

State of California  
AIR RESOURCES BOARD

**Third Notice of Public Availability of Modified Text and  
Availability of Additional Documents and Information**

**PUBLIC HEARING TO CONSIDER ADOPTION OF A REGULATION TO IMPLEMENT  
THE LOW CARBON FUEL STANDARD**

Public Hearing Date: April 23, 2009  
Public Availability of Modified Text Date: December 15, 2009  
Deadline for Public Comment: January 14, 2010

This Notice is part of the continuation of a rulemaking in which the Air Resources Board (Board or ARB) is establishing a regulation implementing California's Low Carbon Fuel Standard (LCFS). On November 25, 2009, ARB's Executive Officer adopted the LCFS regulation, noting that it was complete with two limited exceptions pertaining to (1) a severability provision, and (2) identification of two pathways and their associated carbon intensity values for biodiesel and renewable diesel made from Midwest soybeans, as work on those pathways had not yet been completed. The adopted regulation was submitted to the Office of Administrative Law (OAL) on the same day, along with the required documentation including the Final Statement of Reasons (FSOR) covering the regulation as adopted. The FSOR explained that modified regulatory language adding the two incomplete elements would be made available for supplemental comment as soon as possible; after considering the comments the Executive Officer would adopt the final two elements and submit them to OAL along with the necessary supporting documents before March 4, 2010. This notice solicits comment on the proposed text of the remaining two elements and on additional documents supporting those elements.

At its April 23, 2009 public hearing, the Board approved the adoption of the LCFS regulation to be contained in California Code of Regulations (CCR), title 17, sections 95480, 95480.1, 95481, 95482, 95483, 95484, 95485, 95486, 95487, 95488, 95489, and 94590. The LCFS regulation applies to any transportation fuel, as defined in the regulation, which is sold, supplied, or offered for sale in California, and to any regulated party, as defined in the regulation, which is responsible for a transportation fuel in a calendar year. The proposed LCFS regulation was described in detail in the Initial Statement of Reasons (ISOR) released to the public on March 5, 2009, along with a public notice informing the public of the proposed rulemaking (45-Day Notice).

At the hearing on April 23, 2009, the staff presented, and the Board approved, modifications proposed in response to comments received during the public comment period that began on March 5, 2009, and ended at the hearing on April 23, 2009. As a result, on July 20, 2009, the first Notice of Public Availability of Modified Text and Availability of Additional Documents (First 15-Day Change Notice) was issued, along

with the proposed modified regulatory text. The public comment period for the First 15-Day Change Notice ended August 19, 2009.

As a result of comments received, additional modifications to the regulatory text were proposed in the Second Notice of Public Availability of Modified Text and Additional Documents and Information (Second 15-Day Change Notice) issued September 23, 2009, with a comment deadline of October 8, 2009. That notice also expressed ARB's intent that a Third Notice of Public Availability of Modified Text and Additional Documents and Information (Third 15-Day Change Notice) would be issued covering the carbon intensity values and supporting pathway documents for biodiesel and renewable diesel processed from Midwest soybeans.

Since ARB was able to prepare all necessary rulemaking documents before work on the two additional pathways was completed, the rulemaking was bifurcated as noted above so that the entire regulation except for the incomplete elements could be adopted submitted to OAL in November 2009.

This Third 15-Day Change Notice covers the carbon intensity values and supporting pathway documents for biodiesel and renewable diesel processed from Midwest soybeans, along with a severability clause that was inadvertently omitted from earlier versions of the LCFS regulation. Excerpts of the regulation showing the text of the modified regulatory language is shown in Attachment 1. For ease of viewing, the regulatory language that was adopted and submitted to OAL November 25, 2009 is shown in plain text. The proposed modifications made public with this Third 15-Day Change Notice are shown in ~~double strikethrough italics~~ and double underline italics, respectively. The complete text of the LCFS regulation with the proposed modifications shown is posted on ARB's website for the LCFS rulemaking: <http://www.arb.ca.gov/regact/2009/lcfs09/lcfs09.htm>.

It has been ARB's practice to provide at least 30 days for comment on new pathway documents for the LCFS regulation. Accordingly, a 30-day comment period is provided by the modifications and pathway documents made available by this notice.

### **Summary of Proposed Modifications**

The following is a summary of the proposed modifications to the LCFS regulation made available with this Third 15-Day Change Notice along with the rationale for making them.

#### **Applicability (section 95480.1)**

A new subsection (f) has been added to incorporate a severability clause. From the beginning of the LCFS development, it was the ARB's intent to make each section and provision of the LCFS regulation severable to the extent allowed by law. However, the severability clause was inadvertently omitted from earlier versions of the regulation. The addition of this clause effectuates this intent, and is necessary to help assure that

invalidation of one provision of the LCFS regulation does not have the unintended effect of invalidating the entire regulation.

### **Definitions (section 95481)**

Section 95481(a)(20.5) of the adopted regulation contains the definition for “GTAP” or “GTAP Model.” The definition includes the computer files for the GTAP model customized for corn ethanol (GTAP-BIO (February 2009)) and for sugarcane ethanol (GTP-SGR (February 2009)), which are incorporated by reference in the regulation. The proposed modification adds the incorporation by reference of GTAP-SOY (December 2009), which is the GTAP model customized for Midwest soybeans, along with its component files. The GTAP-SOY package was posted at <http://www.arb.ca.gov/fuels/lcfs/lcfs.htm> on December 14, 2009 and available with its components as a .zip file for download at <http://www.arb.ca.gov/fuels/lcfs/gtapsoy.zip>.

### **Determination of Carbon Intensity Values (section 95486)**

Two pathways and their associated carbon intensity values in Table 7 for biodiesel and renewable diesel made from Midwest soybeans have been added. The corresponding supporting pathway documents are also incorporated by reference.

### **Supporting Documents and Information**

In accordance with Government Code section 11347.1, staff has added the following documents to the rulemaking record in support of the proposed action:

- Stationary Source Division, Air Resources Board (December 14, 2009, v.3.0), “Detailed California-Modified GREET Pathway for Biodiesel from Midwest Soybeans;”
- Stationary Source Division, Air Resources Board (December 14, 2009, v.3.0), “Detailed California-Modified GREET Pathway for Renewable Diesel from Midwest Soybeans;”
- GREET, v.1.8b (updated December 14, 2009), which is the GREET model updated in December 2009 to reflect the Midwest soybean to biodiesel and renewable diesel pathways;
- GTAP-SOY (December 2009), the GTAP model customized for Midwest soybeans, along with its component files; and
- Stationary Source Division, “Land Use Change Effects for Soy Biodiesel,” December 14, 2009 (appended to this Notice as Attachment 2).

These documents are being relied upon solely as support for the new regulatory text now being added as described in this notice.

## **Availability of the Attachments and Other Materials**

By this notice, the modified regulatory text and supplemental documents and information added to the rulemaking record and identified above are being made available for public comment prior to the final action by the Board's Executive Officer. As noted above, the documents listed above as attachments to this notice can be obtained from ARB's website at the following address: <http://www.arb.ca.gov/regact/2009/lcfs09/lcfs09.htm>, or from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814. If you would like a paper copy of any of these attachments sent to you through postal mail, please call Ms. Manisha Singh at (916) 323-0014 and give your name, company name, if any, and mailing address.

## **Comments and Subsequent Action**

In accordance with section 11346.8 of the Government Code, the Board directed the Executive Officer to adopt the approved LCFS regulation after making the modified regulatory language available to the public for a supplemental written comment period of at least 15 days. The Board further provided that the Executive Officer shall consider such written comments as may be submitted during this period, shall make such modifications as may be appropriate in light of comments received, and shall present the regulations to the Board for further consideration if he determines that this is warranted. As noted below, this notice covers only the two elements that were not in the regulation adopted by the Executive Officer November 25, 2009.

Written comments will only be accepted on the modifications approved by the Board and may be submitted by postal mail or electronic mail as follows:

Postal mail: Clerk of the Board, Air Resources Board  
1001 I Street, Sacramento, California 95814

Electronic submittal: <http://www.arb.ca.gov/lispub/comm/bclist.php>

Please note that under the California Public Records Act (Govt. Code § 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

In order to be considered by the Executive Officer, comments must be directed to the ARB in one of the two forms described above and received by ARB by the end of the deadline date for public comment listed at the beginning of this notice. Only comments relating to the modifications to the text of the regulation or to the additional documents and information referenced above shall be considered by the Executive Officer. A Supplement to the FSOR will be prepared addressing all comments responsive to this notice.

For individuals with sensory disabilities, this document and other related material can be made available in Braille, large print, audiocassette, or computer disk. For assistance, please contact the Clerk of the Board at (916) 322-5594 as soon as possible.

## Attachments (2)

*The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see ARB's website at [www.arb.ca.gov](http://www.arb.ca.gov).*

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# ATTACHMENT 1

Modified Regulation Order

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## ATTACHMENT 2

### Land Use Change Effects for Soy Biodiesel

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## **Land Use Change Effects for Soy Biodiesel**

### **Stationary Source Division, Air Resources Board**

On March 05, 2009, the Air Resources Board (ARB/Board) published the Initial Statement of Reasons (ISOR) for the Low Carbon Fuel Standard (LCFS) regulation. In the ISOR, staff presented preliminary estimates for soy biodiesel land use change (LUC) impacts. Since these results were preliminary, they were not included in the LCFS Lookup Table. Working with researchers at UC Berkeley, staff has estimated a new LUC carbon intensity value for soy biodiesel which is presented in this report.

#### **1. GTAP Model Updates for Soy Biodiesel Modeling**

ARB uses the Global Trade Analysis Project (GTAP) model for estimating LUC impacts of increased biofuel production. For the preliminary modeling presented in the ISOR, GTAP was severely limited in its ability to represent the soy biodiesel sector. Some key GTAP model limitations were as follows:

- The modeling employed the GTAP 6 global economic data base which used 2001 as the reference year. Very little biodiesel was being produced in 2001 and therefore the economic sector was not well developed.
- The model included an aggregated oilseeds sector and was not capable of specifically modeling changes in soybean demand. Because of this limitation, an external model adjustment for the difference in average fuel yield between biodiesel derived from soy and aggregated oilseeds was required.
- The modeling did not account for market effects of soy meal production and therefore an external adjustment for soy meal co-product credit was required. As an initial estimate, we assumed a 75 percent co-product credit for soy meal.

Since publication of the ISOR, several improvements to the modeling of soy biodiesel were made to address these limitations. Revisions to the model are as follows:

- The present soy biodiesel land use change results are produced using the GTAP 7 data base which uses 2004 as the reference year. The global biodiesel sector was more fully developed in 2004.
- The current modeling separates out soybeans from the aggregated oilseeds sector and therefore is capable of specifically modeling changes in soybean demand.
- The modeling now allocates a feed byproduct within the biodiesel sector. Soybean was assumed to consist of 20 percent oil and 80 percent soy meal by mass.

Based on these changes, staff believes the model results for soy biodiesel are now sufficiently robust to be included in the Lookup Table.

## 2. Results and Discussion of Land Use Change Effects.

In this section, we present land use change results for soy biodiesel. Results include a sensitivity analysis performed on key model inputs. All land use change carbon intensity values were calculated using the annualized method with a 30 year project horizon.

### a. Key Inputs into the GTAP model

Table I summarizes the key inputs for the GTAP analysis. The parameters appearing in this table are briefly described below and more fully described in Appendix C of the ISOR. The primary input to computable general equilibrium models such as GTAP is the specification of the changes that will, by moving the economy away from equilibrium, result in the establishment of a new equilibrium. Parameters such as elasticities are used to estimate the extent which introduced changes alter the prior equilibrium.

**Table I**  
**Key Inputs into the GTAP model**

<b>Inputs/Parameters</b>	<b>Ranges (if appropriate)</b>
Baseline Year	2004
Soy biodiesel production increase (billion gallons)	0.75
Crop Yield Elasticity	0.2 to 0.4
Elasticity of Harvested Acreage Response	0.5
Elasticity of land transformation	0.1 to 0.3
Elasticity of crop yields with respect to area expansion	0.5 to 0.75
Trade elasticity	Central Values*

\*see Table C5-2 in Appendix C of the ISOR

- Fuel production increase: The primary input to computable general equilibrium models such as GTAP is the specification of the changes that will result in a new equilibrium. We modeled a production increase from 0.25 to 1.0 billion gallons of soy biodiesel. A final volume of 1.0 billion gallons is consistent with the Renewable Fuel Standard mandate for biomass based diesel.
- Crop yield elasticity: This parameter determines how much the crop yield will increase in response to a price increase for the crop. Agricultural crop land is more intensively managed for higher priced crops. If the crop yield elasticity is 0.25, a P percent increase in the price of the crop relative to input cost will result in a percentage increase in crop yields equal to P times 0.25. The higher the elasticity, the greater the yield increases in response to a price increase.

- Elasticity of crop yields with respect to area expansion: This parameter expresses the yields that will be realized from newly converted lands relative to yields on acreage previously devoted to that crop. Because almost all of the land that is well-suited to crop production has already been converted to agricultural uses, yields on newly converted lands are almost always lower than corresponding yields on existing crop lands.
- Elasticity of harvested acreage response: This parameter expresses the extent to which changes occur in cropping patterns of existing agricultural land as land costs change. The higher the value, the more cropping patterns will change (e.g. soybean to corn) in response to land costs.
- Elasticity of land transformation across cropland, pasture and forest land: This elasticity expresses the extent to which expansion into forestland and pastureland occurs due to increased demand for agricultural land (driven by higher crop prices).

### b. Sensitivity Analysis Results

As shown in Table 2, the model results are sensitive to changes in crop yield elasticity, elasticity of land transformation, and elasticity of crop yields with respect to area expansion and are insensitive to reasonable changes in the biodiesel production increase. This model behavior is similar to that presented in the ISOR for corn, sugarcane, and preliminary soy biodiesel results.

**Table 2**  
**Sensitivity Analysis Results for Soy Biodiesel**

Input variable	Input Variable Ranges		Percent Change in LUC Carbon Intensity
	Low Value	High Value	
Biodiesel production increase (billion gallons)	0.45	0.75	-5
Crop Yield Elasticity	0.2	0.4	-21
Elasticity of land transformation	0.1	0.3	70
Elasticity of crop yields w.r.t. area expansion	0.50	0.75	-38

### c. Calculating the LUC carbon intensity for soy biodiesel

In order to select an appropriate central value for the land use change impact of soy biodiesel production, seven scenarios were performed with varying elasticity values.

For these scenarios, staff utilized elasticity value ranges consistent with the corn ethanol analysis presented in Chapter IV and Appendix C of the ISOR. These ranges are as follows:

- Elasticity of crop yield with respect to area expansion: 0.5 to 0.75
- Crop yield elasticity: 0.2 to 0.4
- Elasticity of land transformation: 0.1 to 0.3
- Trade elasticity: central case

For both corn ethanol and sugarcane ethanol, an external adjustment was made to model results to account for changes in feedstock crop yield since the baseline year of the model. Since yields for soybean (three year running averages) have remained relatively stable since the baseline year of 2004, an external adjustment was not necessary for soy biodiesel.

Table 3 shows the LUC and carbon intensity results for seven scenarios. As shown in the rightmost column of Table 3, the mean global land conversion value across the range of runs is 0.51 million hectares. When the total GHG emissions from the conversion of these lands are annualized over a 30-year period, the result is a mean land use change impact of 62 gCO<sub>2e</sub>/MJ.

**Table 3**  
**GTAP Modeling Results for Soy Biodiesel Indirect Land Use Change**

<b>Scenario</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>Mean</b>
Economic Inputs								
Soy Biodiesel production increase (bill. gal.)	0.75	0.75	0.75	0.75	0.75	0.75	0.75	
Elasticity of yield wrt area expansion	0.50	0.75	0.50	0.50	0.50	0.66	0.75	
Crop yield elasticity	0.40	0.40	0.20	0.40	0.40	0.25	0.20	
Elasticity of land transformation	0.20	0.20	0.20	0.30	0.10	0.20	0.20	
Elasticity of harvested acreage response	0.50	0.50	0.50	0.50	0.50	0.50	0.50	
Trade elasticity of crops	central							
Model Results								
Total land converted (million ha)	0.54	0.36	0.67	0.65	0.39	0.50	0.45	0.51
• Forest land (million ha)	0.23	0.13	0.30	0.29	0.18	0.22	0.18	0.22
• Pasture land (million ha)	0.31	0.23	0.37	0.36	0.21	0.28	0.26	0.29
U.S. land converted (million ha)	0.24	0.16	0.28	0.28	0.16	0.20	0.18	0.21
• U.S. forest land (million ha)	0.11	0.06	0.13	0.12	0.08	0.09	0.08	0.10
• U.S. pasture land (million ha)	0.13	0.10	0.14	0.16	0.08	0.11	0.11	0.12
<b>LUC carbon intensity( gCO<sub>2e</sub>/MJ)</b>	66	41	84	83	49	61	53	62