



November 20, 2014

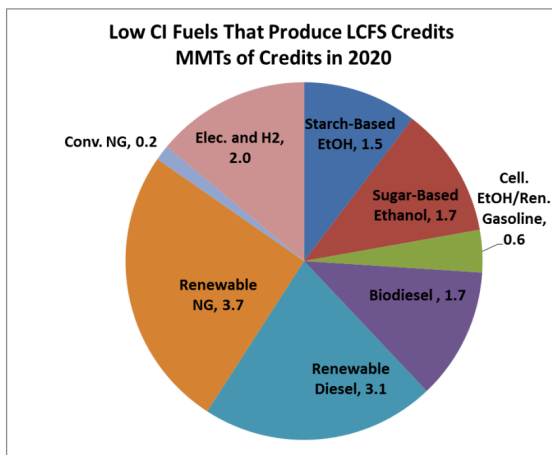
### Domestic Advanced Biofuel capacity through 2017

	2014		2015		2016		2017		# Companies	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
<b>Biodiesel</b>	512	619	512	748	512	904	512	1,094	123	123
<b>Drop-in</b>	214	216	214	216	309	326	319	347	15	27
<b>Ethanol</b>	58	57	97	97	115	170	182	215	26	27
<b>Other</b>	2	2	2	2	20	20	60	60	1	3
<b>TOTAL (volume)</b>	<b>784</b>	<b>893</b>	<b>824</b>	<b>1,063</b>	<b>955</b>	<b>1,421</b>	<b>1,072</b>	<b>1,716</b>	<b>165</b>	<b>180</b>
<b>TOTAL (gge)</b>	<b>819</b>	<b>933</b>	<b>846</b>	<b>1,095</b>	<b>878</b>	<b>1,444</b>	<b>1,056</b>	<b>1,719</b>		

Table 1. E2 advanced biofuel capacity projections, rounded to nearest million gallons, 2014-2017  
gge = gasoline gallon equivalent

The numbers in Table 1 above represent capacity E2 finds reasonably likely to come online by the listed date for North American advanced biofuel facilities 50% or better than fossil fuel counterparts. We assessed financing, progress towards completion, permitting, partnerships and other factors to weight the likelihood of success. A complete breakdown of the projects behind each of these low-end numbers is contained at the end of this document.

This is only one small piece of the pie. In addition to advanced biofuels, there are also imports of advanced biofuels, conventional biofuels, electricity and natural gas. As a conservative assumption, E2 considers that advanced biofuels may provide about 1/2 of the needed carbon reduction opportunities to meet a clean fuel standard (the respective red, green, purple and turquoise pie pieces in Figure 1). There is sufficient natural gas, electricity and conventional biofuels already in place. Therefore, we focus our area of observation on whether advanced biofuels may be able to sufficiently scale in the U.S. to meet one-half of California and Oregon’s standards.



**Figure 1.** The combination of alternative fuels that may meet the California LCFS in 2020, according to ARB’s illustrative scenario.

Source: CA Air Resources Board

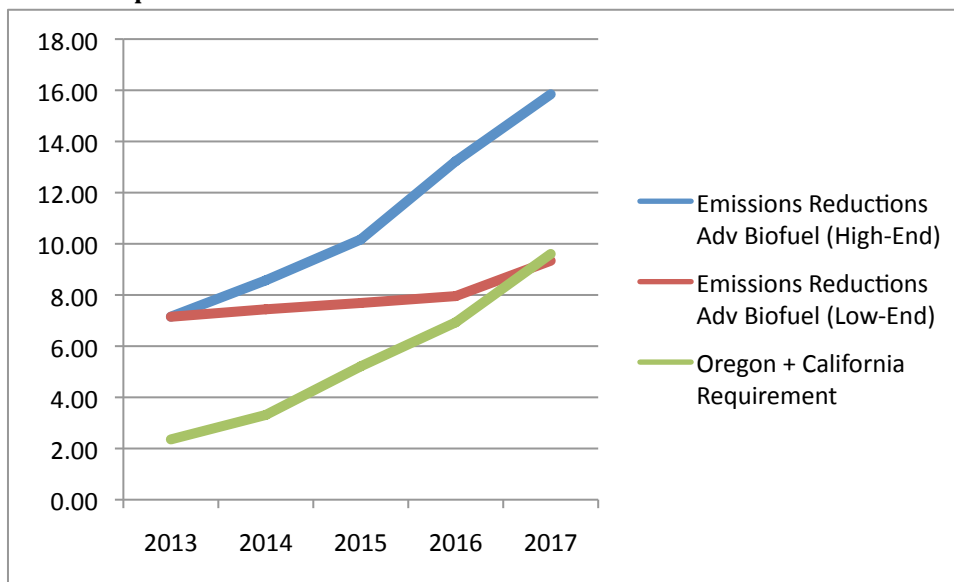
As a reference point, about 17 million metric tons (MMT) are needed to meet the California standard in 2020 and 2 MMTs to meet the proposed Oregon standard in 2025, using proposed carbon intensity values. We utilize our North American capacity estimates and translate this into MMTs of reduction opportunities. In Table 2, the first line shows one-half of the total of metric tons of reduction that both California and Oregon will need in 2017, which is 9.6 MMT. Again, we are looking at only one-half because the other half will likely be provided by other fuels. The capacities E2 counts will create between 9 and 15 MMT of reduction as shown in lines 2 and 3. To meet the Oregon standard in 2025, less than an additional 2 MMT are needed.

	2013	2014	2015	2016	2017
California + Oregon Requirement (MMT CO2e reduction)	2.36	3.31	5.21	7.03	9.62
Emissions Reductions E2 Fuel (Low-End)	7.15	7.44	7.69	7.96	9.34
Emissions Reductions E2 Fuel (High-End)	7.15	8.57	10.17	13.23	15.84
Difference (Low-End) *	4.79	4.13	2.48	0.93	-0.29
Difference (High-End) *	4.80	5.26	4.96	6.20	6.22

**Table 2.** E2 capacity volumes versus California and Oregon fuel standards.

\* A positive number means E2 fuels over-comply with the standard (credits may be banked).

**A Visual representation of the above:**

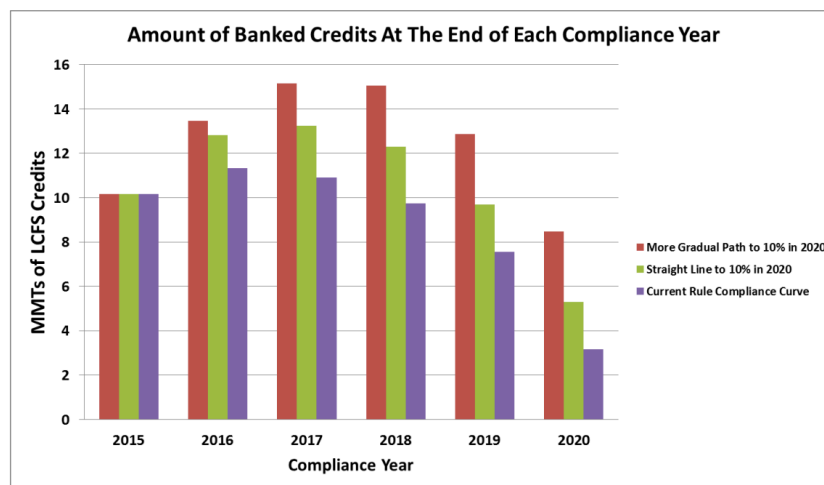


**What if E2 is overly optimistic?**

There are many factors that might help meet both the California and Oregon standard in 2020 and beyond that are not incorporated with this analysis. Some of these include:

- Petroleum carbon reduction opportunities upstream and at refineries, like solar steam power
- Imports: renewable diesel from one producer alone may generate as much as 2.5 MMT of reduction

- Additional credits from investor owned utilities: Until recently, some California utilities have been unable to trade banked credits while waiting on approval from the public utilities commission.
- Breakthrough technologies: such as renewable gasoline and biochar carbon sequestration
- More gradual California compliance: E2 supports a more gradual path to 10% compliance in 2020. Under this path, fewer cumulative credits are needed, providing a slight error margin. This is shown in Figure 2 below, which are ARB's illustrative scenarios given today's fuel availability. The gradual path, in red, shows that as many as 8 MMTs of banked credit could exist in 2020, providing a sufficient margin of error, even when considering the 2 MMTs Oregon will need in 2020.
- Baseline and alternative fuel carbon intensity values for both California and Oregon may be updated for improvements in lifecycle science. Data being considered in California shows a trend of an increasing gap between fossil fuels and alternative fuels. These potential new values will make compliance even more readily achievable.



**Figure 2.** Proposed ARB compliance paths and banked credits estimated to comply with LCFS.  
*Source: CA Air Resources Board.*

**North American Advanced Biofuel Projects – through 2017**  
Facilities counted towards E2 low-end capacity

Company	Facility Location	Partnerships	Projected Online	Fuel Type	Feedstock	Note
Abengoa	Hugoton, KS	Dyadic license for enzyme technology	2014	Ethanol	cellulose	Complete October
Ace Ethanol (Sweetwater)	Stanley, WI	Sweetwater Energy	2016	cellulosic Ethanol	cellulose	Secured permits
American Process	Alpena, MI	Cobalt, GranBio	2012	Cellulosic Ethanol then butanol	woody biomass	Produced fuel that generated cellulosic ethanol RINs.
Canergy, LLC	Brawley, CA	Beta Renewables, Chemtex	2017	Ethanol	energy cane	In permitting process for Impervial Valley facility.
Chemtex	Sampson County, NC	Beta Renewables, Biofuels Center NC, Novozymes	2017	Cellulosic Ethanol	miscanthus and switchgrass	JV of Chemtex and Gruppo Mossi & Ghisolfi; prototype in Italy is operational.
Cool Planet	Louisiana	BP and ConocoPhillips	2015	Renewable Gasoline	cellulose	Broke ground on facility in February 2014 and secured \$100M in financing in March.
Diamond Green	Norco, Louisiana	Uses UOP oil.	2013	Renewable Diesel	animal fat, used cooking oil	Began production in June 2013
DuPont Cellulosic Ethanol	Nevada, Iowa		2015	Ethanol	lignocellulosics, corn stover, switchgrass	
Emerald Biofuels	Plaquemine, LA	Dow, Honeywell	2016	Renewable Diesel	waste fats and oils	Complete in Sept
Enerkem, Inc.	Edmonton, Alberta		2014	Ethanol and methanol	MSW	Currently producing methanol. Expect to produce ethanol at full capacity in 2016.
Enerkem, Inc.	Varennes, Quebec		2017	Ethanol and methanol	MSW	
Fiberight	Blairstown, IA		2015	Ethanol	MSW	Began construction in April, 2014
Front Range Energy (Sweetwater)	Windsor, CO	Sweetwater Energy	End-of 2016	Ethanol	woody biomass, agricultural residue	7% of feedstock to come from Sweetwater's cellulosic sugars. In process of acquiring land for Sweetwater facility.
Fulcrum Bioenergy	Reno, NV	Waste Management, Waste Connection	End-of 2016	Jet fuel, diesel	MSW	
INEOS Bio	Vero Beach, FL		2013	Ethanol	Vegetative and yard waste	Began producing in July 2013, but suspended production to fix

						operational issues. Working towards stable production at full capacity. May incorporate MSW as feedstock in the future.
Oberon	Imperial Valley, CA	Volvo	2013	DME	Methanol, methane, biogas, natural gas, stranded gas	Diesel replacement for heavy duty vehicles. Volvo Group launching DME fleet.
Pacific Ethanol (Sweetwater Energy)	Madera, CA	Sweetwater Energy	2017	Ethanol	sweetwater sugars	Will begin permitting process this year.
POET- DSM	Emmetsburg, IA		2014	Ethanol	Corn stover	Complete Sept
Quad County Corn	Galva, IA		2014	Ethanol	corn kernel cellulose	Produced first gallon of cellulosic ethanol in July 2014
Renewable Energy Group Geismar (Dynamic Fuels)	Geismar, LA	JV Syntroleum Corp and Tyson	2010	Renewable Diesel	animal fat, used cooking oil	Idle since 2012, but acquired by Renewable Energy Group in 2014.
Sapphire Energy	Columbus, NM	Linde CO2 supplier, Tesoro as customer	operating	crude oil	algae	Expect to produce 100 barrels of crude oil/day by 2015, which may be refined into any fuel. Expect to reach commercial scale by 2018.
Solazyme	Clinton IA		2013	multiple fuels - renewable	sugar	500,000 L
Solazyme	Peoria IL		2013	multiple fuels - renewable	sugar	2,000,000 L

Summary of ethanol, drop-in, and other fuel table (GGE)					
	2013	2014	2015	2016	2017
<b>Drop-in</b>	86.2	243.5	243.7	253.7	362.0
<b>Ethanol</b>	7.7	38.5	65.3	77.0	121.9
<b>Other (DME, Butanol)</b>	0.9	0.9	0.9	12	36
<b>Total GGE</b>	94.9	283.0	309.9	342.7	519.9

## Biodiesel Producers

Company	City	State	Nameplate (MGY)	Note
<a href="#">Advanced Biodiesel</a>	Noblesville	IN	2	
<a href="#">Agribiofuels, LLC</a>	Dayton	TX	12	
<a href="#">Allied Renewable Energy</a>	Birmingham	AL	15	
Alternative Fuel Solutions	Huntington	IN	0.8	
<a href="#">American Biodiesel Energy</a>	Erie	PA	4	
<a href="#">Baker Commodities Billerica</a>	Billerica	MA		
<a href="#">Baker Commodities Los Angeles</a>	Vernon	CA		
<a href="#">Beaver Biodiesel, LLC</a>	Portland	OR	1	
<a href="#">Bently Biofuels Company</a>	Minden	NV	1	Owned by Pacific Biodiesel
<a href="#">Big Island Biodiesel, LLC</a>	Keaau	HI	5	Owned by Pacific Biodiesel
<a href="#">Bio-Alternative, LLC</a>	Covington	IN	16	
<a href="#">BIODICO</a>	Multiple		13.0	2 facilities: Denton, TX & Port Hueneme, CA. Formerly Biodiesel Industries
<a href="#">Biodiesel of Las Vegas</a>	Las Vegas	NV	4	
<a href="#">Biodiesel of Texas, Inc.</a>	Denton	TX	2	
<a href="#">BioDiesel One</a>	Southington	CT	3	
<a href="#">BioVantage Fuels, LLC</a>	Belvidere	IL	4	
<a href="#">Black Bear Biodiesel</a>	Plainfield	VT		
BlackGold Biofuels	Philadelphia	PA		
<a href="#">Blue Ridge Biofuels</a>	Asheville	NC	1	
<a href="#">Blue Sun Biodiesel</a>	St. Joseph	MO	30	
Bridgeport Biodiesel (Tri-state biodiesel)	Bridgeport	CT	1	Expanding to 8-10 million gallons per year of capacity
<a href="#">Buster Biofuel</a>	San Diego	CA	1.0	CEC award for \$2.6M. Plan to scale up capacity to 5 million gallons per year.
<a href="#">Calumet Penreco, LLC</a>	Dickinson	TX		
<a href="#">Cape Cod BioFuels</a>	Sandwich	MA	0.5	
<a href="#">Channel Biorefinery &amp; Terminals, LLC</a>	Houston	TX		
<a href="#">Chesapeake Green Fuels</a>	Multiple		12	2 facilities
<a href="#">Clinton County Bio Energy</a>	Clinton	IA	10	
<a href="#">Community Fuels</a>	Stockton	CA	10	American Biodiesel Inc.
<a href="#">Crimson Renewable Energy</a>	Bakersfield	CA	22	Awarded \$5M grant from the CEC to expand its biorefinery in Bakersfield.
<a href="#">Delek Renewables AR</a>	Crossett	AR	13	Former Pinnacles facility
<a href="#">Delek Renewables TX</a>	Cleburne	TX	12	Beacon Energy
Double Diamond Biofuels, Inc	Dimmit	TX	30	
<a href="#">Eberle Biodiesel</a>	Liverpool	TX	0.5	
<a href="#">Emergent Green Energy</a>	Minneola	KS	2	
Energy Tec	Maquoketa	IA	0.03	
<a href="#">Eslinger</a>	Dos Palos	CA		CEC award \$6M for 5 MG plant in Fresno
<a href="#">Ever Cat Fuels</a>	Isanti	MN	3	
<a href="#">Extreme Biodiesel</a>	Temecula	CA		
<a href="#">Flint Hill Resources LP</a>	Euless	TX		

Company	City	State	Nameplate (MGY)	Note
<a href="#">Foothills Bio-Energies, LLC</a>	Lenoir	NC	5	
<a href="#">FutureFuel</a>	Batesville	AR	58	
<a href="#">GEN-X Energy Group</a>	Moses Lake	WA	15	Will produce 6 million gallons of biodiesel annually.
<a href="#">General Biodiesel</a>	Seattle	WA	5	
<a href="#">Genuine Bio-Fuel</a>	Indiantown	FL	6	
<a href="#">GeoGreen Biofuels</a>	Vernon	CA		
<a href="#">Global Alternative Fuels, LLC</a>	El Paso	TX	15	
<a href="#">Golden Leaf Energy Inc.</a>	Harvey	LA	2	
<a href="#">Greecycle Arizona</a>	Tucson	AZ	2	
<a href="#">Green Biofuels Corporation</a>	Miami	FL		
<a href="#">Green Earth Fuels</a>	Galena Park	TX	90	
Green Energy Products	Sedgwick	KS		Being rebuilt after fire.
<a href="#">Green Gallon Solutions of North America</a>	multiple	FL (3), TN, TX	12.0	5 facilities
<a href="#">Green Waste Solutions of Alaska</a>	Anchorage	AK	0.3	Owned by Pacific Biodiesel
<a href="#">Greenleaf Biofuels</a>	New Haven	CT	10	
<a href="#">Greenwave Biodiesel</a>	Ft. Lauderdale	FL	4	
<a href="#">Griffin Industries</a>	Butler	KY	1.8	Owned by Darling International
<a href="#">HERO BX (Lake Erie Biofuels)</a>	Erie	PA	45	
<a href="#">High Plains Bioenergy</a>	Guymon	OK	30	
<a href="#">Imperial Western Products</a>	Coachella	CA	10.5	
<a href="#">Imperium Renewables</a>	Hoquiam	WA	100	
<a href="#">Iowa Renewable Energy</a>	Washington	IA	30	
<a href="#">Jatrodiesel</a>	Miamisburg	OH	5	
<a href="#">Kelley Green</a>	Goshen	KY	0.1	
<a href="#">Kyoto Fuels Corporation</a>	Lethbridge	AB		
Louisiana ECO Green, LLC	Bourg	LA		
<a href="#">Maine Bio-Fuel</a>	Portland	ME	0.5	
ME Bioenergy LLC	Lilbourn	MO	5	
<a href="#">Mesa Processing, Inc.</a>	Ft. Worth	TX		
<a href="#">Midlands Biofuels</a>	Winnsboro	SC	0	
<a href="#">Midwest Biodiesel Products, LLC</a>	Roxanna	IL	30	
<a href="#">Milligan Bio-Tech, Inc.</a>	Foam Lake	SK	20	
<a href="#">Mother Earth Energy</a>	Chester	PA		
Natural Biodiesel Plant	Hayti	MO	5	
Nature's Bioreserves	Sioux City	SD		DOD grant 2013
<a href="#">New Leaf Biofuel</a>	San Diego	CA	6	
<a href="#">Newport Biodiesel</a>	Newport	RI	0.5	
Noil Energy Group	Commerce	CA		
<a href="#">North Star Biofuels</a>	Watsonville	CA	20.00	
<a href="#">Northeast Biodiesel</a>	Greenfield	MA		
<a href="#">Oregon Oils, Inc</a>	Portland	OR		
<a href="#">Outpost Biodiesel</a>	Grafton	NH	0.03	

Company	City	State	Nameplate (MGY)	Note
<a href="#">Pacific Biodiesel</a>	Multiple		12	7 facilities not otherwise captured
<a href="#">Patriot Biodiesel</a>	Greensboro	NC	6.9	
<a href="#">Piedmont Biofuels Industrial</a>	Pittsboro	NC	3.3	
<a href="#">Pleasant Valley Biofuels</a>	Washington City	UT	5.5	
<a href="#">Producers Choice Soy Energy</a>	Moberly	MO	5	
<a href="#">RBF Port Neches, LLC</a>	Port Neches	TX	180	
<a href="#">Red Birch Energy, Inc.</a>	Bassett	VA	3	
<a href="#">Renewable Energy Group</a>	Multiple		257	8 facilities. 4 additional facilities in development
<a href="#">REV Biodiesel</a>	Gilbert	AZ	10	Division of Pure Earth Energy Resources.
<a href="#">Sabine Biofuels II</a>	Port Arthur	TX	30	Joint venture of Endicott Biofuels and Holly Corporation
<a href="#">Sanimax Energy</a>	Deforest	WI	20	
<a href="#">Scott Petroleum Corporation</a>	Greenville	MS	20	
<a href="#">SeQuential</a>	Salem	OR	5.0	Owned by Pacific Biodiesel
Shenandoah Agricultural Products	Clearbrook	VA	0.3	
<a href="#">Simple Fuels Biodiesel, Inc.</a>	Chilcoat	CA	1	
<a href="#">Smart Fuels Florida</a>	Fruitland Park	FL	3	
<a href="#">Southeast BioDiesel</a>	North Charleston	SC	5	
Southeastern Biodiesel Solutions	Creola	AL	1	
Sullens Biodiesel	Morrison	TN	2	
<a href="#">Sun Power Biodiesel</a>	Cumberland	WI	3	
<a href="#">Texas Biotech, Inc</a>	Arlington	TX	5	
<a href="#">Texas Green Manufacturing</a>	Littlefield	TX	1.3	
The La Grange Plant	La Grange	TX	3.5	
<a href="#">Thumb BioEnergy</a>	Sandusky	MI	0.4	
<a href="#">Tidewater Biodiesel, LLC</a>	Chesapeake	VA		
<a href="#">TMT Biofuels</a>	Port Leyden	NY	0.3	
<a href="#">Triangle Biofuels Industries</a>	Wilson	NC	3	
<a href="#">United Oil Company</a>	Pittsburgh	PA	5	
<a href="#">US Alternative Fuels Corp.</a>	Johnstown	PA	2	
<a href="#">Vanguard Synfuels</a>	Pollock	LA	12	
<a href="#">Veros Energy</a>	Moundville	AL	37	
<a href="#">Viesel Fuel</a>	Stuart	FL	11	
<a href="#">Virginia Biodiesel Refinery</a>	West Point	VA	7	Owned by Pacific Biodiesel
<a href="#">W2Fuel LLC</a>	Multiple	IA & MI	20.0	2 facilities
<a href="#">Walsh Bio Fuels</a>	Mauston	WI	5	
<a href="#">Washakie Renewable Energy</a>	Plymouth	UT	10	
<a href="#">Western Dubuque Biodiesel</a>	Farley	IA	36	
<a href="#">Western Iowa Energy</a>	Wall Lake	IA	30	
<a href="#">White Mountain Biodiesel</a>	North Haverhill	NH	5.5	
<a href="#">Whole Energy Fuels</a>	Anacortes	WA	2	
<a href="#">Wil Fischer Distributing Co, Inc.</a>	Springfield	MO		
<a href="#">World Energy (US Biofuels)</a>	Rome	GA	13	



<b>Total Capacity (Million Gallons/Year)</b>	1544.992
<b>Number of Biodiesel Companies</b>	123

E2's biodiesel list includes active biodiesel producers that process non-virgin feedstocks or can accept non-virgin feedstocks. We do not include facilities that process virgin oils only, although it is possible that these facilities will make modifications to their facilities to accept other feedstocks in the future. Capacity included virgin oil facilities totals 2.4 billion gallons per year.