

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

<i>Fuel</i>	<i>Pathway Identifier</i>	<i>Pathway Description</i>	<i>Carbon Intensity Values (gCO₂e/MJ)</i>		
			<i>Direct Emissions</i>	<i>Land Use or Other Indirect Effect</i>	<i>Total</i>
CARBOB	CBOB001	CARBOB - based on the average crude oil supplied to California refineries and average California refinery efficiencies	99.18	0	99.18
Ethanol from Corn	ETHC001	Midwest average; 80% Dry Mill; 20% Wet Mill; Dry DGS; NG	69.40	30	99.40
	ETHC002	California average; 80% Midwest Average; 20% California; Dry Mill; Wet DGS; NG	65.66	30	95.66
	ETHC003	California; Dry Mill; Wet DGS; NG	50.70	30	80.70
	ETHC004	Midwest; Dry Mill; Dry DGS, NG	68.40	30	98.40
	ETHC005	Midwest; Wet Mill, 60% NG, 40% coal	75.10	30	105.10
	ETHC006	Midwest; Wet Mill, 100% NG	64.52	30	94.52
	ETHC007	Midwest; Wet Mill, 100% coal	90.99	30	120.99
	ETHC008	Midwest; Dry Mill; Wet, DGS; NG	60.10	30	90.10
	ETHC009	California; Dry Mill; Dry DGS, NG	58.90	30	88.90
	ETHC010	Midwest; Dry Mill; Dry DGS; 80% NG; 20% Biomass	63.60	30	93.60
	ETHC011	Midwest; Dry Mill; Wet DGS; 80% NG; 20% Biomass	56.80	30	86.80
	ETHC012	California; Dry Mill; Dry DGS; 80% NG; 20% Biomass	54.20	30	84.20

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			<i>Direct Emissions</i>	<i>Land Use or Other Indirect Effect</i>	<i>Total</i>
	ETHC013	California; Dry Mill; Wet DGS; 80% NG; 20% Biomass	47.44	30	77.44
	ETHC014	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 71% of fuel use (by energy); Coal carbon content not to exceed 48%	60.99	30	90.99
	ETHC015	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 66% of fuel use (by energy); Coal carbon content not to exceed 48%	59.08	30	89.08
	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 60% of fuel use (by energy); Coal carbon content not to exceed 48%	57.16	30	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 54% of fuel use (by energy); Coal carbon content not to exceed 48%	55.24	30	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 71% of fuel use (by energy); Coal carbon content not to exceed 48%	59.80	30	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 65% of fuel use (by energy); Coal carbon content not to exceed 48%	57.86	30	87.86

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			<i>Direct Emissions</i>	<i>Land Use or Other Indirect Effect</i>	<i>Total</i>
	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 59% of fuel use (by energy); Coal carbon content not to exceed 48%.	55.91	30	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 53% of fuel use (by energy); Coal carbon content not to exceed 48%	53.96	30	83.96
	ETHC022	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	57.16	30	87.16
	ETHC023	2A Application*: Midwest; Dry Mill; Partially Dry DGS; NG; Plant energy use not to exceed a value the applicant classifies as confidential	54.29	30	84.29
	ETHC024	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	61.60	30	91.60
	ETHC025	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	62.44	30	92.44
	ETHC026	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	58.49	30	88.49
	ETHC027	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	58.50	30	88.50

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	ETHC028	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	61.66	30	91.66
	ETHC029	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	60.52	30	90.52
	ETHC030	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	44.70	30	74.70
	ETHC031	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	53.69	30	83.69
	ETHC032	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	50.01	30	80.01
	ETHC033	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	50.26	30	80.26
	ETHC034	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	50.47	30	80.47

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	ETHC035	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	43.21	30	73.21
Ethanol from Sugarcane	ETHS001	Brazilian sugarcane using average production processes	27.40	46	73.40
	ETHS002	Brazilian sugarcane with average production process, mechanized harvesting and electricity co-product credit	12.40	46	58.40
	ETHS003	Brazilian sugarcane with average production process and electricity co-product credit	20.40	46	66.40
	ETHS004	2B Application*: Brazilian sugarcane processed in the CBI with average production process; Thermal process power supplied with NG	32.94	46	78.94
	ETHS005	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	17.94	46	63.94
	ETHS006	2B Application*: Brazilian sugarcane processed in the CBI with average production process and electricity co-product credit; Thermal process power supplied with NG	25.94	46	71.94
Compressed Natural Gas	CNG001	California NG via pipeline; compressed in CA	67.70	0	67.70
	CNG002	North American NG delivered via pipeline; compressed in CA	68.00	0	68.00
	CNG003	Landfill gas (bio-methane) cleaned up to pipeline quality NG; compressed in CA	11.26	0	11.26
	CNG004	Dairy Digester Biogas to CNG	13.45	0	13.45

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Liquefied Natural Gas	LNG001	North American NG delivered via pipeline; liquefied in CA using liquefaction with 80% efficiency	83.13	0	83.13
	LNG002	North American NG delivered via pipeline; liquefied in CA using liquefaction with 90% efficiency	72.38	0	72.38
	LNG003	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
	LNG004	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
	LNG005	Overseas-sourced LNG delivered as LNG to CA; no re-gasification or re-liquefaction in CA	77.50	0	77.50
	LNG006	Landfill Gas (bio-methane) to LNG liquefied in CA using liquefaction with 80% efficiency	26.31	0	26.31
	LNG007	Landfill Gas (bio-methane) to LNG liquefied in CA using liquefaction with 90% efficiency	15.56	0	15.56
	LNG008	Dairy Digester Biogas to LNG liquefied in CA using liquefaction with 80% efficiency	28.53	0	28.53
	LNG009	Dairy Digester Biogas to LNG liquefied in CA using liquefaction with 90% efficiency	17.78	0	17.78
Electricity	ELC001	California average electricity mix	124.10	0	124.10
	ELC002	California marginal electricity mix of natural gas and renewable energy sources	104.71	0	104.71
Hydrogen	HYGN001	Compressed H ₂ from central reforming of NG (includes liquefaction and re-gasification steps)	142.20	0	142.20
	HYGN002	Liquid H ₂ from central reforming of NG	133.00	0	133.00

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	HYGN003	Compressed H ₂ from central reforming of NG (no liquefaction and re-gasification steps)	98.80	0	98.80
	HYGN004	Compressed H ₂ from on-site reforming of NG	98.30	0	98.30
	HYGN005	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

<i>Fuel</i>	<i>Pathway Identifier</i>	<i>Pathway Description</i>	<i>Carbon Intensity Values (gCO₂e/MJ)</i>		
			<i>Direct Emissions</i>	<i>Land Use or Other Indirect Effect</i>	<i>Total</i>
Diesel	ULSD001	ULSD - based on the average crude oil supplied to California refineries and average California refinery efficiencies	98.03	0	98.03
Biodiesel	BIOD002	Conversion of waste oils (Used Cooking Oil) to biodiesel (fatty acid methyl esters - FAME) where "cooking" is required	15.84	0	15.84
	BIOD003	Conversion of waste oils (Used Cooking Oil) to biodiesel (fatty acid methyl esters - FAME) where "cooking" is not required	11.76	0	11.76
	BIOD001	Conversion of Midwest soybeans to biodiesel (fatty acid methyl esters -FAME)	21.25	62	83.25
	BIOD004	Conversion of waste oils (Used Cooking Oil) to biodiesel (fatty acid methyl esters - FAME) where "cooking" is required. Fuel produced in the Midwest	18.72	0	18.72
	BIOD005	Conversion of waste oils (Used Cooking Oil) to biodiesel (fatty acid methyl esters - FAME) where "cooking" is not required. Fuel produced in the Midwest	13.83	0	13.83
	BIOD007	Conversion of corn oil, extracted from distillers grains prior to the drying process, to biodiesel	4.00	0	4.00
Renewable Diesel	RNWD002	Conversion of tallow to renewable diesel using higher energy use for rendering	39.33	0	39.33
	RNWD003	Conversion of tallow to renewable diesel using lower energy use for rendering	19.65	0	19.65
	RNWD001	Conversion of Midwest soybeans to renewable diesel	20.16	62	82.16
Compressed Natural Gas	CNG001	California NG via pipeline; compressed in CA	67.70	0	67.70
	CNG002	North American NG delivered via pipeline; compressed in CA	68.00	0	68.00
	CNG003	Landfill gas (bio-methane) cleaned up to pipeline quality NG; compressed in CA	11.26	0	11.26

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			<i>Direct Emissions</i>	<i>Land Use or Other Indirect Effect</i>	<i>Total</i>
	CNG004	Dairy Digester Biogas to CNG	13.45	0	13.45
Liquefied Natural Gas	LNG001	North American NG delivered via pipeline; liquefied in CA using liquefaction with 80% efficiency	83.13	0	83.13
	LNG002	North American NG delivered via pipeline; liquefied in CA using liquefaction with 90% efficiency	72.38	0	72.38
	LNG003	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
	LNG004	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
	LNG005	Overseas-sourced LNG delivered as LNG to CA; no re-gasification or re-liquefaction in CA	77.50	0	77.50
	LNG006	Landfill Gas (bio-methane) to LNG liquefied in CA using liquefaction with 80% efficiency	26.31	0	26.31
	LNG007	Landfill Gas (bio-methane) to LNG liquefied in CA using liquefaction with 90% efficiency	15.56	0	15.56
	LNG008	Dairy Digester Biogas to LNG liquefied in CA using liquefaction with 80% efficiency	28.53	0	28.53
	LNG009	Dairy Digester Biogas to LNG liquefied in CA using liquefaction with 90% efficiency	17.78	0	17.78
Electricity	ELC001	California average electricity mix	124.10	0	124.10
	ELC002	California marginal electricity mix of natural gas and renewable energy sources	104.71	0	104.71
Hydrogen	HYGN001	Compressed H ₂ from central reforming of NG (includes liquefaction and re-gasification steps)	142.20	0	142.20
	HYGN002	Liquid H ₂ from central reforming of NG	133.00	0	133.00

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			<i>Direct Emissions</i>	<i>Land Use or Other Indirect Effect</i>	<i>Total</i>
	HYGN003	Compressed H ₂ from central reforming of NG (no liquefaction and re-gasification steps)	98.80	0	98.80
	HYGN004	Compressed H ₂ from on-site reforming of NG	98.30	0	98.30
	HYGN005	Compressed H ₂ from on-site reforming with renewable feedstocks	76.10	0	76.10

Table 8. Carbon Intensity Lookup Table for Crude Oil Production and Transport

<i>Country of Origin</i>	<i>Crude Identifier</i>	<i>Carbon Intensity Values (gCO₂e/MJ)</i>
	Baseline Crude Average*	11.39
	Annual Crude Average**	See 95486(b)(2)(A)1.
Angola	Dalia	7.86
	Girassol	10.43
	Greater Plutonio	8.82
Argentina	Canadon Seco	7.54
	Escalante	7.51
	Hydra	8.03
Australia	Pyrenees	5.96
Brazil	Albacora Leste	7.35
	Frade	6.62
	Marlim	6.75
	Marlim Sul	9.69
	Ostra	5.71
	Polvo	5.62
Cameroon	Lokele	24.02
Canada	Albian Heavy Synthetic	21.02
	Cold Lake	18.74
	Federated	7.77
	Koch Alberta	7.61
	Mixed Sweet Blend	7.75
	Suncor Synthetic A	24.49

	Suncor Synthetic C	24.49
	Syncrude Sweet Premium	21.87
Colombia	Castilla Blend	6.45
	Vasconia	6.63
Ecuador	Napo	7.45
	Oriente	9.34
Iraq	Basra Light	12.08
Kuwait/Saudi Arabia Partitioned Zone	Eocene	5.59
	Ratawi	5.77
Nigeria	Bonny Light	17.88
Oman	Oman	12.30
Peru	Loreto	5.82
	Mayna	7.14
Russia	ESPO	12.09
Saudi Arabia	Arab Extra Light	6.86
	Arab Light	6.75
Trinidad and Tobago	Calypso	6.95
United States	Alaska North Slope	12.81
	California Average Production	12.90
Venezuela	Boscan	12.53
	Petrozuata	23.58
	Zuata Sweet	23.50

* Based on production and transport of the crude oil supplied to California refineries during the baseline calendar year, 2010

** Based on production and transport of the crude oil supplied to California refineries during a specified calendar year or years. The Annual Crude Average CI value will be first calculated for calendar year 2012 and subsequently updated annually using data for crude oil supplied to California refineries during the specified calendar year or years.

