

# California's Clean Fuel Standard Boosts the Electric Vehicle Market

## HIGHLIGHTS

*The Low Carbon Fuel Standard is critical to advancing electric vehicles (EVs) in California. The policy, which supports clean transportation fuels, generated \$92 million to support transportation electrification in 2016. This money has been used for a variety of initiatives that help make EVs more affordable for drivers, transit agencies, and private businesses. The impact of the LCFS in accelerating deployment of EVs and reducing carbon emissions will grow over time as the EV market matures and as more electricity is generated from renewable resources. However, to tap the program's full potential the state should extend it through 2030 and refine it to further accelerate EV deployment.*

The vast majority of cars and trucks in California are fueled by gasoline and diesel, making vehicles the largest source of global warming emissions in the state. Shifting away from fossil fuels in the transportation sector is critical to meeting California's goals for reducing global warming emissions in coming decades.

One policy that is moving California in this direction is the Low Carbon Fuel Standard (LCFS). Clean fuel standards like the LCFS and Oregon's similar Clean Fuels Program were originally understood primarily as policies that support biofuels. But in recent years, the LCFS has started to play a major role in the state's growing electric vehicle (EV) market as well, by providing incentives for electricity as a transportation fuel. More than 320,000 electric cars have been sold in the state since 2010 (IHS Markit 2017) and Californians have more choices of models than anywhere else in the United States (Reichmuth and Anair 2016). Electric buses and trucks are beginning to appear in corporate and government fleets as well.

The LCFS works in concert with policies that reduce the upfront cost of purchasing an EV, require automakers to sell electric models, and increase the availability of places to recharge. Together, these policies help California meet its climate goals, reduce air pollution, and lead the country toward a transportation sector powered by clean electricity.



California's Low Carbon Fuel Standard goes beyond supporting biofuels; indeed, the policy is poised to be a major driver in the growth of the state's electric vehicle market.

## Electricity's Role in the LCFS

The LCFS was established in 2009 to provide a stable market for the production and use of cleaner transportation fuels. The program regulates the “carbon intensity” (i.e., the amount of global warming emissions per unit of energy output) of fuels, taking into account the emissions generated over each fuel’s life cycle, from extraction and production to delivery and use. Under the LCFS, petroleum refineries and fuel importers must gradually reduce the average carbon intensity of the fuels they sell, reaching a 10 percent reduction in 2020 relative to 2010.

Displacing gasoline and diesel with electricity or other low-carbon transportation fuels (such as biodiesel, ethanol, or hydrogen) generates LCFS credits because these fuels have carbon intensities below the standard. Refineries and fuel importers comply with the standard by blending low-carbon biofuels into the gasoline or diesel they sell, purchasing credits from parties that sell clean fuels, or a combination of the two. Each credit represents one metric ton of avoided carbon dioxide emissions (or an equivalent amount of methane or other heat-trapping gases).

Thanks in large part to the LCFS, use of alternative fuels grew by 50 percent in California between 2011 and 2016, and the program reported 25 million metric tons of reduced

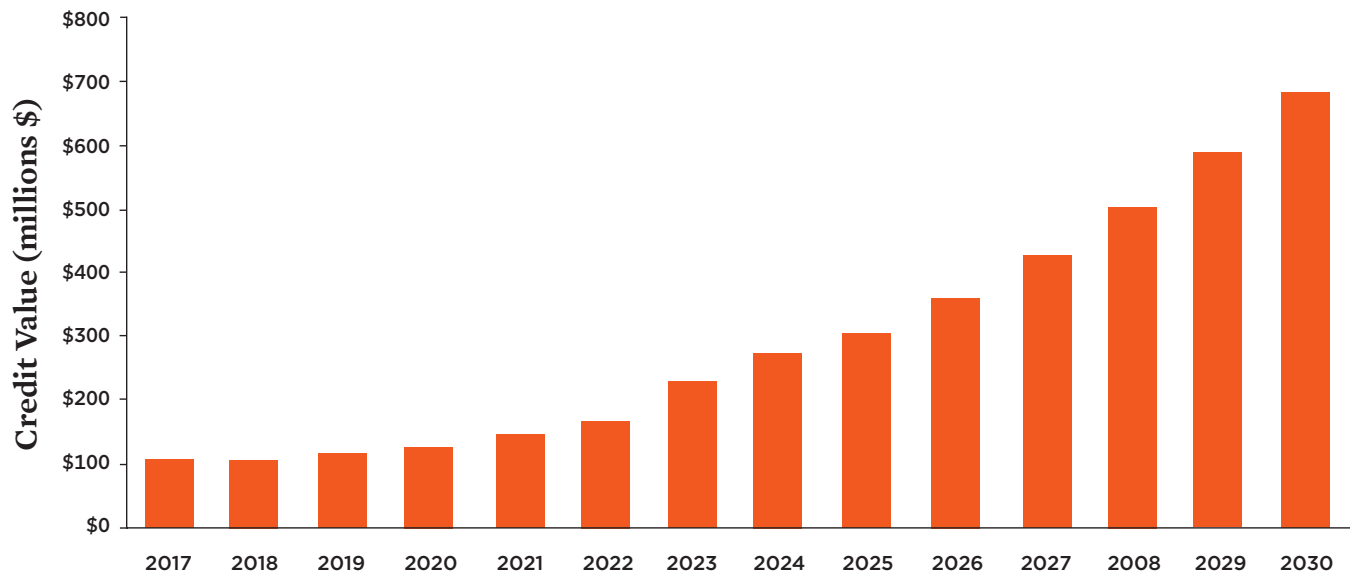
BOX 1.

### The LCFS Rewards Cleaner Charging

To date, most of the LCFS credits for electricity have been determined based on the average emissions of the California grid, which includes natural gas, solar, wind, and other electricity resources. But EVs’ true potential climate benefits are only achieved when they are charged with 100 percent renewable energy. The LCFS already has provisions allowing fleets or charging stations to install solar panels on site and get credit for carbon-free charging, which increases credit generation by almost 50 percent. CARB is expected to adopt new rules in 2018 to enable more EV drivers to charge with renewable energy through programs run by their utilities, and recognize and reward the additional emissions reductions.

carbon emissions during that time. Electricity used by cars, trucks, rail lines, and even forklifts comprised a growing share of these emissions reductions, rising from less than 1 percent in 2011 to 10 percent in 2016. In 2016, electricity

## Projected Value of LCFS Electricity Credits, 2017–2030



*As more EVs hit the road, electricity will comprise a growing share of the LCFS credit market, generating billions of dollars in credit value for EV owners and operators and accelerating the transition to electric mobility.*

Note: Assumes future credit price of \$100 per metric ton of avoided carbon dioxide emissions.

SOURCE: CARB 2017C.

credits alone generated credits valued at about \$92 million (CARB 2017a; CARB 2017b). In comparison, California's Clean Vehicle Rebate Project, a popular program that provides up to \$2,500 toward the purchase of a passenger EV, distributed \$97 million in rebates the same year (CSE 2017).

The share of reductions from electricity will continue to increase as more EVs hit the road and more electricity is generated from renewable sources (see Box 1). CARB estimates that, by 2030, electricity could account for approximately a quarter of emissions reductions under the LCFS—more than any other fuel (CARB 2017c). Assuming reasonable future credit prices of \$100 per metric ton, the use of electricity as a transportation fuel would generate LCFS credits valued at \$4 billion between 2017 and 2030 (see the figure, p. 2).

## EV Drivers Reap Rewards

Under the LCFS, credits are generated whenever an EV driver recharges his or her vehicle at home. However, rather than asking hundreds of thousands of EV drivers to participate in this program, the state's electric utilities receive credits for at-home charging done in their respective service territories. These transferred credits comprise the majority of the 1.29 million electricity-related LCFS credits generated to date. The utilities are required to put the proceeds from LCFS credit sales toward programs to support their residential customers who own or lease an EV. Four utilities began such programs in 2017, each taking a slightly different approach (CARB 2017d):

- **Pacific Gas and Electric**—Residential EV drivers can claim a one-time \$500 rebate.
- **Sacramento Municipal Utility District**—Residential EV drivers can either claim a \$599 one-time rebate or receive a free Level 2 charger.
- **San Diego Gas & Electric**—Residential EV drivers can claim an account credit of at least \$50 annually through 2020. The total rebate amount will depend on the number of participants each year. (Participants received a \$200 bill credit in 2017.)
- **Southern California Edison**—Residential EV drivers can claim a one-time \$450 rebate.

The LCFS also enables public charging station providers to generate credits; the revenue from these credit sales can go toward building more charging stations or defraying charging costs for customers. Currently more than 7,500 public charging stations are registered with the program. A similar commercial credit program could also work in the future for

taxis and ride-hailing services (e.g., Uber, Lyft) interested in electrifying their fleets (see Box 2).

## LCFS Support for Electric Buses and Trucks

Shifting away from fossil fuels is especially important for heavy-duty vehicles such as transit buses, delivery trucks, and freight-hauling “big rigs.” These vehicles comprise just 7 percent of all vehicles in California, but account for 33 percent of nitrogen oxide (NO<sub>x</sub>) emissions from all sources, 20 percent of global warming emissions from the transportation sector, and more particulate matter than all of California's power plants combined (Chandler, Espino, and O’Dea 2017). Even after accounting for the emissions associated with generating electricity (based on California's grid mix), electric buses, for example, typically have 70 percent lower global warming emissions and 50 percent lower NO<sub>x</sub> emissions than diesel and natural gas buses on a life cycle basis (Chandler, Espino, and O’Dea 2017).

The LCFS helps make electric trucks and buses more affordable to companies and government agencies that manage heavy-duty vehicle fleets. Electric truck and bus fleet owners can generate and sell LCFS credits and use the proceeds however best serves the needs of the business.

### BOX 2.

## Electric Taxis and Ride Hailing Services

Taxis typically log many more miles per year than the average passenger car; for example, a typical New York City taxi drives 70,000 miles per year versus about 14,000 miles for a new privately owned car (ORNL 2017; NYCTLC 2014). An electric taxi powered by zero-carbon electricity (see Box 1) could receive \$2,100 per year via LCFS credit sales, substantially increasing the incentive of operators to go electric. In the future, fleets of self-driving EVs could provide taxi or ride-hailing services (e.g., Uber, Lyft). These fleets may drive even more miles per year than conventional taxis, generating even more credits.

These credits could accrue to charging station providers, allowing them to expand their charging station networks, or to taxi or ride-hailing fleets, reducing the costs of owning and charging EVs. Larger fleets have yet to take advantage of the LCFS in this way, though one start-up company in Los Angeles, Green Commuter, is currently receiving LCFS credits to operate a small fleet of electric taxis.





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Electric buses generate credits under the Low Carbon Fuel Standard, making them more affordable to transit agencies—like the Los Angeles County Department of Transportation (LADOT)—that are interested in electrifying their fleets.

The LCFS is proving to be an important incentive for transit agencies, which are leaders in the adoption of heavy-duty EVs. At credit values of \$100 per metric ton, transit agencies earn about \$9,000 per year for each electric bus in their fleets. LCFS credits can bring the already low cost of EV charging down to as little as \$7,000 per year for an electric bus, compared with \$24,000 in fuel costs for the average diesel bus (CARB 2016). Already seven transit agencies in California have committed to fully electric bus fleets by 2030 or earlier, including Los Angeles Metropolitan Transit Agency (Metro), which operates the second-largest bus fleet in the country with 2,200 buses. As sources of electricity in California become cleaner, electric buses will generate even greater revenue for transit agencies under the LCFS.

## The Future of the LCFS

The amount of support the LCFS provides for EVs will naturally grow over time as the EV market grows, and as more LCFS credits flow to electric utilities, transit agencies, and other owners of electric fleets. Fortunately, unlike other incentive programs that rely on public funding, the incentives for clean fuel providers under the LCFS are paid for by petroleum companies when they purchase LCFS credits to offset their emissions.

Even with the program’s successes, there are changes to the LCFS that could increase its effectiveness in the years ahead. These changes include:

- **Strengthening the LCFS and extending it to 2030**—CARB is planning to make program amendments in 2018 that will extend the LCFS to 2030. To maximize the program’s impact, CARB should also set a carbon intensity reduction target of at least 20 percent (up from its current target of 10 percent), and adjust this number higher if new program flexibilities make higher emissions reductions feasible.
- **Refining utility incentive programs**—As electric utilities gain experience with their newly launched rebate programs, utilities and policymakers should consider lessons learned and refine these programs to most effectively support EV adoption.
- **Enhancing participation by small business and transit agencies**—CARB should streamline LCFS administrative requirements to encourage smaller fleets and transit agencies to participate in the program.

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