Calculation of 2013 Crude Average CI Value

Posting: Section 95486(b)(2)(A)3 of the Low Carbon Fuel Standard (LCFS) Regulation[1] states that each year the Executive Officer will post the Annual Crude Average carbon intensity calculation at the ARB-LCFS website for public comment. Written comments shall be accepted for 15 calendar days following the date on which the analysis was posted. Only comments related to potential factual or methodological errors in the posted Annual Crude Average carbon intensity value may be considered. The Executive Officer shall evaluate the comments received and, if the Executive Officer deems it necessary, may request in writing additional information or clarification from the commenters. Commenters shall have 10 days to respond to these requests. The Executive Officer shall post the final Annual Crude Average carbon intensity value at the ARB-LCFS website within 15 days of completion of the comment period, if no comments are received. If comments are received, the Executive Officer shall post the final Annual Crude Average carbon intensity value within 15 days of receiving any additional information or clarification requested from the commenters by the Executive Officer.[2]

Calculation of 2013 Crude Average CI: As described in subsections 95486(b)(2)(A)1 and 3, the 2013 Crude Average CI value is a volume weighted average of carbon intensities for crudes supplied to California during 2012 and 2013. The table below shows a breakdown of the sources of crude oil supplied to California refineries during 2012 and 2013 and the carbon intensity values assigned to these crude sources. All crude oil produced in and offshore of California is assumed to be refined in California. The volume contributions for California produced crudes are based on oil production data obtained from the California Department of Conservation.[3] The volume contributions for California federal offshore crudes are based on oil production data obtained from the Bureau of Safety and Environmental Enforcement.[4] The volume contributions of imported crudes are based on oil supply data submitted by refineries via a survey for 2012 volumes and annual compliance reporting for 2013 volumes. Fifty-seven crude names that do not appear in Table 8 (the Crude Lookup Table in section 95486(b)(1)) were supplied to California refineries during 2012 and 2013. These crudes contributed only 8.5 percent of the total volume of crude supplied to California refineries and are assigned the 2010 Baseline Crude Average CI value of 11.39 gCO_2e/MJ.[5] The 2013 Crude Average carbon intensity, 11.36 gCO_2e/MJ, is calculated by weighting the

[1] The LCFS regulation is found at California Code of Regulations (CCR), title 17, sections 95480-95490. Subsequent section references are to CCR title 17.
[2] ARB received one comment during the 15 day period. The comment and response are contained in the appendix to this document.
[3] California Department of Conservation, Online Production and Injection Query, http://opi.consrv.ca.gov/opi/opi.dll, (accessed May 29, 2014).
[4] Bureau of Safety and Environmental Enforcement website http://www.data.bsee.gov/homepg/data_center/production/PacificFreeProd.asp, (accessed May 2013 and May 2014).
[5] In conjunction with the update to OPGEE v1.1, staff intends to calculate carbon intensity values for all crudes supplied to California refineries during 2010, 2011, 2012 and 2013 that are not in the current Crude Lookup Table (Table 8, section 95486(b)(1)). ARB intends to make use of these new carbon intensity values in calculating Annual Crude Average CI values for 2015 and later years.

carbon intensity value for each crude by the volume supplied to California refineries during 2012 and 2013.

2013 Crude Average Carbon Intensity Calculation

Country/State	Crude Name	CI (g/MJ)	2012 and 2013 Volume (bbl)
	2013 Annual Crude Average CI	11.36	
Algeria	Saharan	11.39	1,485,985
Angola	Dalia	7.86	5,396,596
	Gimboa	11.39	177,590
	Girassol	10.43	2,815,984
	Greater Plutonio	8.82	4,563,776
	Kissanje	11.39	1,202,327
	Nemba	11.39	603,471
	Pazflor	11.39	11,776,338
Argentina	Escalante	7.51	625,020
	Medanito	11.39	310,000
Australia	Enfield	11.39	527,084
	Pyrenees	5.96	746,771
	Vincent	11.39	764,185
Brazil	Albacora Leste	7.35	772,526
	Frade	6.62	1,304,998
	Jubarte	11.39	525,120
	Lula	11.39	2,473,108
	Marlim	6.75	7,500,371
	Ostra	5.71	1,877,939
	Roncador	11.39	969,337
	Roncador Heavy	11.39	3,110,954
	Sapinhoa	11.39	1,032,516
Canada	Access Western Blend	11.39	228,810
	Albian Muskeg River Heavy	11.39	499,060
	Albian Heavy Synthetic	21.02	7,666,165
	Borealis	11.39	386,249
	Bow River	11.39	270,383
	Cardium	11.39	16,611
	Cold Lake	18.74	11,312,831
	Fosterton	11.39	1,060,536
	Halkirk	11.39	35,728
	Koch Alberta	7.61	140,470
	Light Sweet	11.39	37,148
	Lloydminster	11.39	2,773

	Mixed Sweet	7.75	53,570
	Peace River Sour	11.39	452,915
	Pembina	11.39	201,500
	Shell Synthetic Light	11.39	475,489
	Suncor Synthetic (all grades)	24.49	7,824,657
	Surmont	11.39	953,907
	Wabasca	11.39	385,817
Chad	Doba	11.39	719,359
Colombia	Cano Limon	11.39	1,175,973
	Castilla	6.45	24,792,862
	Cusiana	11.39	69,690
	Magdalena	11.39	10,483,945
	Rubiales	11.39	502,242
	South Blend	11.39	5,765,530
	Vasconia	6.63	22,736,813
Congo	Azurite	11.39	984,378
	Djeno	11.39	324,585
Ecuador	Napo	7.45	44,274,270
	Oriente	9.34	79,695,073
Equatorial Guinea	Ceiba	11.39	4,145,194
	Zafiro	11.39	1,035,612
Iraq	Basra Light	12.08	111,315,276
Kuwait	Kuwait	11.39	8,286,220
Libya	Amna	11.39	513,090
Mauritania	Chinquetti	11.39	625,062
Neutral Zone	Eocene	5.59	291,620
	Ratawi	5.77	530,000
Nigeria	Antan	11.39	1,120,179
Oman	Oman	12.30	2,279,456
Peru	Loreto	5.82	6,105,395
	Mayna	7.14	230,000
Russia	ESPO	12.09	15,478,624
	M100	11.39	416,874
Saudi Arabia	Arab Extra Light	6.86	37,146,086
	Arab Light	6.75	102,036,845
	Arab Medium	11.39	24,343,374
	Arab Heavy	11.39	813,300
Trinidad	Calypso	6.95	620,210
Venezuela	Bachaquero	11.39	266,800
	Boscan	12.53	245,000
	Hamaca DCO	11.39	662,400

	Laguna	11.39	283,440
	Mesa 30	11.39	357,753
	Petrozuata (all grades)	23.58	1,969,774
	Zuata (all grades)	23.50	1,536,743
US Alaska	ANS	12.81	147,992,805
US Colorado	Niobrara	11.39	987,807
US New Mexico	Four Corners	11.39	604,410
US North Dakota	Bakken	11.39	3,822,020
	North Dakota Sweet	11.39	57,446
US Texas	West Texas Intermediate	11.39	320,310
US Utah	Covenant	11.39	1,339,076
	Utah Sweet	11.39	71,645
US Wyoming	Wyoming	11.39	115,078
US California*	Aliso Canyon	1.97	425,117
	Ant Hill	26.37	88,389
	Antelope Hills	2.69	260,648
	Antelope Hills, North	13.16	587,457
	Arroyo Grande	27.81	727,414
	Asphalto	7.92	585,709
	Bandini	7.75	21,596
	Bardsdale	5.24	178,671
	Barham Ranch	2.74	152,167
	Beer Nose	2.18	140,216
	Belgian Anticline	3.62	91,303
	Bellevue	8.27	49,192
	Bellevue, West	8.63	23,664
	Belmont, Offshore	3.19	1,519,270
	Belridge, North	5.00	5,196,723
	Belridge, South	14.49	47,146,523
	Beverly Hills	3.33	1,503,692
	Big Mountain	3.15	60,136
	Blackwells Corner	11.05	19,836
	Brea-Olinda	2.97	2,245,816
	Buena Vista	13.61	2,341,617
	Burrel	16.44	21,979
	Cabrillo	2.84	36,679
	Canal	4.04	55,137
	Canfield Ranch	3.58	226,342
	Caneros Creek	2.96	44,035
	Cascade	2.20	304,902
	Casmalia	11.61	397,901

	Castaic Hills	2.79	21,719
	Cat Canyon	5.09	2,278,760
	Cheviot Hills	3.06	58,092
	Chico-Martinez	3.83	223,407
	Cienaga Canyon	3.89	67,270
	Coalinga	25.36	11,068,127
	Coles Levee, N	3.47	298,025
	Coles Levee, S	4.27	153,842
	Comanche	10.75	54,904
	Coyote, East	5.59	449,259
	Cuyama, South	11.86	428,146
	Cymric	19.91	28,143,746
	Deer Creek	18.29	96,044
	Del Valle	4.30	109,152
	Devils Den	3.63	39,791
	Edison	9.03	1,613,953
	El Segundo	2.98	45,616
	Elk Hills	5.36	26,070,461
	Elwood, S., Offshore	4.18	2,906,531
	Fruitvale	10.24	849,386
	Greeley	8.14	225,352
	Hasley Canyon	2.07	75,525
	Helm	3.35	132,339
	Holser	3.01	41,729
	Honor Rancho	2.69	165,286
	Huntington Beach	7.80	4,148,837
	Hyperion	1.65	20,692
	Inglewood	8.74	5,511,514
	Jacalitos	2.22	264,450
	Jasmin	17.54	258,507
	Kern Front	25.06	6,770,131
	Kern River	9.55	51,925,635
	Kettleman Middle Dome	3.53	104,660
	Kettleman North Dome	4.70	59,195
	Landslide	10.49	70,952
	Las Cienegas	4.46	711,938
	Livermore	2.17	26,689
	Lompoc	31.05	672,731
	Long Beach	5.12	2,768,405
	Long Beach Airport	3.73	27,772
	Los Angeles Downtown	4.11	61,139

	Los Angeles, East	8.28	43,664
	Lost Hills	11.40	21,508,937
	Lost Hills, Northwest	4.35	55,293
	Lynch Canyon	7.73	305,429
	Mahala	3.57	21,526
	McCool Ranch	1.71	25,181
	McDonald Anticline	4.92	124,325
	McKittrick	15.47	4,586,653
	Midway-Sunset	21.18	58,083,465
	Montalvo, West	2.63	1,402,812
	Montebello	10.29	1,164,457
	Monument Junction	3.81	249,205
	Mount Poso	20.57	1,847,032
	Mountain View	4.42	223,758
	Newhall-Potrero	2.83	246,961
	Newport, West	4.33	181,255
	Oak Canyon	3.81	42,062
	Oak Park	2.13	32,566
	Oakridge	2.57	257,228
	Oat Mountain	1.90	188,193
	Ojai	3.27	553,838
	Olive	1.93	105,381
	Orcutt	12.52	2,687,665
	Oxnard	16.89	218,303
	Paloma	3.42	53,116
	Placerita	31.66	1,896,781
	Playa Del Rey	6.04	83,549
	Pleito	4.01	844,722
	Poso Creek	28.41	5,528,357
	Pyramid Hills	2.92	119,461
	Railroad Gap	6.56	284,316
	Raisin City	7.64	248,648
	Ramona	3.37	95,279
	Richfield	3.63	651,388
	Rincon	2.93	671,831
	Rio Bravo	4.85	642,488
	Rio Viejo	2.50	155,669
	Riverdale	2.99	128,055
	Rose	2.10	702,945
	Rosecrans	5.18	313,783
	Rosecrans, South	3.11	18,719

	Rosedale	6.60	29,106
	Rosedale Ranch	8.84	340,240
	Round Mountain	28.73	8,024,178
	Russell Ranch	6.56	128,988
	Salt Lake	2.82	94,306
	Salt Lake, South	3.68	71,162
	San Ardo	28.82	14,501,933
	San Miguelito	4.44	966,361
	San Vicente	2.31	559,091
	Sansinena	2.54	387,308
	Santa Clara Avenue	3.31	122,050
	Santa Fe Springs	11.34	1,695,991
	Santa Maria Valley	6.48	451,141
	Santa Susana	3.14	35,243
	Sargent	4.77	75,516
	Saticoy	3.26	80,536
	Sawtelle	2.83	349,972
	Seal Beach	4.07	897,071
	Semitropic	3.39	81,936
	Sespe	2.91	782,751
	Shafter, North	2.54	2,034,945
	Shiells Canyon	3.24	172,177
	South Mountain	3.10	1,191,934
	Stockdale	1.71	227,931
	Tapia	6.42	85,137
	Tapo Canyon, South	2.87	19,442
	Tejon	7.96	1,260,280
	Tejon Hills	5.74	33,245
	Tejon, North	4.72	91,104
	Temescal	3.10	123,036
	Ten Section	6.22	198,726
	Timber Canyon	3.30	76,778
	Torrance	4.45	781,375
	Torrey Canyon	2.88	244,458
	Union Avenue	1.79	27,038
	Ventura	4.35	10,219,698
	Wayside Canyon	2.93	157,294
	West Mountain	2.89	25,574
	Wheeler Ridge	3.34	168,867
	White Wolf	1.64	21,445
	Whittier	2.51	179,000

	Wilmington	6.36	27,123,801
	Yowlumne	11.22	531,655
	Zaca	10.45	414,719
US Federal OCS	Beta	1.74	3,109,510
	Carpinteria	2.62	736,052
	Dos Cuadras	3.83	2,041,366
	Hondo	4.27	9,522,715
	Hueneme	4.33	212,897
	Pescado	3.45	4,468,323
	Point Arguello	8.68	2,717,170
	Point Pedernales	6.00	3,208,442
	Sacate	2.33	6,347,903
	Santa Clara	2.41	1,053,925
	Sockeye	5.82	2,124,013
Total			1,182,749,249

*All California fields that produced at least 10,000 bbls during 2012 or 2013

Appendix: Comment and Response

Comment: We have reviewed the recently published draft calculation of the California Industry Average Crude Carbon Intensity for 2013. We have noted that GHG intensity of AHS is reported in this document as 21.02 gCO_2e/MJ, a value calculated with OPGEE 1.0.

We believe that this value of 21.02 gCO_2e/MJ contains an error due to higher and lower heating values being confused when coefficients from Canada's GHGenius model (which works in HHV) were used unchanged in California's OPGEE 1.0 model (which works in LHV). My colleague Trevor Stephenson engaged in some communication on this matter with Adam Brandt which resulted in the OPGEE 1.0 model being corrected. The resulting updated value of 19.86 gCO_2e/MJ was published in the minutes of CARB's "LCFS Proposed 2013 Regulatory Amendments" workshop of March 5th, 2013 (see http://www.arb.ca.gov/fuels/lcfs/regamend13/Draft_Crude_CI_Values_%28OPGEEv1.1_DraftA%29_March_4_2013.pdf).

Please could you confirm that this value will be corrected in the 2013 calculation and in upcoming regulatory updates to adopt the latest "OPGEE" model (v. 1.1) going forward?

Response: The LCFS regulation language specifies "The Annual Crude Average carbon intensity value will be calculated using a volume-weighted average of individual crude carbon intensity values. Volumes for individual crudes will be the total volumes reported by all regulated parties in the Annual Compliance Reports for the calendar year. Individual crude carbon intensity values are those listed in Table 8."

The "updated" carbon intensity (CI) value of 19.86 gCO_2e/MJ discussed by the commenter was presented in a list of draft CI values at the March 2013 workshop. These CI values were not approved and included in Table 8.

The CI value for Albian Heavy Synthetic (AHS) in Table 8 of the LCFS regulation is 21.02 gCO_2e/MJ. This CI value was used in calculating both the 2012 and 2013 Crude Average CI values and will continue to be used for future calculations until revisions to Table 8 are adopted and approved through the Office of Administrative Law (OAL). Therefore, the 2013 Crude Average CI calculation will not be revised as suggested by the commenter.

Staff is in the process of proposing revisions to both OPGEE and Table 8 as part of the LCFS re-adoption scheduled to go to the Board this fall. The OPGEE correction noted by the commenter is part of the revised OPGEE model (OPGEEv1.1 Draft C) and will be reflected in the revised CI value for AHS crude to be considered by the Board.

Once the revisions are adopted by the Board and approved through OAL, the revised CI value for AHS will be used in calculating future Annual Crude Average CI values.