pathways for the fuels in this table can report on their Method 2A and 2B applications that those pathways will

[4] See for example, the renewable biomass definition in H R 2452, The "American Clean Energy And Security Act of 2009," drafted by Congressmen Waxman and Marky.

entail no significant land use change impacts. In support of that conclusion, applicants should cite Table 1.

Producers considering the use of Method 2B to establish a pathway involving one of the feedstocks appearing in Table 1 should be aware that—although the fuels appearing in the Table will incur, at most, a very small land use change charge—they may be found to incur other categories of carbon intensity charges. One such charge would occur if the feedstock used for fuel production is diverted from another use. The quantity that is diverted from the competing use would have to be at least partially replaced with a substitute raw material. The acquisition of that substitute material may generate GHG emissions that would be charged to the fuel. The possibility also exists that indirect effects other than land use change could be identified in connection with a new fuel feedstock.

Table 1: Fuels Expected to Have No or Inherently Negligible Land Use Effects on Carbon Intensity

Fuel	Feedstock	Conditions/Restrictions
Biodiesel	Used cooking oil	
	Inedible Tallow (sourced in the United States)	
	Municipal Solid Waste (suitable biosolids)	
	Medical Waste	
	Algae	Specific conditions of operation are to be determined to assess land use impacts if any. There may be a need to demonstrate sustainable production of algae without displacement of crop land..
Renewable Diesel (RD)	Inedible Tallow (sourced in the United States)	
Fischer–Tropsch Diesel	Forest Waste (gasification)	Criteria Under Development
	Agricultural Waste (gasification)	No impacts if enough residues are left on fields to ensure soil and crop health (only sustainable quantities are utilized for fuel) [a] Requires verification.
	Municipal Solid Waste (gasification)	
	Medical Waste (gasification)	
	Dedicated crops such as Poplar (gasification) (see "Forest Waste" and "Dedicated Crops" under "Cellulosic Ethanol," below)	

Fuel	Feedstock	Conditions/Restrictions
	LFG and Digester Gas	
Cellulosic Ethanol	Forest Waste	Criteria Under Development
	Agricultural Waste (stover from corn, straw from rice and wheat; vineyard prunings)	No impacts if enough residues are left on fields to ensure soil and crop health (only sustainable quantities are utilized for fuel).[a] Requires verification.
	Municipal Yard Waste	
	Demolition Waste	
	Switchgrass	If grown on land unsuitable for crops, then impacts are zero Also, if grown between traditional crop growing periods, impacts from Land Use Change should be zero. Verification will be required.
	Industrial Waste	
	Double cropped or mixed cropping	When a feedstock is harvested between traditional food crop plantings. This must be verified.
	Lumberyard mill residues	
	Dedicated crops (such as Poplar) grown on land unsuitable for food crop cultivation	Needs verification that land is unsuitable for food crop cultivation
CNG/LNG	Landfill Gas	
	Sewage Digester Gas	
	Dairy Digester Gas	
Electricity	Solar Generation	
	Wind Generation	
	Biomass-Fueled Generation	The biomass fuel used must have been found to have no land use change impacts.
	Sewage-Digester-Gas-Fueled Generation	
	Landfill-Gas-Fueled Generation	
	Dairy-Digester-Gas-Fueled Generation	

Fuel	Feedstock	Conditions/Restrictions
Hydrogen	LFG	Process power must be from one of the sources listed in this table
	Dairy Digester Gas	
	Sewage Digester Gas	
	Electrolysis	

[a] Enough crop residue must be left on the field to insure the maintenance of sufficient soil organic matter. Depletion of organic matter is ultimately not sustainable, eventually leading to the need for additional crop land to replace the lost production.

V. Priority Pathways for Inclusion in the Lookup Table

Table 2 lists the fuel pathways which staff has designated as high priority for addition to the Lookup Table during 2010. Fuel providers not need to apply for approval of these pathways under Methods 2A and 2B.

Staff continues to develop pathways for fuels with the potential to benefit California. Such fuels would utilize feedstocks and other resources available in-State, and are likely to create jobs for Californians. Staff will also give precedence to fuels which are most likely to be available in significant quantities during the first few years of the LCFS implementation. Fuels which may not be available in significant quantities early on, but which could contribute to overall fuel carbon intensity reductions over the longer term are also given priority. Among this group of fuels are those that are likely to be developed with the assistance of the Alternative and Renewable Fuel and Vehicle Technology Program (AB 118). Under this program, the Energy Commission is authorized to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. The Energy Commission has an annual program budget of approximately $100 million to support such projects.

Table 2: Priority Pathways for Inclusion in the Lookup Table

Fuel	Feedstock	Source of Priority Status

VI. Future Certification Program.

In its approval of the Low Carbon Fuel Standard, the Board directed the Executive Officer to work with stakeholders to develop "robust, transparent, and specific criteria for conducting Carbon Intensity Lookup Table modifications through a certification process" (Resolution 09-31, April 23, 2009, page 18). The most effective approach to designing a certification process is to base that process upon the experience gained working with regulated parties to develop new pathways and sub-pathways. As the Executive Officer and staff gain experience assisting applicants,

evaluating applications, responding to comments, and holding hearings, they will be applying that experience on an ongoing basis to the development of a pathway certification process proposal Such a process would be similar to the existing ARB fuel additive certification process: proposed additives are subjected to a set of standardized evaluations that are comprehensively described in a certification procedures manual. In order to develop an LCFS fuel pathway certification process, staff will consciously work to systematize and standardize the application evaluation process. The result will be an increasingly streamlined, efficient, and clearly defined process—one that can be readily transformed into a certification process.

When a pathway certification process proposal has been drafted, staff will seek Board approval to formally integrate that process into the LCFS regulation. If approved, that process will replace the one described herein.

VII. Evaluation of High Carbon Intensity Crude Oils.

The purpose of this section is to clarify how a regulated party determines the appropriate carbon intensity values for CARBOB and diesel fuel derived from different crude oil sources.

Definitions

- "included in the 2006 California baseline crude mix" means the crude oil constituted at least 2.0 percent of the 2006 California baseline crude mix, by volume, as shown by California Energy Commission records for 2006.
- "high carbon intensity crude oil" means any crude oil that has a total production and transport carbon intensity value greater than 15.00 gCO_2e/MJ.

Regulation requirements

Section 95486(b)(2)(A) of the LCFS regulation specifies the requirements for using the Lookup Table to determine carbon intensity values for CARBOB, gasoline, and diesel fuel This section requires a regulated party to use the average carbon intensity value shown in the Lookup Table if the fuel is derived from crude oil that is either 1) "included in the 2006 California baseline crude mix" or 2) not a "high carbon intensity crude oil". If neither of these conditions apply, the regulated party must either use 1) the carbon intensity shown in the Lookup Table corresponding to the crude oil's pathway or 2) the carbon intensity determined via Method 2B if there is no carbon intensity shown in the Lookup Table corresponding to the crude's pathway.

If Method 2B shows that the carbon intensity for crude oil production and transport is less than or equal to 15 gCO_2e/MJ, the finished fuel will be assigned the average carbon intensity value from the Lookup Table for CARBOB, gasoline, or diesel fuel. Technologies such as carbon capture and sequestration may be used by a producer to reduce the carbon intensity for crude oil production and transport to less than 15 gCO_2e/MJ. If Method 2B shows that the carbon intensity value for crude oil

production and transport is greater than 15 gCO_2e/MJ, the finished fuel will be assigned the total carbon intensity value determined by Method 2B.

Implementation:
The regulation language implies that ARB should promulgate a means of determining which crude oil sources will result in the finished fuel being assigned the average carbon intensity value from the Lookup Table.

A. Crude oils which are "included in the 2006 California baseline crude oil mix"
Table 1 (next page) shows that at least two percent of the total California crude oil in 2006 was received from the following sources: California, Alaska, Saudi Arabia, Ecuador, Iraq, Brazil, Mexico, and Angola. Finished fuels derived from these sources will be assigned the average carbon intensity value from the lookup table.

Table 1: Breakdown of Crude Supplied to California Refineries in 2006[5]

Source of Crude	Percentage of Total CA Crude
California	38.83
Alaska	16.12
Saudi Arabia	13.27
Ecuador	10.86
Iraq	8.57
Brazil	2.74
Mexico	2.36
Angola	2.29
Columbia	1.43
Oman	0.97
Venezuela	0.63
Argentina	0.53
All others	1.42

B. Crude oils which are not "included in the 2006 California baseline crude oil mix"
A three step screening process will be used to determine the appropriate carbon intensity to be assigned to crude oil sources which are not "included in the 2006 California baseline crude oil mix"

1. Low carbon intensity crude production: Crude oil production methods and reservoir characteristics will be evaluated using a conservative list of criteria.

[5] California Energy Commission (2009) "Energy Almanac" Retrieved from http://energyalmanac.ca.gov/petroleum/statistics

Those crude sources satisfying all of the criteria will be classified as low carbon intensity sources and fuels derived from these sources will be assigned the average carbon intensity value from the Lookup Table. Regulated parties will obtain data, make a determination, and report the data and determination to ARB. An example of potential criteria follows:

- Crude oil with an API gravity greater than 20 and produced by means other than thermally enhanced oil recovery (e.g. cyclic steam injection, steam flooding, steam assisted gravity drainage) or crude bitumen mining
- Gas flaring at a rate less than 175 scf/bbl (5 scm/bbl).
- Average reservoir depth less than10,000 ft
- Produced and/or injected water to oil ratio less than 10 bbl/bbl
- Produced and/or injected gas to oil ratio less than 2000 scf/bbl

2. Crude oil sources not meeting these criteria will undergo a more rigorous screening by ARB to determine if the crude oil will be considered "low carbon intensity" or "potential high carbon intensity". Additional data regarding crude oil production methods and reservoir characteristics may be required to complete this screening. [If the above data is not available, ARB will make a determination based upon the best available data for oil production from the given field and/or country]

3. Sources considered "potential high carbon intensity" will require a carbon intensity determination using Method 2B to determine if the crude oil meets the 15 gCO_2/MJ threshold.

VI References

Tilman, David, Robert Socolow, Jonathon A. foley, Jason Hill, Eric Larson, Lee Lynd, Stephen Pacala, John Reilly, Tim Searchinger, Chris Somerville, and Robert Williams. "Beneficial Biofuels—The Food, Energy, and Environment Trilemma." *Science* 325:270-271. July 17, 2009.

Attachment C

Low Carbon Fuel Standard Sustainability Workplan

MARCH 2010

LOW CARBON FUEL STANDARD SUSTAINABILITY WORKPLAN

When the Air Resources Board (ARB or Board) approved the Low Carbon Fuel Standard (LCFS) on April 23, 2009, the Board directed staff in Resolution 09-31 to work with the Interagency Forest Work Group (IFWG), appropriate state agencies, environmental advocates, regulated parties, and other interested stakeholders to present a workplan to the Board by December 2009 for developing sustainability provisions to be used in implementing the LCFS regulation. The workplan is to provide a framework for how sustainability provisions could be incorporated and enforced in the LCFS program, and it should include a schedule for finalizing feasible and appropriate sustainability provisions by no later than December 2011.

I. Importance of LCFS Sustainability Provisions

The LCFS regulation will reduce the carbon intensity of transportation fuels by at least 10 percent by 2020. To accomplish this goal, alternative, lower-carbon-intensity (CI) transportation fuels must replace petroleum-based fuels. Examples of these alternative fuels are cellulosic ethanol, biodiesel, alternative diesel, electricity, natural gas, and hydrogen. Since the LCFS will create a higher demand for these alternative fuels, it is important for staff to address the sustainable production of these fuels.

Sustainability is generally considered to be the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs. A more scientific definition would be: the long term viability of natural resource consumption in balance with the supporting ecosystem. The three major components of sustainability are environmental, social, and economic sustainability.

Environmental Sustainability

Environmental sustainability ensures that the production and delivery of alternative fuels do not harm natural resources, such as land, water, and air. For liquid biofuels, sustainability includes the cultivation, collection, and processing of feedstocks, as well as the distribution and consumption of the biofuels themselves. Land impacts include those affecting soil quality, soil erosion, and loss of biodiversity; water impacts take into account water quality and availability; and air impacts can include increased emissions of criteria pollutants (such as nitrogen oxides and particulate matter), toxic air pollutants, and greenhouse gases (GHGs).

The Board-approved LCFS regulation contains provisions that already address some of these environmental sustainability issues. By its very design, the LCFS will result in a net reduction of greenhouse gases by taking into account the full lifecycle GHG emissions of alternative transportation fuels. For each fuel pathway, the LCFS requires

the analysis of both direct effects and indirect effects when determining the carbon intensity of the fuel.

Direct effects take into account farming practices (e.g., frequency and type of fertilizer used), crop yields, harvesting practices, transportation of the feedstock, the type of fuel-production process used, its efficiency and fuel use, the value of co-products generated, and the transport and distribution of the fuel. Biofuels that are energy-intensive to produce and distribute will have higher CI values and be of less value when complying with the LCFS standards.

ARB staff has currently identified one indirect effect that generates significant quantities of GHGs: land use change effects. A land use change effect is initially triggered by a significant increase in the demand for a crop-based biofuel. For example, when farmland devoted to food and feed production is diverted to the production of that biofuel crop, supplies of the displaced food and feed crops are reduced. Supply reductions cause prices to rise, which, in turn, stimulates increased production. If that production takes place on land formerly in non-agricultural uses, a land-use-change impact results. The specific impact consists of the carbon released to the atmosphere from the lost cover vegetation and disturbed soils in the periods following the land use conversion.

The analysis of indirect land use effects is relatively new and controversial. The Board directed staff, through Resolution 09-31, to convene an expert workgroup to assist us in refining and improving the land use and indirect effect analysis of transportation fuels. This workgroup will evaluate key factors that might impact the land use values for biofuels, including agricultural yield improvements, co-product credits, land emission factors, food price elasticity, and other relevant factors.

Although the LCFS does address some environmental impacts through the analysis of fuel pathways, it does not yet address environmental sustainability issues such as biodiversity; protection of specified sensitive lands; biomass collection volumes; water quality and adequate water supplies; soil quality and erosion; and localized air quality impacts. Although the California Environmental Quality Act (CEQA) addresses many of these potential impacts for specific projects in California, CEQA may not adequately address sustainability issues; therefore, these environmental impacts will be some of the issues addressed within the next two years.

Social Sustainability

Social sustainability includes the consideration of labor rights, income distribution, working conditions, the land rights of indigenous people, environmental justice, food prices, and food security. The concern is that the LCFS, by creating a market for low-CI alternative fuels, may attract biofuels that come at the expense of adverse social impacts. These potential social impacts must be addressed as part of staff's sustainability analyses over the next two years.

The United Kingdom, the European Union, and the Netherlands have been tackling sustainability issues of biofuels because of their own mandates for biofuel use. Unlike Europe, which imports nearly all of its biofuels, the United States is expected to produce most of its own biofuels; therefore, federal and state laws would address issues related to labor practices. Nevertheless, ARB is committed to working with our national and international partners to address potential sustainability issues arising from the worldwide demand of biofuels. To this end, staff is gathering information on current international activities and identifying contacts with whom to engage. Staff will continue to participate/monitor the pertinent sustainability activities of these entities.

Economic Sustainability

Economic sustainability should also be considered when addressing the production and use of alternative fuels. Economic sustainability overlaps previously mentioned social concerns regarding food prices and food security, but it also includes creating an economic environment in which alternative fuels can be produced and distributed on a long-term basis. Economic incentives, such as grants and tax credits, initially help in this regard; however, any market is more likely to thrive when uncertainty is removed to the greatest extent possible and robust business plans can be developed. To that end, staff will work with alternative fuel producers and distributers, petroleum-based transportation fuel providers (such as refineries and distributers), and other affected parties to address the economic sustainability of meeting the LCFS standards. Staff believes that the LCFS can improve California's economy by attracting investment in biofuel production within the State.

II. Key Elements for Addressing Sustainability within the LCFS

As staff initiates the effort to develop sustainability provisions to be used in implementing the LCFS regulation, it is premature to determine if the provisions will be regulatory in nature (i.e., incorporated into the LCFS regulation), or a set of policies approved by the Board to establish a sustainability framework for the LCFS, or both. In any of these scenarios, there must be an overall framework for addressing sustainability.

A report[1] published by researchers at the University of California at Davis (UC Davis) examined a range of sustainability requirements for biofuels and considered a possible framework for LCFS sustainability provisions. This section briefly discusses some of the key elements of the proposed sustainability framework

[1] Yeh, S.; Summer, D.; Kaffka, S.; Ogden, J.; Jenkins, B. *Implementing Performance-Based Sustainability Requirements for the Low Carbon Fuel Standard – Key Design Elements and Policy Considerations*; Research Report UCD-ITS-RR-09-05; Institute of Transportation Studies, University of California, Davis: Davis, CA, 2009.

The study reviewed sustainability requirements and criteria being implemented or proposed by governments promoting biofuel programs—particularly the United Kingdom and the European Union. The study also reviewed the sustainability principles and criteria proposed by the Roundtable on Sustainable Biofuels (RSB). RSB is an international initiative involving stakeholders across the entire biofuel supply chain, nongovernmental organizations, experts, governments, and inter-governmental agencies.

Some of the key elements identified in the study for a sustainability provision include:

- Principles and criteria
- Benchmarking and/or third-party certification requirements
- Supply chain and reporting requirements
- Legality

The California Energy Commission (CEC), in response to recent legislation[2], has been developing sustainability principles and criteria for its Alternative and Renewable Fuel and Technology Program. The intent of the program is "to develop and deploy alternative and renewable fuel and advanced transportation technologies to achieve the State's climate change policies, reduce petroleum use, increase the use of alternative fuels and spur the development of in-state bioenergy sources."[3] Since the program awards public funds for projects that meet these objectives, CEC staff has had to develop sustainability metrics through which funding priorities are determined. ARB staff commends the CEC accomplishments and will continue to work closely with CEC staff on sustainability issues common to both agencies.

Principles and Criteria

Setting sustainability standards requires the adoption of principles, criteria, and indicators by which sustainability can be measured. Principles may address specific impacts, such as soil, water, and air impacts; human and labor rights; food prices and security; and conservation of specific natural resources. Within these principles lie the criteria that are the essential elements of a sustainability provision Examples may include requiring that workers' wages and working conditions respect all applicable laws and international conventions or requiring biofuel production to not withdraw surface or groundwater resources beyond replenishment capacities.

[2] Assembly Bill118 (Núñez, Chapter 750, Statutes of 2007) and Assembly Bill 109 (Núñez, Chapter 351, Statutes of 2008).

[3] CEC. *Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program*; CEC-600-2009-008-CMF; California Energy Commission: Sacramento, CA, 2009

Benchmarking and/or Third-Party Certification

Incorporating sustainability provisions into the LCFS must be more than a guiding philosophy or overall policy. A baseline or set of standards must be identified against which the environmental, social, and economic impacts of alternative fuel production can be measured. Currently, there are a number of organizations that have established, or are establishing, certification standards for biofuel sustainability. For example, there are several certifying organizations that explicitly address forestry products:

- Forest Stewardship Council (FSC)
- Programme for the Endorsement of Forest Certification (PEFC) schemes
- American Tree Farm Systems (ATFS)
- Sustainable Forestry Initiative (SFI)
- Canadian Standards Association (CSA)

Certifying organizations for other biofuels include:

- Roundtable on Sustainable Biofuels (RSB)
- Roundtable on Responsible Soy (RTRS)
- Roundtable on Sustainable Palm Oil (RSPO)
- Council on Sustainable Biomass Production (CSBP)
- Better Sugarcane Initiative (BSI)
- Western Renewable Energy Generation Information System (WREGIS)
- Sustainable Biodiesel Alliance (SBA)
- Sustainable Agriculture Network (SAN)

Whether ARB establishes its own sustainability principles and criteria to which the standards of certifying organizations must be benchmarked, or accepts the certification of some of the organizations as proof of sustainability, staff must follow the development of sustainability standards developed by other countries, organizations, or industry groups that can serve as models for California.

Supply Chain (Chain of Custody) Requirements and Reporting Requirements

Tracking biofuel feedstocks through the entire process of harvesting, collecting, and converting them to biofuels, then distributing the biofuels themselves, can be complicated. However, to ensure that biofuels are being produced in a sustainable manner, some chain of custody (CoC) method must be used to track them. Generally, the three types of CoC methods are segregation, book-and-claim, and mass-balance.

The segregation system is the strictest, requiring certified commodities to be fully traceable and completely separated from non-certified. An example of a segregation system is organic produce, which is kept separate from nonorganic produce. As applied to the LCFS, completely segregating feedstocks and the resultant biofuels produced is impractical for all but the smallest of batches of biofuels.

With a book-and-claim method, feedstocks and biofuels are not traceable to the source. Certificates ensure that the biofuels were produced and introduced into the fuels market, but their ultimate use is unknown. Electricity markets use this method for tracking renewable energy credits. Producers of renewable energy guarantee the production of renewable energy through a certification process. The certified credits are traded in the market, but the specific source of the renewable electricity cannot be traced once the electricity is put into the electrical grid.

With the mass-balance method, certified and non-certified feedstocks and biofuels can be mixed, but certifications for the feedstocks and biofuels must stay with the finished products along the supply chain. This method may be more amenable to the LCFS. The LCFS requires all regulated parties to report quarterly specific fuel pathway information, such as fuel type, blendstocks (if applicable), feedstock type, fuel quantity (in megajoules), federal renewable identification number (RIN), if applicable, feedstock origin, process information, and fuel carbon intensity. Perhaps a third-party sustainability certification can accompany this feedstock/biofuel data.

Legality

When developing sustainability standards, caution must be used so that rules of the World Trade Organization (WTO) are not violated. The WTO requires that regulations and standards should neither create unnecessary barriers nor discriminate against products with the same physical properties but with different production process and production methods (PPM).

Studies[4] examining the WTO issue generally concluded the following:

- Some of the sustainability principles and criteria may violate this WTO PPM rule.
- A reporting obligation for companies to deliver information on the sustainability of their biomass is considered feasible under WTO law. Therefore, a proposed sustainability framework that requires reporting is unlikely to violate WTO rules.
- Minimum demands for biodiversity and environment may have a medium-high risk of violating WTO rules.
- Minimum demands on economic prosperity and well-being will be in violation of the WTO, except for extreme human rights violations (e.g., slavery).

These WTO constraints reinforce the need for ARB to work collaboratively with national and international partners when addressing sustainability provisions for the LCFS.

The UC Davis study (Yeh et al) concluded:

> A sustainability scheme can only be effective if the proposed framework is robust but not excessively complicated, and the criteria are measureable and verifiable.

[4] See Reference 1 (Yeh et al) for attributed studies.

It also needs to acknowledge the limitations of resources, politics, and California's legal jurisdiction and be consistent with international efforts in sustainability criteria. Government assistance in facilitating information sharing, certification, and capacity will be crucial for the development of the sustainability criteria.

ARB staff concurs with this assessment.

III. ARB Process for Addressing Sustainability Provisions for LCFS

In developing sustainability provisions for the Low Carbon Fuel Standard, ARB staff will:

1. Work with the Interagency Forest Work Group (IFWG), appropriate state agencies, environmental advocates, regulated parties, and other interested stakeholders in an open, transparent, and fully participatory process.

2. Work with national and international partners to address potential sustainability issues arising from the worldwide demand of biofuels.

3. Work with alternative fuel producers and distributers, petroleum-based transportation fuel providers (such as refineries and distributers), and other affected parties to address the economic sustainability of meeting the LCFS standards, especially as it pertains to the California economy.

4. Follow the development of certification and benchmark systems developed by other countries, organizations, or industry groups that can serve as models for California.

5. Identify policies that can incentivize the adoption of sustainability provisions and the production of sustainable fuels.

6. Comply with Health and Safety Code section 38562(b), enacted by AB 32, that requires the ARB, to the extent feasible, to ensure that activities undertaken do not disproportionately impact low-income communities and to consider overall societal benefits, including reductions in other air pollutants, diversification of energy sources, and other benefits to the economy, environment, and public health.

7. Prioritize efforts to regionalize national and international sustainability provisions for the California context (natural resources, social and economic circumstances)

IV. Proposed Schedule for LCFS Sustainability Workplan

Date	Action
March 2010	• Work with CEC staff to identify near-term sustainability research opportunities. • Form an LCFS Sustainability Work Group (SWG) consisting of representatives from IFWG, appropriate state agencies, environmental advocates, regulated parties, and other interested parties to provide input on the development of the LCFS sustainability provisions. – Establish protocols for SWG. – Establish overall workload.
May 2010	• Identify and discuss sustainability issues related to forests. • Identify and discuss sustainability issues related to agricultural lands.
June – Dec 2010	• Assess existing certification frameworks and standards and their potential applicability to forests and agricultural lands in California. • Identify gaps and/or the need for regionalizing criteria and indicators.
September 2010	• Conduct a public workshop to discuss accomplishments and future activities.
Oct - Dec 2010	• Draft language related to sustainability provisions for forests and agricultural lands.
January 2011	• Conduct a public workshop to discuss accomplishments and future activities.
May 2011	• Complete first draft of environmental, economic, and social sustainability provisions • Determine approach to incorporating provisions (regulatory/policy) • Design compliance framework (benchmarking or recognizing existing certification standards), including chain of custody and reporting requirements. • Determine potential incentives for sustainable biofuels.
July – Sept 2011	• Conduct public workshops on draft sustainability provisions and compliance framework.
October 2011	• Release proposed regulation and/or policy document, initiating formal 45-day public comment period (if applicable).
December 2011	• Present LCFS sustainability recommendation to the Board.