

MODIFIED REGULATION ORDER FOR THE LOW CARBON FUEL REGULATION

**EXCERPTS SHOWING MODIFICATIONS BEING MADE AVAILABLE IN
CONJUNCTION WITH THE THIRD 15-DAY CHANGE NOTICE**

Note: Set forth below are excerpts of the regulation implementing the Low Carbon Fuel Standard showing the modifications being made available December 14, 2009, in conjunction with the Third 15-Day Change Notice. Excerpts of the final regulatory text submitted to the Office of Administrative Law (OAL) on November 25, 2009 are shown in plain type. The proposed modifications are shown in double underline italics to indicate additions to the final regulatory text and ~~double strikethrough italics~~ to indicate deletions.

Modify sections 95480.1, 95481, and 95486, title 17, California Code of Regulations (CCR), to read as follows:

**Subchapter 10. Climate Change
Article 4. Regulations to Achieve Greenhouse Gas Emission Reductions**

Subarticle 7. Low Carbon Fuel Standard

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Section 95480.1. Applicability

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(f) Severability. Each part of this subarticle shall be deemed severable, and in the event that any part of this subarticle is held to be invalid, the remainder of this subarticle shall continue in full force and effect.

NOTE: Authority cited: Sections 38510, 38560, 38560.5, 38571, 38580, 39600, 39601, 41510, 41511, Health and Safety Code; and *Western Oil and Gas Ass'n v. Orange County Air Pollution Control District*, 14 Cal.3rd 411, 121 Cal.Rptr. 249 (1975). Reference cited: Sections 38501, 38510, 38560, 38560.5, 38571, 38580, 39000, 39001, 39002, 39003, 39515, 39516, 41510, 41511, Health and Safety Code; and *Western Oil and Gas Ass'n v. Orange County Air Pollution Control District*, 14 Cal.3rd 411, 121 Cal.Rptr. 249 (1975).

Section 95481. Definitions and Acronyms

(a) *Definitions.* For the purposes of sections 95480 through 95489, the definitions in Health and Safety Code sections 39010 through 39060 shall apply, except as

otherwise specified in this section, section 95480.1, or sections 95482 through 95489:

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(20.5) "GTAP" or "GTAP Model" means the Global Trade Analysis Project Model (~~February~~ December 2009), which is hereby incorporated by reference, and is a software package comprised of:

- (A) RunGTAP (February 2009), a visual interface for use with the GTAP databases (posted at <http://www.arb.ca.gov/fuels/lcfs/lcfs.htm> in February 2009 and available for download at <https://www.gtap.agecon.purdue.edu/products/rungtap/default.asp>), which is hereby incorporated by reference;
- (B) GTAP-BIO (February 2009), the GTAP model customized for corn ethanol (posted at <http://www.arb.ca.gov/fuels/lcfs/lcfs.htm> in February 2009 and available with its components as a .zip file for download at <http://www.arb.ca.gov/fuels/lcfs/gtapbio.zip>); which is hereby incorporated by reference; ~~and~~
- (C) GTP-SGR (February 2009), the GTAP model customized for sugarcane ethanol (posted at <http://www.arb.ca.gov/fuels/lcfs/lcfs.htm> in February 2009 and available with its components as a .zip file for download at <http://www.arb.ca.gov/fuels/lcfs/gtpsgr.zip>), which is hereby incorporated by reference;
- (D) *GTAP-SOY (December 2009), the GTAP model customized for Midwest soybeans (posted at <http://www.arb.ca.gov/fuels/lcfs/lcfs.htm> in December 2009 and available with its components as a .zip file for download at <http://www.arb.ca.gov/fuels/lcfs/gtapsoy.zip>); which is hereby incorporated by reference.*

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NOTE: Authority cited: Sections 38510, 38560, 38560.5, 38571, 38580, 39600, 39601, 41510, 41511, Health and Safety Code; and *Western Oil and Gas Ass'n v. Orange County Air Pollution Control District*, 14 Cal.3rd 411, 121 Cal.Rptr. 249 (1975). Reference cited: Sections 38501, 38510, 38560, 38560.5, 38571, 38580, 39000, 39001, 39002, 39003, 39515, 39516, 41510, 41511, Health and Safety Code; and *Western Oil and Gas Ass'n v. Orange County Air Pollution Control District*, 14 Cal.3rd 411, 121 Cal.Rptr. 249 (1975).

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Section 95486. Determination of Carbon Intensity Values

(a) *Selection of Method.*

- (1) A regulated party for CARBOB, gasoline, or diesel fuel must use Method 1, as set forth in section 95486(b)(2)(A), to determine the carbon intensity of each fuel or blendstock for which it is responsible ("regulated party's fuel").
- (2) A regulated party for any other fuel or blendstock must use Method 1, as set forth in section 95486(b)(2)(B), to determine the carbon intensity of each fuel for the regulated party's fuels, unless the regulated party is approved for using either Method 2A or Method 2B, as provided in section 95486(c) or (d).
- (3) A regulated party's choice of carbon intensity value under Method 1 in either (a)(1) or (a)(2) above is subject in all cases to Executive Officer approval, as specified in this provision. If the Executive Officer has reason to believe that the regulated party's choice is not the value that most closely corresponds to its fuel or blendstock, the Executive Officer shall choose a carbon intensity value, in the Carbon Intensity Lookup Tables for the fuel or blendstock, which the Executive Officer determines is the one that most closely corresponds to the pathway for that fuel or blendstock. The Executive Officer shall provide the rationale for his/her determination to the regulated party in writing within 10 business days of the determination. The regulated party shall be responsible for reconciling any deficits, in accordance with section 95485, that were incurred as a result of its initial choice of carbon intensity values. In determining whether a carbon intensity value that is different than the one chosen by the regulated party is more appropriate, the Executive Officer may consider any information submitted by the regulated party in support of its choice of carbon intensity value.

(b) *Method 1 – ARB Lookup Table.*

- (1) To generate carbon intensity values, ARB uses the California-modified GREET (CA-GREET) model (version 1.8b, February 2009, updated December 2009), which is incorporated herein by reference, and a land-use change (LUC) modifier (when applicable). The CA-GREET model is available for downloading on ARB's website at <http://www.arb.ca.gov/fuels/lcfs/lcfs.htm>.

The Carbon-Intensity Lookup Tables, shown below, specify the carbon intensity values for the enumerated fuel pathways that are described in the

following supporting documents, all of which are incorporated herein by reference:

- (A) Stationary Source Division, Air Resources Board (February 27, 2009, v.2.1), "Detailed California-Modified GREET Pathway for California Reformulated Gasoline Blendstock for Oxygenate Blending (CARBOB) from Average Crude Refined in California;"
- (B) Stationary Source Division, Air Resources Board (February 27, 2009, v.2.1), "Detailed California-Modified GREET Pathway for California Reformulated Gasoline (CaRFG);"
- (C) Stationary Source Division, Air Resources Board (February 28, 2009, v.2.1), "Detailed California-Modified GREET Pathway for Ultra Low Sulfur Diesel (ULSD) from Average Crude Refined in California;"
- (D) Stationary Source Division, Air Resources Board (February 27, 2009, v.2.1), "Detailed California-Modified GREET Pathway for Corn Ethanol;"
- (E) Stationary Source Division, Air Resources Board (February 27, 2009, v.2.1), "Detailed California-Modified GREET Pathway for Brazilian Sugarcane Ethanol;"
- (F) Stationary Source Division, Air Resources Board (February 28, 2009, v.2.1), "Detailed California-Modified GREET Pathway for Compressed Natural Gas (CNG) from North American Natural Gas;"
- (G) Stationary Source Division, Air Resources Board (February 28, 2009, v.2.1), "Detailed California-Modified GREET Pathway for Compressed Natural Gas (CNG) from Landfill Gas;"
- (H) Stationary Source Division, Air Resources Board (February 27, 2009, v.2.1), "Detailed California-Modified GREET Pathway for California Average and Marginal Electricity;"
- (I) Stationary Source Division, Air Resources Board (February 27, 2009, v.2.1), "Detailed California-Modified GREET Pathway for Compressed Gaseous Hydrogen from North American Natural Gas;"
- (J) Stationary Source Division, Air Resources Board (September 23, 2009, v.2.0), "Detailed California-Modified GREET Pathways for Liquefied Natural Gas (LNG) from North American and Remote Natural Gas Sources;"
- (K) Stationary Source Division, Air Resources Board (September 23, 2009, v.2.0), "Detailed California-Modified GREET Pathway for Liquefied Natural Gas (LNG) from Landfill Gas (LFG);"
- (L) Stationary Source Division, Air Resources Board (July 20, 2009, v.1.0), "Detailed California-Modified GREET Pathway for Compressed Natural Gas (CNG) from Dairy Digester Biogas;"

- (M) Stationary Source Division, Air Resources Board (September 23, 2009, v.2.0), "Detailed California-Modified GREET Pathway for Liquefied Natural Gas (LNG) from Dairy Digester Biogas;"
- (N) Stationary Source Division, Air Resources Board (September 23, 2009, v.2.0), "Detailed California-Modified GREET Pathway for Biodiesel from Used Cooking Oil;"
- (O) Stationary Source Division, Air Resources Board (September 23, 2009, v.2.0), "Detailed California-Modified GREET Pathway for Co-Processed Renewable Diesel from Tallow (U.S. Sourced);" ~~and~~
- (P) Stationary Source Division, Air Resources Board (September 23, 2009, v.2.3), "Detailed California-Modified GREET Pathways for Brazilian Sugarcane Ethanol: Average Brazilian Ethanol, With Mechanized Harvesting and Electricity Co-product Credit, With Electricity Co-product Credit;"
- (Q) *Stationary Source Division, Air Resources Board (December 14, 2009, v.3.0), "Detailed California-Modified GREET Pathway for Biodiesel from Midwest Soybeans; and*
- (R) *Stationary Source Division, Air Resources Board (December 14, 2009, v.3.0), "Detailed California-Modified GREET Pathway for Renewable Diesel from Midwest Soybeans."*

Table 6. Carbon Intensity Lookup Table for Gasoline and Fuels that Substitute for Gasoline.

Fuel	Pathway Description	Carbon Intensity Values (gCO ₂ e/MJ)		
		Direct Emissions	Land Use or Other Indirect Effect	Total
Gasoline	CARBOB – based on the average crude oil delivered to California refineries and average California refinery efficiencies	95.86	0	95.86
Ethanol from Corn	Midwest average; 80% Dry Mill; 20% Wet Mill; Dry DGS	69.40	30	99.40
	California average; 80% Midwest Average; 20% California; Dry Mill; Wet DGS; NG	65.66	30	95.66
	California; Dry Mill; Wet DGS; NG	50.70	30	80.70
	Midwest; Dry Mill; Dry DGS, NG	68.40	30	98.40
	Midwest; Wet Mill, 60% NG, 40% coal	75.10	30	105.10
	Midwest; Wet Mill, 100% NG	64.52	30	94.52
	Midwest; Wet Mill, 100% coal	90.99	30	120.99
	Midwest; Dry Mill; Wet, DGS	60.10	30	90.10
	California; Dry Mill; Dry DGS, NG	58.90	30	88.90
	Midwest; Dry Mill; Dry DGS; 80% NG; 20% Biomass	63.60	30	93.60
	Midwest; Dry Mill; Wet DGS; 80% NG; 20% Biomass	56.80	30	86.80
	California; Dry Mill; Dry DGS; 80% NG; 20% Biomass	54.20	30	84.20
	California; Dry Mill; Wet DGS; 80% NG; 20% Biomass	47.44	30	77.44
Ethanol from Sugarcane	Brazilian sugarcane using average production processes	27.40	46	73.40
	Brazilian sugarcane with average production process, mechanized harvesting and electricity co-product credit	12.40	46	58.40
	Brazilian sugarcane with average production process and electricity co-product credit	20.40	46	66.40
Compressed Natural Gas	California NG via pipeline; compressed in CA	67.70	0	67.70
	North American NG delivered via pipeline; compressed in CA	68.00	0	68.00
	Landfill gas (bio-methane) cleaned up to pipeline quality NG; compressed in CA	11.26	0	11.26
	Dairy Digester Biogas to CNG	13.45	0	13.45

Liquefied Natural Gas	North American NG delivered via pipeline; liquefied in CA using liquefaction with 80% efficiency	83.13	0	83.13
	North American NG delivered via pipeline; liquefied in CA using liquefaction with 90% efficiency	72.38	0	72.38
	Overseas-sourced LNG delivered as LNG to Baja; re-gasified then re-liquefied in CA using liquefaction with 80% efficiency	93.37	0	93.37
	Overseas-sourced LNG delivered as LNG to CA; re-gasified then re-liquefied in CA using liquefaction with 90% efficiency	82.62	0	82.62
	Overseas-sourced LNG delivered as LNG to CA; no re-gasification or re-liquefaction in CA	77.50	0	77.50
	Landfill Gas (bio-methane) to LNG liquefied in CA using liquefaction with 80% efficiency	26.31	0	26.31
	Landfill Gas (bio-methane) to LNG liquefied in CA using liquefaction with 90% efficiency	15.56	0	15.56
	Dairy Digester Biogas to LNG liquefied in CA using liquefaction with 80% efficiency	28.53	0	28.53
	Dairy Digester Biogas to LNG liquefied in CA using liquefaction with 90% efficiency	17.78	0	17.78
Electricity	California average electricity mix	124.10	0	124.10
	California marginal electricity mix of natural gas and renewable energy sources	104.71	0	104.71
Hydrogen	Compressed H ₂ from central reforming of NG (includes liquefaction and re-gasification steps)	142.20	0	142.20
	Liquid H ₂ from central reforming of NG	133.00	0	133.00
	Compressed H ₂ from central reforming of NG (no liquefaction and re-gasification steps)	98.80	0	98.80
	Compressed H ₂ from on-site reforming of NG	98.30	0	98.30
	Compressed H ₂ from on-site reforming with renewable feedstocks	76.10	0	76.10

Table 7. Carbon Intensity Lookup Table for Diesel and Fuels that Substitute for Diesel.

Fuel	Pathway Description	Carbon Intensity Values (gCO ₂ e/MJ)		
		Direct Emissions	Land Use or Other Indirect Effect	Total
Diesel	ULSD – based on the average crude oil delivered to California refineries and average California refinery efficiencies	94.71	0	94.71
Biodiesel	Conversion of waste oils (Used Cooking Oil) to biodiesel (fatty acid methyl esters -FAME) where “cooking” is required	15.84	0	15.84
	Conversion of waste oils (Used Cooking Oil) to biodiesel (fatty acid methyl esters -FAME) where “cooking” is not required	11.76	0	11.76
	<u>Conversion of Midwest soybeans to biodiesel (fatty acid methyl esters –FAME)</u>	<u>21.25</u>	<u>62</u>	<u>83.25</u>
Renewable Diesel	Conversion of tallow to renewable diesel using higher energy use for rendering	39.33	0	39.33
	Conversion of tallow to renewable diesel using lower energy use for rendering	19.65	0	19.65
	<u>Conversion of Midwest soybeans to renewable diesel</u>	<u>20.16</u>	<u>62</u>	<u>82.16</u>
Compressed Natural Gas	California NG via pipeline; compressed in CA	67.70	0	67.70
	North American NG delivered via pipeline; compressed in CA	68.00	0	68.00
	Landfill gas (bio-methane) cleaned up to pipeline quality NG; compressed in CA	11.26	0	11.26
	Dairy Digester Biogas to CNG	13.45	0	13.45
Liquefied Natural Gas	North American NG delivered via pipeline; liquefied in CA using liquefaction with 80% efficiency	83.13	0	83.13
	North American NG delivered via pipeline; liquefied in CA using liquefaction with 90% efficiency	72.38	0	72.38
	Overseas-sourced LNG delivered as LNG to Baja; re-gasified then re-liquefied in CA using liquefaction with 80% efficiency	93.37	0	93.37
	Overseas-sourced LNG delivered as LNG to CA; re-gasified then re-liquefied in CA using liquefaction with 90% efficiency	82.62	0	82.62
	Overseas-sourced LNG delivered as LNG to CA; no re-gasification or re-liquefaction in CA	77.50	0	77.50

	Landfill Gas (bio-methane) to LNG liquefied in CA using liquefaction with 80% efficiency	26.31	0	26.31
	Landfill Gas (bio-methane) to LNG liquefied in CA using liquefaction with 90% efficiency	15.56	0	15.56
	Dairy Digester Biogas to LNG liquefied in CA using liquefaction with 80% efficiency	28.53	0	28.53
	Dairy Digester Biogas to LNG liquefied in CA using liquefaction with 90% efficiency	17.78	0	17.78
Electricity	California average electricity mix	124.10	0	124.10
	California marginal electricity mix of natural gas and renewable energy sources	104.71	0	104.71
Hydrogen	Compressed H ₂ from central reforming of NG (includes liquefaction and re-gasification steps)	142.20	0	142.20
	Liquid H ₂ from central reforming of NG	133.00	0	133.00
	Compressed H ₂ from central reforming of NG (no liquefaction and re-gasification steps)	98.80	0	98.80
	Compressed H ₂ from on-site reforming of NG	98.30	0	98.30
	Compressed H ₂ from on-site reforming with renewable feedstocks	76.10	0	76.10

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NOTE: Authority cited: Sections 38510, 38560, 38560.5, 38571, 38580, 39600, 39601, 41510, 41511, Health and Safety Code; and *Western Oil and Gas Ass'n v. Orange County Air Pollution Control District*, 14 Cal.3rd 411, 121 Cal.Rptr. 249 (1975). Reference cited: Sections 38501, 38510, 38560, 38560.5, 38571, 38580, 39000, 39001, 39002, 39003, 39515, 39516, 41510, 41511, Health and Safety Code; and *Western Oil and Gas Ass'n v. Orange County Air Pollution Control District*, 14 Cal.3rd 411, 121 Cal.Rptr. 249 (1975).

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