

April 22, 2016

As California LCFS Reaches Halfway Mark, Grain Ethanol Provides Half of Carbon Credits But Compliance Challenges Lie Ahead

On this date seven years ago the California Air Resources Board (CARB) convened to formally adopt the Low Carbon Fuel Standard (LCFS), a program requiring fuel suppliers to reduce the carbon intensity (CI) of gasoline and diesel fuels by 10% between 2011 and 2020. Back in those halcyon days, CARB assumed the CI reductions required under the LCFS would be largely achieved through rapid growth in the use of electric vehicles, imported sugarcane ethanol, cellulosic biofuels, and even hydrogen fuel cells—all of which were deemed by CARB to have low CI impacts relative to petroleum.

Meanwhile, CARB expected grain-based ethanol produced in the Midwest would make a quick exit from the California fuel market due to the artificially high CI value it was assigned. CARB Chair Mary Nichols stated she had even considered an outright “ban” on grain ethanol and other “grown fuels.” Thanks to a trumped up penalty for an unproven theory known as “indirect land use change (ILUC),” the CI value assigned to average Midwest corn ethanol in the original LCFS regulation was actually *4% higher than gasoline*. In effect, this meant state fuel suppliers would be penalized for continuing to blend ethanol made in the Heartland. As a result, CARB expected Midwest corn ethanol use to fall 60-70% between 2010 and 2015, and they projected the fuel to be entirely purged from the state by 2017.

So, what has actually happened in the California market since the LCFS was adopted? How have regulated parties complied with the CI reduction requirements? How has grain ethanol been affected? Just last week, CARB released detailed data regarding LCFS credit generation and the mix of fuels that have been used to comply with the regulation through its first five years. The data certainly revealed some surprises, and it would be quite an understatement to say the LCFS hasn’t exactly played out the way CARB envisioned in 2009.

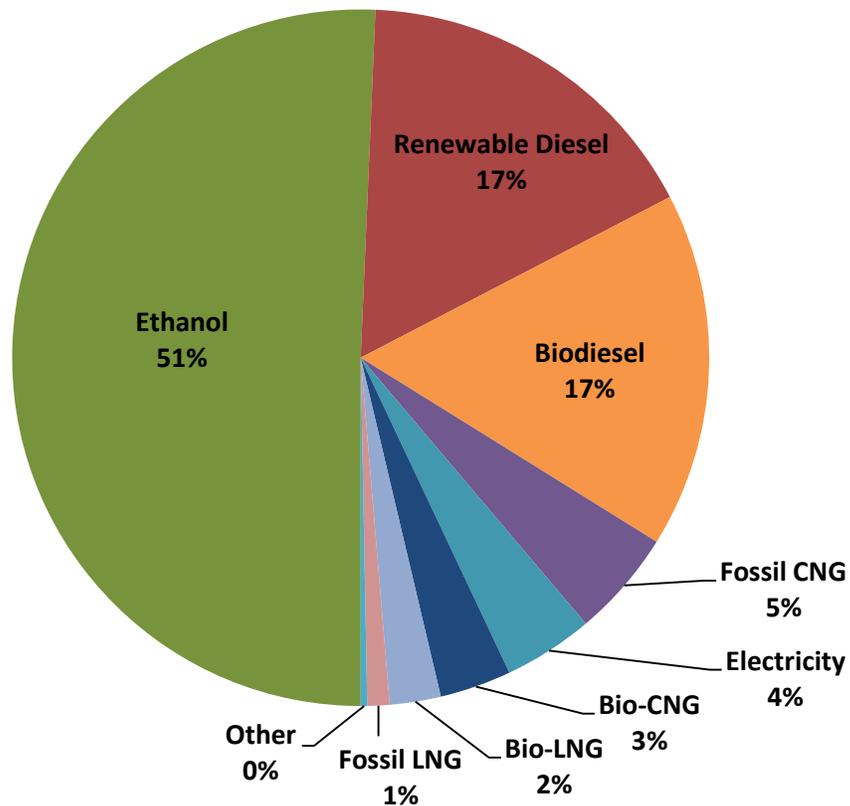
A Review of CARB’s LCFS Credit Generation Data

According to the CARB data, regulated parties have reduced the carbon intensity of the state’s transportation fuels by a cumulative **16.55 million metric tons (MMT)** of CO₂-equivalent greenhouse gases (GHG) since enforcement began in 2011. While that’s an impressive accomplishment, the manner in which these reductions were achieved likely came as a surprise to CARB.

- Grain-based ethanol has generated **7.58 MMT** of CI reductions since the program’s inception, accounting for **46% of total LCFS credits** and nearly **75% of credits in the gasoline pool**. To date, grain ethanol has provided substantially more credits than any other fuel used under the LCFS.
- Sugarcane and molasses-based ethanol has provided less than 0.80 MMT of CI reductions, making up **less than 5%** of total LCFS credits.
- Biodiesel use has provided 2.73 MMT of LCFS credits, with corn distillers oil-derived biodiesel making up roughly one-third of that total.
- Renewable diesel, much of which is imported from overseas, accounts for 2.76 MMT of credits.

- Liquid biofuels are responsible for **87% of total LCFS credits**, with fossil- and bio-based compressed natural gas accounting for another 8%.
- Electricity for transportation has been responsible **for just 4%** of total credits, and much of that has come from electrified rail transit, forklifts, and other industrial applications. In 2009, CARB projected that a total of 130,000-360,000 plug-in hybrid and battery electric vehicles (EVs) would be buzzing along California roadways by 2015. But data from the U.S. Department of Energy (DOE) shows total cumulative **nationwide** sales of EVs at 395,000 through 2015. It seems highly unlikely that up to 90% of the entire nation’s EVs are in California. The data also show EV sales dropped from 2014 to 2015—the first year-over-year decrease since EVs hit the market.
- Hydrogen has provided 0.00004% of credits.

California LCFS Carbon Credit Generation by Fuel Type, 2011-2015

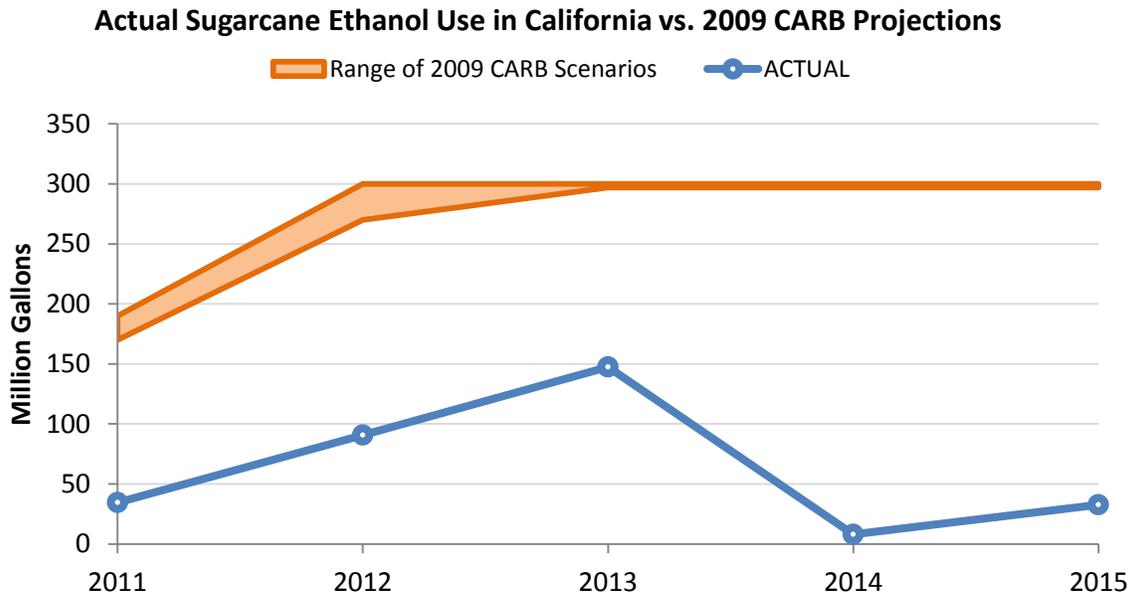
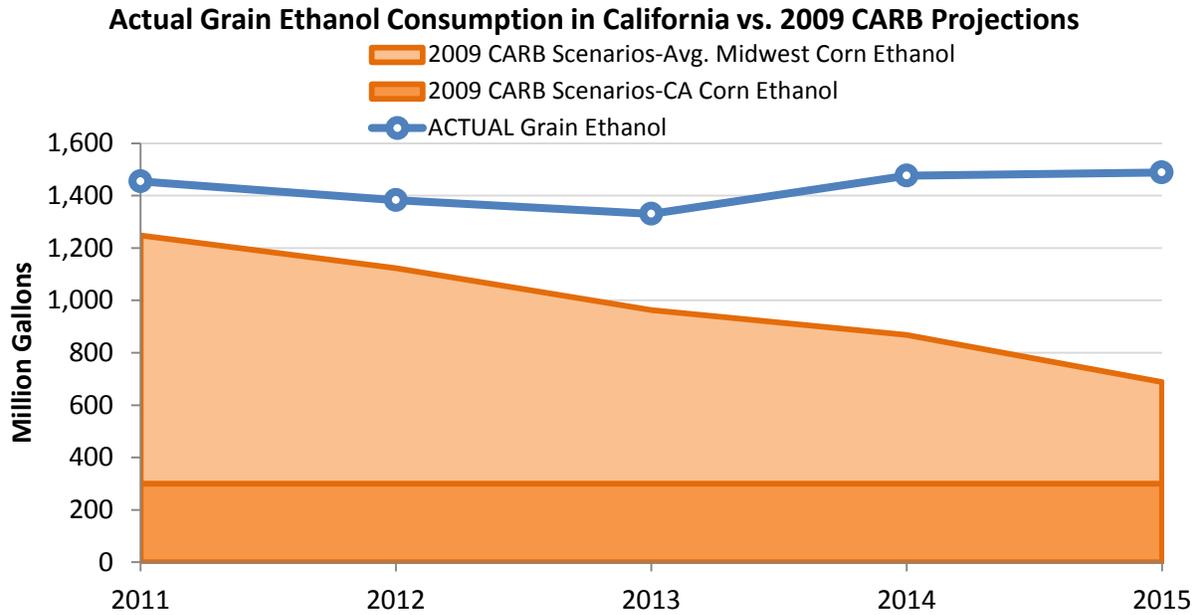


A Review of CARB’s LCFS Fuel Volume Data

As for fuel volumes, CARB projected in 2009 that grain ethanol use would fall from nearly 1.25 billion gallons in 2011 to less than 700 million gallons by 2015, with roughly 400 million gallons coming from Midwest ethanol producers and the remaining 300 million gallons coming from California producers. In reality, at **1.49 billion gallons**, the CARB data show a record amount of grain ethanol consumption in 2015, with the lion’s share of product coming from the Midwest.

Meanwhile, because it has not been economically competitive with U.S. grain ethanol, consumption of imported sugarcane ethanol was 32.7 million gallons in 2015—that’s a far cry from the 300 million

gallons CARB had projected for 2015 back in 2009. In fact, the 2015 total is down a hair from the 2011 level of 34.5 million gallons.



CARB: Maybe Corn Ethanol Isn't So Bad After All...

So, what happened? How is it possible that a fuel CARB initially deemed “worse than gasoline” has provided roughly half of the CI reductions to date? In short, it didn’t take CARB long to realize that it had wrongly inflated the assumed CI of grain-based ethanol and simultaneously underestimated the CI of gasoline. Midwest ethanol producers flooded CARB with petitions demonstrating—using actual data—that the agency had overestimated the emissions associated with making ethanol. As early as 2011,

CARB recognized that “the volume of lower-CI corn ethanol will far exceed the 2009 estimates” and ethanol plants “have made efficiency improvements” that CARB had initially overlooked.

As part of CARB’s LCFS “re-adoption” process in 2015, the agency also made revisions to its faulty ILUC penalty for corn ethanol, reducing it by roughly one-third. While CARB continues to greatly exaggerate potential ILUC emissions (its current ILUC value is more than double the ILUC factor adopted by Oregon in 2015 for its own LCFS), the result of these changes is that most Midwest corn ethanol reduces GHG emissions by 25-35% compared to gasoline under the LCFS. That’s a lot different than where CARB started out. Still, if CARB had adopted the latest science and data on ILUC (as Oregon did), corn ethanol’s GHG benefit would be closer to 35-45% compared to gasoline.

The Next Five Years

A big part of the reason that the LCFS has been achievable thus far is that CARB was ordered by a court in 2013 to “freeze” the required CI reductions while it fixed certain legal maladies with the program. The original LCFS schedule had CI reduction requirements increasing from 1% in 2013 to 1.5% in 2014 to 2.5% in 2015. But because of the court decision, 2014 and 2015 required reductions were frozen at the 2013 level of 1%. This allowed regulated parties to bank a large number of credits in 2014 and 2015.

But the re-adoption process got the LCFS “back on track” in 2016, with the annual required CI reduction growing to 2%. The required CI reduction grows to 3.5% next year and 5.0% in 2018. Then it spikes to 7.5% in 2019 and 10% in 2020. In other words, half of the total required CI reductions are crammed into the last two years of the 10-year LCFS schedule. LCFS credit markets are already responding to the increasing stringency of the program, with credit prices up more than 400% since this time last year.

As the CI reduction requirements ramp up in the next several years, regulated parties will find it much more difficult to generate necessary credits using grain-based ethanol to make E10. Instead, they will be compelled to retire banked credits, increase imports of more expensive sugarcane ethanol, or cross their fingers that consumer purchases of EVs pick up quickly. Analysts generally agree that if CARB neglects to make additional revisions to assigned CI values for broadly available biofuels, deficit generation will outpace credits in 2016 or 2017 and the credit bank will be exhausted by 2018.

Fortunately, CARB can avert this market failure by taking two scientifically justified actions. First, the agency should further revise its assumed CI values for grain ethanol based on the best available science and empirical data. Specifically, CARB should follow the lead of the Oregon Department of Environmental Quality and adopt the latest ILUC estimate from the U.S. Department of Energy and Purdue University.

Second, CARB should immediately begin the regulatory process to approve the use of mid-level ethanol blends like E15, E20, and E25. Currently, E10 and E85 are the only two approved ethanol blends in the state. Blending greater volumes of ethanol would not only allow regulated parties to generate more LCFS credits, but it would also allow for increased gasoline pool octane—something the automakers have been suggesting will be necessary to meet future CAFE/GHG standards.

Given the time involved in formally adopting regulatory amendments in California, CARB should get started right away. Otherwise, the future of the California LCFS is in great peril.