

RSVP now! Join RMI and top climate and business leaders on Sept. 24 @ Climate Week!



Shares    

## Understanding California's Low Carbon Fuel Standards Regulation

What is LCFS, who must comply, and what is required for compliance?

October 4, 2023

By **Sudeshna Mohanty, Marie McNamara**

### What is LCFS?

A Low Carbon Fuel Standard (LCFS) is a rule designed to reduce greenhouse gas (GHG) emissions and air pollution from transportation using a market-based mechanism that caps the carbon intensity (CI) of fuels.

### RECENT POSTS

Dispatch from the Carbon Mapper Satellite Launch

Q&A: Six Charts for Six Solutions to the Battery Mineral Challenge

16 Rural Electric

## Objective of regulation

California's LCFS program was enacted through California's AB32 Global Warming Solutions Act, which tasked state agencies to reduce GHG emissions from the transportation sector. The California Air Resources Board (CARB) designed the LCFS program by setting CI standards that increase in stringency over time for transportation fuels such as gasoline, diesel, and their substitutes used in

Shares



re of the amount of

lifecycle GHG emissions associated with the production, distribution, and consumption of transportation fuels. CARB set CI targets to gradually decline 80 percent from a 2010 baseline by 2030 and then remain constant.

Besides GHG reduction, LCFS helps California reduce its fossil fuel dependency and improves air quality. The introduction of LCFS has also spurred innovation and investment in diverse low-carbon fuels, resulting in a doubling of volume of these fuels since its introduction nearly a decade ago. In 2022, the California transportation fuel market excelled in fulfilling LCFS requirements, prompting CARB staff to **consider** increasing them, especially as low-carbon fuels gain increasing economic viability.

Cooperatives  
Will  
Leverage  
\$7.3 Billion in  
Federal  
Funding to  
Deliver More  
Affordable,  
Reliable  
Electricity to  
Their  
Members

Scaling Low-  
Income Solar  
with the  
Inflation  
Reduction  
Act

### CATEGORIES

Africa

Amory  
Lovins

Building  
Electrification

Buildings

Carbon  
Markets

China

Cities

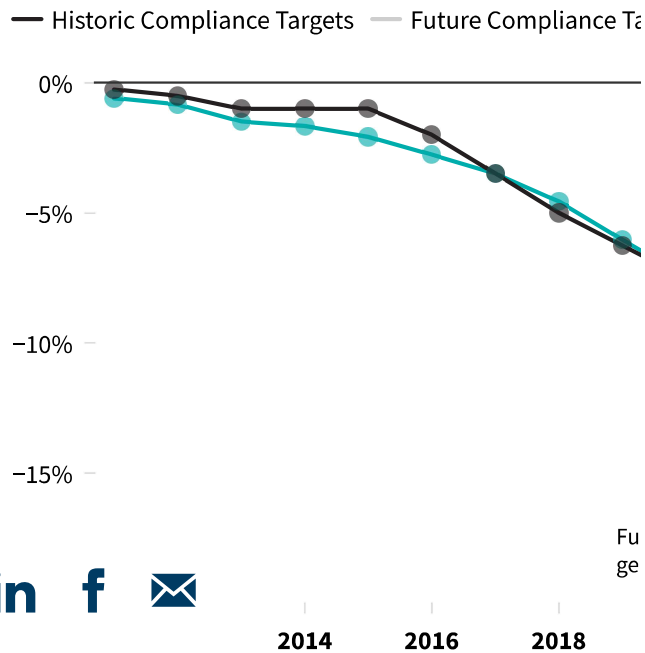
Climate Data

Commercial  
Buildings

e-Lab:  
Electricity  
Innovation  
Lab

Electricity

## LCFS targets and historic performance



Shares



**Fuels covered in LCFS:** Fossil fuel sources such as gasoline, diesel, compressed natural gas (CNG), liquefied natural gas (LNG), as well as alternative transportation fuels such as biofuel and biofuel blends, including bio-diesel, ethanol and bio-CNG, bio-LNG, electricity, and hydrogen.

**Fuels exempt:** Alternative fuels that are not biomass based or fuels supplied in volumes less than a 3.6 million gasoline gallon equivalent per year are exempt from the LCFS regulation. Fuels used for military vehicles, aircraft, ocean-going vessels, and locomotives are also exempt from meeting the CI standards for LCFS.

## Who are the regulated parties in LCFS?

For fossil fuels used in transportation, the regulated parties are typically the producers in California or importers of

Energy

Efficiency

Finance

General

General

Energy

Global South

Hydrogen

India

Industry

Islands

Oil and Gas

Solutions

Residential

Buildings

RMI

South East

Asia

Spark Chart

Strategic

Insights

Supply Chain

Emissions

Transportation

Trucking

US Policy

fossil fuels to California. In the case of fossil natural gas (FNG), the regulated party is the entity that owns the fuel facility before the fuel is dispensed or the entity that owns the fueling equipment. For biofuels, the producers or importers of the biofuel can claim LCFS credits.

For electricity, the electric distribution utilities (EDUs) can opt in to claim LCFS credits for residential and non-residential EV charging and are subject

Shares



es regarding the use of

. For public charging, the EV service provider (EVSP) or site host can opt in to claim credits in place of the EDUs. Fleet operators and business owners can also opt in to claim credits for private access charging for fleets and workplaces respectively.

**Expanding beyond California:** At the time of this writing, states such as Oregon, Washington, and the province of British Columbia have recently introduced their own LCFS legislation to establish state markets, and have aligned their policies with California to reduce GHG emissions and promote clean energy along the entire western corridor of the United States and Canada through the Pacific Coast Collaborative (PCC) agreement.

### **How does the program work?**

**California uses a credit and deficit system to enforce LCFS.**

Transportation fuels in California that



have a higher CI than the benchmark generate deficits, and those that have a lower CI than the benchmark generate credits. The CI of baseline transportation fuel (gasoline or diesel) defines the benchmark CI.

If a regulated party, such as a fossil fuel producer or importer, has a deficit at the end of the reporting year, they must purchase credits from those who have generated a surplus (EDUs, EVSPs, bio-fuel producers or

Shares



## How do we generate LCFS credits? generation pathways?

LCFS credits can be generated in three ways:

1. **Fuel-based crediting** in which providers of low-carbon transportation fuels in California generate credits by certifying their fuels' CI and reporting the volume of fuel supplied.
2. **Project-based crediting** through carbon capture and storage (CCS), which can happen at refineries and production facilities.
3. **Zero-emissions vehicle (ZEV) infrastructure capacity-based crediting** in which hydrogen fueling and EV charging providers can claim credits for unused fueling capacity. This crediting is meant to support the business model of ZEV fueling providers in the early years of the

ZEV transition when ZEV adoption and station utilization is low.

## How are LCFS credits calculated?

One LCFS credit is equal to one metric ton (1MT CO<sub>2</sub>) of avoided GHG emissions and is a function of the:

- Difference in CI between the baseline fuel (gasoline/diesel) and alternative fuel.
- Volume of baseline fuel displaced.

The CI difference and volume are

Shares     ough:

- Energy density of the alternative fuel;
- Volume of alternative fuel; and
- Energy efficiency ratio which accounts for the varying fuel efficiencies of different engine types.

## How is the LCFS credit price set?

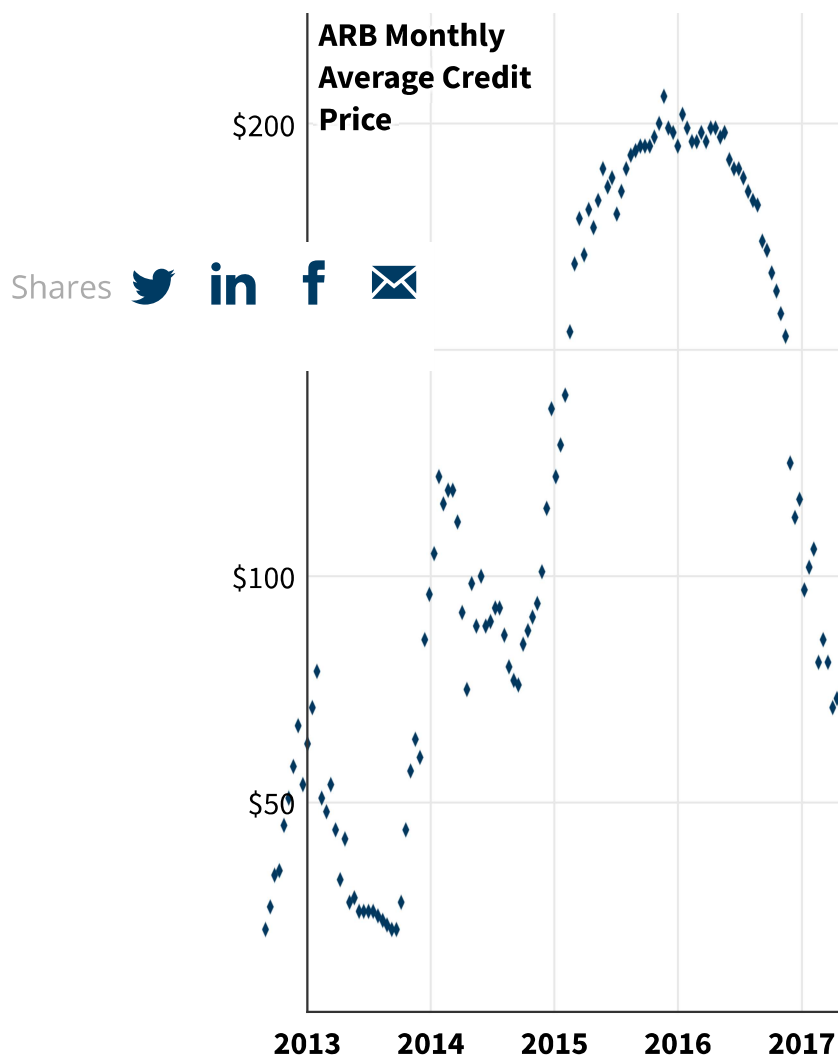
The credit-based mechanism allows the marketplace to determine the fuel mix in California and the regulation sets the target or CI intensity limit. Market actors can then choose how to comply by adopting low carbon fuels or purchasing credits to achieve compliance.

Given that the market sets the price of credits based on how many are in circulation at a given time, prices can be volatile. The exhibit below depicts the market price volatility since LCFS was enacted in 2013. To limit the

impact of LCFS credit prices on end users, CARB put a \$200 cap on credit prices in 2016 dollars, adjusted for inflation annually. The cap was \$253.53 in 2023.

---

## Volatility of LCFS credit prices



## How does LCFS deficits interact with fuel prices?

Designed as a cross-subsidy program, obligated parties under LCFS who do not meet CI targets generate deficits and can meet the program requirements by buying credits from producers of low carbon fuel. For instance, in 2021 the average CI of crude oil supplied to California

refineries was 12.88 gCO<sub>2</sub>e/MJ, nearly 9 percent higher than the target CI of 11.78 gCO<sub>2</sub>/MJ set by the LCFS program. Obligated parties who produced or imported that crude had to purchase credits to offset the deficit.

While there are several steps involved in transforming crude oil into retail fuel which could affect its CI, if we assume retail fuel has the same CI undercompliance (9%) as crude oil

Shares     I example and given that were \$200 at that time, it

would amount to a ~23 cent/gal compliance cost for the party who owns and dispenses that fuel. Conversely, in 2023, LCFS credits were trading below \$100 but CI compliance data is not available preventing a similar calculation. Regardless, because retail prices for fuel for the everyday consumer depend on a series of variables, there is not a direct correlation between the LCFS compliance cost and consumer prices.

### **Case Study: The LCFS program can support EV supply equipment service providers and can add an additional source of revenue**

To understand how EV fueling earns LCFS credits, let's take the example of charging a Chevy Bolt EV, for which the alternative clean energy fuel is electricity, and the baseline fuel is gasoline.

In California, the cost of electricity from the grid averages **20 to 30 cents per kWh**. EV fueling at public charging stations increases the amount consumers must pay, as EVSPs must pay for the additional costs of charging hardware, site costs, software, operation, maintenance, and more. Today, public chargers often have relatively low utilization. Until more EVs are on the street, cost recovery can be uncertain for EV charging

Shares     **d varies considerably**  
**the utility rate**

#### **structure.**

Incentives such as those provided by LCFS can significantly improve the business case for public charging, and lower public charging costs for EV drivers. Using the CARB **LCFS calculator**, and assuming the maximum LCFS credit price of \$200 per credit, fully charging a 65kWh Chevy Bolt battery would earn \$10.25 in LCFS credits, or approximately 16 cents per kWh, which would offset 50-80 percent of the electricity cost.

At the time of this analysis, the average LCFS credit price was \$74 per credit, which would translate to LCFS revenue of 6 cents per kWh of EV fueling, only covering 20-30 percent of the electricity cost – a 62 percent drop from the maximum possible incentive. Thus, the price volatility of LCFS credits can significantly impact cost recovery and EVSP business models.

# Impact on electric fleets

LCFS can help build the business case for commercial vehicle owners of medium- and heavy-duty vehicles to electrify. Electric fleet operators may choose to own the charging stations and claim LCFS credits or partner with EVSPs to share LCFS revenue via charging discounts or other contractual agreements. As a result, LCFS can help lower the total cost of ownership (TCO) by lowering fueling

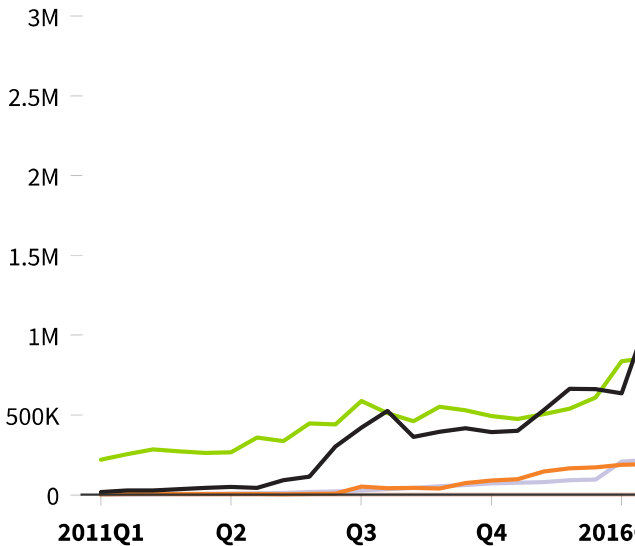
Shares     can help justify the higher fuel cost.

## Sources of LCFS credits

Now that we have understood how crucial LCFS is to strengthening public and fleet EV charging infrastructure, let's take a closer look at the sources for LCFS credits. The exhibit below shows LCFS credits generated from 2011 to Q3 2022 by fuel type.

### LCFS Credits (MT) By Fuel Type Q1 2011 - Q4 2022

— Ethanol — Electricity — Biomethane — Biodiese  
— Other (Hydrogen, Renewable Naphtha, Propane, Innov



**The volume of credits generated is increasing,** flooding the LCFS marketplace which drives credit values lower. Electricity as a transportation fuel currently generates the smallest share of LCFS credits while the lions' share of LCFS credits – nearly three quarters – is being directed to biomass-based fuels. Several stakeholders, including National Resources Defense Council (NRDC), have highlighted concerns over

Shares



intended consequences,

incentivizing the production of livestock biomethane and crop-based biofuels, and diverting resources away from the ZEV transition.

Fueling credits are based on the CI of the fuel: the lower the CI, the more credit it earns. The accounting of CI for biomethane and crop-based fuels is a particular concern, as the CI of fuels from dairy and crop feedstocks are reported to be lower due to inaccurate accounting of their impact. NRDC has also proposed measures to improve the effectiveness of the LCFS program by redirecting credits away from biofuels. These biofuels also earn additional revenue through the federal Renewable Fuel Standards program, which does not include electricity for EV charging in its scope. In summary, the current credit generation mechanism presents a relative disadvantage for electricity, a cleaner

transportation fuel that needs greater incentive support for a zero-emission future.

### The significance of LCFS

LCFS is a landmark piece of legislation which created, for the first time, a market-based mechanism to slash transportation emissions by working on four sectors of the economy: energy, environment, agriculture, and transportation. The additional revenue provided by LCFS credits, funded by

Shares



on fuels, incentivizes the ve to cleaner fuels such as electricity.

One could say that LCFS has contributed to California's high EV adoption. While there has been significant critique of its support of bio-fuels instead of zero-emissions transportation, the LCFS model has led policymakers to even consider introducing a LCFS like regulation at a federal level.

# Donate

Give Once

Give Monthly