

15-DAY MODIFIED REGULATION ORDER

Amend section 95486, title 17, California Code of Regulations (CCR), to read as follows:

[Note: The original regulatory text is shown in plain type. The proposed amendments are shown in underline to indicate addition and ~~strikeout~~ to show deletions. The further proposed amendments subject to comment are shown in double underline to indicate additions and ~~double strikeout~~ to show deletions. Text that has both ~~single underline~~ and ~~double strikeout~~ is additional text that staff proposed during the 45-day Public Notice period but proposed for retraction as part of this 15-day Public Notice period. All other portions remain unchanged and are indicated by the symbol “* * * * *” for reference]

Subchapter 10. Climate Change Article 4. Regulations to Achieve Greenhouse Gas Emission Reductions Subarticle 7. Low Carbon Fuel Standard

Section 95486. Determination of Carbon Intensity Values

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(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;” Pathway CBOB001;
- (B) Stationary Source Division, Air Resources Board (February 27, 2009, v.2.1), “Detailed California-Modified GREET

Pathway for California Reformulated Gasoline (CaRFG)₁”
Pathways ETHC001, ETHC002, ETHC003, ETHC004, ETHC005,
ETHC006, ETHC007, ETHC008, ETHC009, ETHC010, ETHC0011,
ETHC0012, ETHC0013;

- (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;” Pathway ULSD001;
- (D) Stationary Source Division, Air Resources Board
(February 27, 2009, v.2.1), “Detailed California-Modified GREET
Pathway for Corn Ethanol;” Pathways ETHC001, ETHC002,
ETHC003, ETHC004, ETHC005, ETHC006, ETHC007, ETHC008,
ETHC009, ETHC010, ETHC0011, ETHC0012, ETHC0013;
- (E) Stationary Source Division, Air Resources Board
(February 27, 2009, v.2.1), “Detailed California-Modified GREET
Pathway for Brazilian Sugarcane Ethanol;” Pathways ETHS001,
ETHS002, ETHS003;
- (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;” Pathways CNG001, CNG002;
- (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;”
Pathway CNG003;
- (H) Stationary Source Division, Air Resources Board
(February 27, 2009, v.2.1), “Detailed California-Modified GREET
Pathway for California Average and Marginal Electricity;” Pathways
ELC001, ELC002;
- (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;” Pathways HYG001, HYG002, HYG003, HYG004,
HYG005;
- (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;” Pathways LNG001, LNG002, LNG003,
LNG004, LNG005;
- (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);” Pathways
LNG006, LNG007;
- (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;"
Pathway CNG004;
- (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;"
Pathways LNG008, LNG009;
- (N) Stationary Source Division, Air Resources Board (September 23, 2009, v.2.0), "Detailed California-Modified GREET Pathway for Biodiesel from Used Cooking Oil;" Pathways BIOD002, BIOD003;
- (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);" Pathways RNWD002, RNWD003;
- (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;" Pathways ETHS001, ETHS002, ETHS003;
- (Q) Stationary Source Division, Air Resources Board (December 14, 2009, v.3.0), "Detailed California-Modified GREET Pathway for Biodiesel from Midwest Soybeans;" Pathway BIOD001; 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;" Pathway RNWD001;
- ~~(S) Archer Daniels Midland Company Method B Application Package (November 5, 2010),
http://www.arb.ca.gov/fuels/lcfs/2a2b/apps/adm_col_rpt_ncbi-121410.pdf, Pathways ETHC014, ETHC015, ETHC016, ETHC017, ETHC018, ETHC019, ETHC020, ETHC021;
 Archer Daniels Midland Company Method B Application Package (May 18, 2011), <http://www.arb.ca.gov/fuels/lcfs/2a2b/apps/adm-15day-070811.pdf>, Pathways ETHC014, ETHC015, ETHC016, ETHC017, ETHC018, ETHC019, ETHC020, ETHC021;~~
- ~~(T) POET Method 2A Application Package (December 14, 2010),
http://www.arb.ca.gov/fuels/lcfs/2a2b/apps/poet_rpt_ncbi-121410.pdf, Pathways ETHC025, ETHC026, ETHC027, ETHC028, ETHC029, ETHC030, ETHC031, ETHC032, ETHC033, ETHC034, ETHC035;
 POET Method 2A Application Package (February 20, 2011)
<http://www.arb.ca.gov/fuels/lcfs/2a2b/apps/poet-15day-070811.pdf>, Pathways ETCH025, ETCH026, ETCH027, ETCH028, ETCH029, ETCH030, ETCH031, ETCH032, ETCH033, ETCH034, ETCH035;~~
- (U) Trinidad Bulk Traders LTD Method 2B Application Package (November 23, 2010),

- <http://www.arb.ca.gov/fuels/lcfs/2a2b/apps/tbtl-rpt-ncbi-121410.pdf>,
Pathways ETHS004, ETHS005, ETHS006;
- (V) Green Plains Holdings II LLC—Lakota Plant Division Method 2A
Application Package, (November 3, 2010),
<http://www.arb.ca.gov/fuels/lcfs/2a2b/apps/gp-lak-sum-ncbi-121410.pdf>, Pathway ETHC024;
- (W) Green Plains Central City LLC, Method 2A Application Package
(October 20, 2010), <http://www.arb.ca.gov/fuels/lcfs/2a2b/apps/gp-cct-rpt-ncbi-121410.pdf>, Pathway ETHC023;
- (X) Louis Dreyfus Commodities, Elkhorn Valley Ethanol LLC Method
2A Application Package (December 1, 2010),
<http://www.arb.ca.gov/fuels/lcfs/2a2b/apps/ld-nor-rpt-ncbi-121410.pdf>, Pathway ETHC022;
- (Y) ~~Stationary Source Division, Air Resources Board (December 14,
2010), “Detailed California-Modified GREET Pathway for Biodiesel
Produced in the Midwest from Used Cooking Oil and Used in
California,” Pathways BIOD004, BIOD005;~~
Stationary Source Division, Air Resources Board (June 30, 2011, v.
2.0), <http://www.arb.ca.gov/fuels/lcfs/2a2b/internal/mw-uco-bd-070811.pdf>, “Detailed California-Modified GREET Pathway for
Biodiesel Produced in the Midwest from Used Cooking Oil and
Used in California,” Pathways BIOD004, BIOD005;
- (Z) ~~Stationary Source Division, Air Resources Board (December 14,
2010, v. 1.0), “Detailed California-Modified GREET Pathway for the
Production of Biodiesel from Corn Oil at Dry Mill Ethanol Plants”,
Pathway BIOD007;~~
Stationary Source Division, Air Resources Board (November 3,
2011, Version 2.0) “California-Modified GREET Pathway for the
Production of Biodiesel from Corn Oil at Dry Mill Ethanol Plants”,
Pathway BIOD007;

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

| Fuel | Pathway Identifier | Pathway Description | Carbon Intensity Values (gCO ₂ e/MJ) | | |
|-------------------|--------------------|---|---|-----------------------------------|----------------------------------|
| | | | Direct Emissions | Land Use or Other Indirect Effect | Total |
| Gasoline | <u>CBOB001</u> | CARBOB - based on the average crude oil delivered to California refineries and average California refinery efficiencies | 95.86 | 0 | 95.86 |
| Ethanol from Corn | <u>ETHC001</u> | Midwest average; 80% Dry Mill; 20% Wet Mill; Dry DGS; <u>NG</u> | 69.40 | 30 | 99.40 |
| | <u>ETHC002</u> | California average; 80% Midwest Average; 20% California; Dry Mill; Wet DGS; NG | 65.66 | 30 | 95.66 |
| | <u>ETHC003</u> | California; Dry Mill; Wet DGS; NG | 50.70 | 30 | 80.70 |
| | <u>ETHC004</u> | Midwest; Dry Mill; Dry DGS, NG | 68.40 | 30 | 98.40 |
| | <u>ETHC005</u> | Midwest; Wet Mill, 60% NG, 40% coal | 75.10 | 30 | 105.10 |
| | <u>ETHC006</u> | Midwest; Wet Mill, 100% NG | 64.52 | 30 | 94.52 |
| | <u>ETHC007</u> | Midwest; Wet Mill, 100% coal | 90.99 | 30 | 120.99 |
| | <u>ETHC008</u> | Midwest; Dry Mill; Wet, DGS; <u>NG</u> | 60.10 | 30 | 90.10 |
| | <u>ETHC009</u> | California; Dry Mill; Dry DGS, NG | 58.90 | 30 | 88.90 |
| | <u>ETHC010</u> | Midwest; Dry Mill; Dry DGS; 80% NG; 20% Biomass | 63.60 | 30 | 93.60 |
| | <u>ETHC011</u> | Midwest; Dry Mill; Wet DGS; 80% NG; 20% Biomass | 56.80 | 30 | 86.80 |
| | <u>ETHC012</u> | California; Dry Mill; Dry DGS; 80% NG; 20% Biomass | 54.20 | 30 | 84.20 |
| | <u>ETHC013</u> | California; Dry Mill; Wet DGS; 80% NG; 20% Biomass | 47.44 | 30 | 77.44 |
| | <u>ETHC014</u> | 2B Application*: Midwest; Dry Mill; Plant energy use not to exceed a value the applicant classifies as confidential; No grid electricity use; Coal use not to exceed 63% 71% of fuel use (by energy); Coal carbon content not to exceed 48% | 61.00 <u>60.99</u> | <u>30</u> | 91.00 <u>90.99</u> |
| | <u>ETHC015</u> | 2B Application*: Midwest; Dry Mill; Plant energy use not to exceed a value the applicant classifies as confidential; No grid electricity use; Biomass must be at least 5% of the fuel use (by energy); Coal use not to exceed 58% 66% of fuel use (by energy); Coal carbon content not to exceed 48% | 59.00 <u>59.08</u> | <u>30</u> | 89.00 <u>89.08</u> |

| Fuel | Pathway Identifier | Pathway Description | Carbon Intensity Values (gCO ₂ e/MJ) | | |
|------|--------------------|---|---|-----------------------------------|---------------------------|
| | | | Direct Emissions | Land Use or Other Indirect Effect | Total |
| | ETHC016 | 2B Application*: Midwest; Dry Mill; Plant energy use not to exceed a value the applicant classifies as confidential; No grid electricity use; Biomass must be at least 10% of the fuel use (by energy); Coal use not to exceed 52% 60% of fuel use (by energy); Coal carbon content not to exceed 48% | 57.17 57.16 | 30 | 87.17 87.16 |
| | ETHC017 | 2B Application*: Midwest; Dry Mill; Plant energy use not to exceed a value the applicant classifies as confidential; No grid electricity use; Biomass must be at least 15% of the fuel use (by energy); Coal use not to exceed 46% 54% of fuel use (by energy); Coal carbon content not to exceed 48% | 55.25 55.24 | 30 | 85.25 85.24 |
| | ETHC018 | 2B Application*: Midwest; Dry Mill; Plant energy use not to exceed a value the applicant classifies as confidential; No grid electricity use; Coal use not to exceed 68% 71% of fuel use (by energy); Coal carbon content not to exceed 48% | 60.11 59.80 | 30 | 90.11 89.80 |
| | ETHC019 | 2B Application*: Midwest; Dry Mill; Plant energy use not to exceed a value the applicant classifies as confidential; No grid electricity use; Biomass must be at least 5% of the fuel use (by energy); Coal use not to exceed 62% 65% of fuel use (by energy); Coal carbon content not to exceed 48% | 58.16 57.86 | 30 | 88.16 87.86 |
| | ETHC020 | 2B Application*: Midwest; Dry Mill; Plant energy use not to exceed a value the applicant classifies as confidential; No grid electricity use; Biomass must be at least 10% of the fuel use (by energy); Coal use not to exceed 56% 59% of fuel use (by energy); Coal carbon content not to exceed 48%. | 56.22 55.91 | 30 | 86.22 85.91 |
| | ETHC021 | 2B Application*: Midwest; Dry Mill; Plant energy use not to exceed a value the applicant classifies as confidential; No grid electricity use; Biomass must be at least 15% of the fuel use (by energy); Coal use not to exceed 50% 53% of fuel use (by energy); Coal carbon content not to exceed 48% | 54.27 53.96 | 30 | 84.27 83.96 |

| Fuel | Pathway Identifier | Pathway Description | Carbon Intensity Values (gCO ₂ e/MJ) | | |
|------|--------------------|--|---|-----------------------------------|----------------------------------|
| | | | Direct Emissions | Land Use or Other Indirect Effect | Total |
| | <u>ETHC022</u> | 2A Application*: Midwest; Dry Mill; 15% Dry DGS, 85% Partially Dry DGS; NG; Plant energy use not to exceed a value the applicant classifies as confidential | <u>57.16</u> | <u>30</u> | <u>87.16</u> |
| | <u>ETHC023</u> | 2A Application*: Midwest; Dry Mill; Partially Dry DGS; NG; Plant energy use not to exceed a value the applicant classifies as confidential | <u>54.29</u> | <u>30</u> | <u>84.29</u> |
| | <u>ETHC024</u> | 2A Application*: Midwest; Dry Mill; 75% Dry DGS, 25% Wet DGS; NG; Plant energy use not to exceed a value the applicant classifies as confidential | <u>61.60</u> | <u>30</u> | <u>91.60</u> |
| | <u>ETHC025</u> | 2A Application*: Dry Mill; Dry DGS; Raw starch hydrolysis; Amount and type of fuel use, and amount of grid electricity use not to exceed a value the applicant classifies as confidential | 62.40 <u>62.44</u> | <u>30</u> | 92.40 <u>92.44</u> |
| | <u>ETHC026</u> | 2A Application*: Dry Mill; Dry DGS; Raw starch hydrolysis/ combined heat and power; Amount and type of fuel use, and amount of grid electricity use not to exceed a value the applicant classifies as confidential | 58.50 <u>58.49</u> | <u>30</u> | 88.50 <u>88.49</u> |
| | <u>ETHC027</u> | 2A Application*: Dry Mill; Dry DGS; Raw starch hydrolysis/biomass & landfill gas fuels; Amount and type of fuel use, and amount of grid electricity use not to exceed a value the applicant classifies as confidential | <u>58.50</u> | <u>30</u> | <u>88.50</u> |
| | <u>ETHC028</u> | 2A Application*: Dry Mill; Dry DGS; Raw starch hydrolysis/corn fractionation; Amount and type of fuel use, and amount of grid electricity use not to exceed a value the applicant classifies as confidential | 61.70 <u>61.66</u> | <u>30</u> | 91.70 <u>91.66</u> |
| | <u>ETHC029</u> | 2A Application*: Dry Mill; Dry DGS; Conventional cook/combined heat and power; Amount and type of fuel use, and amount of grid electricity use not to exceed a value the applicant classifies as confidential | 60.50 <u>60.52</u> | <u>30</u> | 90.50 <u>90.52</u> |
| | <u>ETHC030</u> | 2A Application*: Dry Mill; Dry DGS; Raw starch hydrolysis/biogas process fuel; Amount and type of fuel use, and amount of grid electricity use not to exceed a value the applicant classifies as confidential | <u>44.70</u> | <u>30</u> | <u>74.70</u> |

| Fuel | Pathway Identifier | Pathway Description | Carbon Intensity Values (gCO ₂ e/MJ) | | |
|------------------------|--------------------|--|---|-----------------------------------|----------------------------------|
| | | | Direct Emissions | Land Use or Other Indirect Effect | Total |
| | <u>ETHC031</u> | <u>2A Application* : Dry Mill; Wet DGS; Raw starch hydrolysis; Amount and type of fuel use, and amount of grid electricity use not to exceed a value the applicant classifies as confidential</u> | 53.70 <u>53.69</u> | <u>30</u> | 83.70 <u>83.69</u> |
| | <u>ETHC032</u> | <u>2A Application* : Dry Mill; Wet DGS; Raw starch hydrolysis/ combined heat and power; Amount and type of fuel use, and amount of grid electricity use not to exceed a value the applicant classifies as confidential</u> | 49.80 <u>50.01</u> | <u>30</u> | 79.80 <u>80.01</u> |
| | <u>ETHC033</u> | <u>2A Application* : Dry Mill; Wet DGS; Raw starch hydrolysis/corn fractionation; Amount and type of fuel use, and amount of grid electricity use not to exceed a value the applicant classifies as confidential</u> | 50.70 <u>50.26</u> | <u>30</u> | 80.70 <u>80.26</u> |
| | <u>ETHC034</u> | <u>2A Application* : Dry Mill; Wet DGS; Conventional cook/combined heat and power; Amount and type of fuel use, and amount of grid electricity use not to exceed a value the applicant classifies as confidential</u> | 50.50 <u>50.47</u> | <u>30</u> | 80.50 <u>80.47</u> |
| | <u>ETHC035</u> | <u>2A Application* : Dry Mill; Wet DGS; Raw starch hydrolysis/biogas process fuel; Amount and type of fuel use, and amount of grid electricity use not to exceed a value the applicant classifies as confidential</u> | 43.20 <u>43.21</u> | <u>30</u> | 73.20 <u>73.21</u> |
| Ethanol from Sugarcane | <u>ETHS001</u> | Brazilian sugarcane using average production processes | 27.40 | 46 | 73.40 |
| | <u>ETHS002</u> | Brazilian sugarcane with average production process, mechanized harvesting and electricity co-product credit | 12.40 | 46 | 58.40 |
| | <u>ETHS003</u> | Brazilian sugarcane with average production process and electricity co-product credit | 20.40 | 46 | 66.40 |
| | <u>ETHS004</u> | <u>2B Application* : Brazilian sugarcane processed in the CBI with average production process; Thermal process power supplied with NG</u> | <u>32.94</u> | <u>46</u> | <u>78.94</u> |
| | <u>ETHS005</u> | <u>2B Application* : Brazilian sugarcane processed in the CBI with average production process, mechanized harvesting and electricity co-product credit; Thermal process power supplied with NG</u> | <u>17.94</u> | <u>46</u> | <u>63.94</u> |

| Fuel | Pathway Identifier | Pathway Description | Carbon Intensity Values (gCO ₂ e/MJ) | | |
|------------------------|--------------------|---|---|-----------------------------------|--------------|
| | | | Direct Emissions | Land Use or Other Indirect Effect | Total |
| | <u>ETHS006</u> | 2B Application*: Brazilian sugarcane processed in the CBI with average production process and electricity co-product credit; Thermal process power supplied with NG | <u>25.94</u> | <u>46</u> | <u>71.94</u> |
| Compressed Natural Gas | <u>CNG001</u> | California NG via pipeline; compressed in CA | 67.70 | 0 | 67.70 |
| | <u>CNG002</u> | North American NG delivered via pipeline; compressed in CA | 68.00 | 0 | 68.00 |
| | <u>CNG003</u> | Landfill gas (bio-methane) cleaned up to pipeline quality NG; compressed in CA | 11.26 | 0 | 11.26 |
| | <u>CNG004</u> | Dairy Digester Biogas to CNG | 13.45 | 0 | 13.45 |
| Liquefied Natural Gas | <u>LNG001</u> | North American NG delivered via pipeline; liquefied in CA using liquefaction with 80% efficiency | 83.13 | 0 | 83.13 |
| | <u>LNG002</u> | North American NG delivered via pipeline; liquefied in CA using liquefaction with 90% efficiency | 72.38 | 0 | 72.38 |
| | <u>LNG003</u> | 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 |
| | <u>LNG004</u> | 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 |
| | <u>LNG005</u> | Overseas-sourced LNG delivered as LNG to CA; no re-gasification or re-liquefaction in CA | 77.50 | 0 | 77.50 |
| | <u>LNG006</u> | Landfill Gas (bio-methane) to LNG liquefied in CA using liquefaction with 80% efficiency | 26.31 | 0 | 26.31 |
| | <u>LNG007</u> | Landfill Gas (bio-methane) to LNG liquefied in CA using liquefaction with 90% efficiency | 15.56 | 0 | 15.56 |
| | <u>LNG008</u> | Dairy Digester Biogas to LNG liquefied in CA using liquefaction with 80% efficiency | 28.53 | 0 | 28.53 |
| | <u>LNG009</u> | Dairy Digester Biogas to LNG liquefied in CA using liquefaction with 90% efficiency | 17.78 | 0 | 17.78 |
| Electricity | <u>ELC001</u> | California average electricity mix | 124.10 | 0 | 124.10 |
| | <u>ELC002</u> | California marginal electricity mix of natural gas and renewable energy sources | 104.71 | 0 | 104.71 |

| Fuel | <u>Pathway Identifier</u> | Pathway Description | Carbon Intensity Values (gCO ₂ e/MJ) | | |
|----------|---------------------------|--|---|-----------------------------------|--------|
| | | | Direct Emissions | Land Use or Other Indirect Effect | Total |
| Hydrogen | <u>HYGN001</u> | Compressed H ₂ from central reforming of NG (includes liquefaction and re-gasification steps) | 142.20 | 0 | 142.20 |
| | <u>HYGN002</u> | Liquid H ₂ from central reforming of NG | 133.00 | 0 | 133.00 |
| | <u>HYGN003</u> | Compressed H ₂ from central reforming of NG (no liquefaction and re-gasification steps) | 98.80 | 0 | 98.80 |
| | <u>HYGN004</u> | Compressed H ₂ from on-site reforming of NG | 98.30 | 0 | 98.30 |
| | <u>HYGN005</u> | Compressed H ₂ from on-site reforming with renewable feedstocks | 76.10 | 0 | 76.10 |

*Specific conditions apply.

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

| Fuel | Pathway Identifier | Pathway Description | Carbon Intensity Values (gCO ₂ e/MJ) | | |
|------------------------|--------------------|--|---|-----------------------------------|----------------------------------|
| | | | Direct Emissions | Land Use or Other Indirect Effect | Total |
| Diesel | <u>ULSD001</u> | ULSD - based on the average crude oil delivered to California refineries and average California refinery efficiencies | 94.71 | 0 | 94.71 |
| Biodiesel | <u>BIOD002</u> | Conversion of waste oils (Used Cooking Oil) to biodiesel (fatty acid methyl esters -FAME) where "cooking" is required | 15.84 | 0 | 15.84 |
| | <u>BIOD003</u> | 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>BIOD001</u> | Conversion of Midwest soybeans to biodiesel (fatty acid methyl esters - FAME) | 21.25 | 62 | 83.25 |
| | <u>BIOD004</u> | <u>Conversion of waste oils (Used Cooking Oil) to biodiesel (fatty acid methyl esters -FAME) where "cooking" is required. Fuel produced in the Midwest</u> | 18.44 <u>18.72</u> | <u>0</u> | 18.44 <u>18.72</u> |
| | <u>BIOD005</u> | <u>Conversion of waste oils (Used Cooking Oil) to biodiesel (fatty acid methyl esters -FAME) where "cooking" is not required. Fuel produced in the Midwest</u> | 13.53 <u>13.83</u> | <u>0</u> | 13.53 <u>13.83</u> |
| | <u>BIOD007</u> | <u>Conversion of corn oil, extracted from distillers grains prior to the drying process, to biodiesel</u> | 5.90 <u>4.00</u> | <u>0</u> | 5.90 <u>4.00</u> |
| Renewable Diesel | <u>RNWD002</u> | Conversion of tallow to renewable diesel using higher energy use for rendering | 39.33 | 0 | 39.33 |
| | <u>RNWD003</u> | Conversion of tallow to renewable diesel using lower energy use for rendering | 19.65 | 0 | 19.65 |
| | <u>RNWD001</u> | Conversion of Midwest soybeans to renewable diesel | 20.16 | 62 | 82.16 |
| Compressed Natural Gas | <u>CNG001</u> | California NG via pipeline; compressed in CA | 67.70 | 0 | 67.70 |
| | <u>CNG002</u> | North American NG delivered via pipeline; compressed in CA | 68.00 | 0 | 68.00 |
| | <u>CNG003</u> | Landfill gas (bio-methane) cleaned up to pipeline quality NG; compressed in CA | 11.26 | 0 | 11.26 |
| | <u>CNG004</u> | Dairy Digester Biogas to CNG | 13.45 | 0 | 13.45 |

| Fuel | Pathway Identifier | Pathway Description | Carbon Intensity Values (gCO ₂ e/MJ) | | |
|-----------------------|--------------------|---|---|-----------------------------------|--------|
| | | | Direct Emissions | Land Use or Other Indirect Effect | Total |
| Liquefied Natural Gas | <u>LNG001</u> | North American NG delivered via pipeline; liquefied in CA using liquefaction with 80% efficiency | 83.13 | 0 | 83.13 |
| | <u>LNG002</u> | North American NG delivered via pipeline; liquefied in CA using liquefaction with 90% efficiency | 72.38 | 0 | 72.38 |
| | <u>LNG003</u> | 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 |
| | <u>LNG004</u> | 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 |
| | <u>LNG005</u> | Overseas-sourced LNG delivered as LNG to CA; no re-gasification or re-liquefaction in CA | 77.50 | 0 | 77.50 |
| | <u>LNG006</u> | Landfill Gas (bio-methane) to LNG liquefied in CA using liquefaction with 80% efficiency | 26.31 | 0 | 26.31 |
| | <u>LNG007</u> | Landfill Gas (bio-methane) to LNG liquefied in CA using liquefaction with 90% efficiency | 15.56 | 0 | 15.56 |
| | <u>LNG008</u> | Dairy Digester Biogas to LNG liquefied in CA using liquefaction with 80% efficiency | 28.53 | 0 | 28.53 |
| | <u>LNG009</u> | Dairy Digester Biogas to LNG liquefied in CA using liquefaction with 90% efficiency | 17.78 | 0 | 17.78 |
| Electricity | <u>ELC001</u> | California average electricity mix | 124.10 | 0 | 124.10 |
| | <u>ELC002</u> | California marginal electricity mix of natural gas and renewable energy sources | 104.71 | 0 | 104.71 |
| Hydrogen | <u>HYGN001</u> | Compressed H ₂ from central reforming of NG (includes liquefaction and re-gasification steps) | 142.20 | 0 | 142.20 |
| | <u>HYGN002</u> | Liquid H ₂ from central reforming of NG | 133.00 | 0 | 133.00 |
| | <u>HYGN003</u> | Compressed H ₂ from central reforming of NG (no liquefaction and re-gasification steps) | 98.80 | 0 | 98.80 |
| | <u>HYGN004</u> | Compressed H ₂ from on-site reforming of NG | 98.30 | 0 | 98.30 |

| Fuel | <u>Pathway Identifier</u> | Pathway Description | Carbon Intensity Values (gCO ₂ e/MJ) | | |
|------|---------------------------|--|---|-----------------------------------|-------|
| | | | Direct Emissions | Land Use or Other Indirect Effect | Total |
| | <u>HYGN005</u> | Compressed H ₂ from on-site reforming with renewable feedstocks | 76.10 | 0 | 76.10 |