How Many of California's Low-Carbon Fuel Standard Credits were Generated by the Use of Charging Infrastructure Deployed During the EV Project?

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Key Conclusions

- As an electric vehicle service provider (EVSP) dispensing electricity as a transportation fuel in California, the charging infrastructure deployed in the EV Project was eligible to generate Low-Carbon Fuel Standard (LCFS) credits.
- The EV Project dispensed over nine gigawatt hours of energy that were eligible for LCFS credits.
- The measure of LCFS credits is megatons of carbon dioxide (CO_2) averted. The EV Project generated over 5,500 credits (megatons).

Introduction

In January 2007, Governor Schwarzenegger issued an Executive Order to enact LCFS in the State of California. This standard calls for reduction in the carbon intensity of California's transportation fuels, including tailpipe emissions and all other associated emissions from production, distribution, and use of transport fuels within the state. The Air Resources Board (ARB) established regulations for meeting the target of reducing carbon intensity by at least 10% by 2020.

LCFS includes emissions trading as a means for the State of California to meet its overall emissions objective. Credits are earned for emissions reduction and these credits can be sold to entities that need credits in order to comply with regulation.

By providing a lower-carbon fuel, relative to gasoline, the EV Project's charging stations, also identified as electric vehicle supply equipment (EVSE), earned an LCFS credit for each metric ton of CO_2-equivalent emissions avoided.

Although generation of LCFS credits was not a named objective of the EV Project, it is another means of generating revenue for EVSPs. This paper provides an overview of the regulation as it applies to electricity used as a transportation fuel, how LCFS credits were earned, and their value.

This paper is not intended to provide an explanation of California's LCFS Program. Details of this program can be found on the ARB's website at http://www.arb.ca.gov/fuels/lcfs/lcfs.htm.

Data Analyzed

In order to earn LCFS credits for electricity provided as a transportation fuel, an EVSP must be able to quantify the kilowatt hours of energy that were dispensed as transportation fuel. The Blink smart EVSE measures the amount of electricity (in kilowatt-hours (kWh)) dispensed as transportation fuel using its integral, revenue grade meter and network connectivity. It transmits this use data via the internet or a cellular data network to a central database.

This EVSE energy data were transmitted to Idaho National Laboratory (INL) as part of the EV Project. Data experts at INL then captured the relevant charge data from each EVSE operating in California and reported it to EV Project management, who in turn reported it to the California ARB via their online LCFS reporting tool.

Analyses

The LCFS regulation refers to entities who supply electricity through EVSE as regulated parties. By providing a lower-carbon fuel relative to gasoline, regulated parties can earn an LCFS credit for each metric ton of CO_2 equivalent ($MTCO_2e$) emissions avoided through use of electricity—a transportation fuel with a much lower carbon intensity (as defined in the regulation) than the 2020 standard specified in the LCFS regulation.

When LCFS was first established for regulated parties, ambiguous language in the regulation allowed both electric utilities and non-utility EVSE providers to earn credits for EVSE used in single-family and multi-family homes.

In January 2013, the regulation was amended to state that electric distribution utilities would be recognized as the regulated party for single-family and multi-family residences. It also clarified that the regulated party for publicly accessible EVSE would be either the third-party non-utility EVSP or the electric distribution utility that installed (or contracted the party who did the installation of) the publicly accessible charging equipment.

At its outset, the regulation allowed the EV Project to claim credits for use of both residential and publicly accessible charging stations that it had deployed as part of the project. However, with amendment to the regulation, the EV Project could only claim credits in 2013 for use of charging stations it deployed outside of single-family and multi-family residences. Figure 1 shows the energy dispensed for 2011

through 2013 that was eligible for LCFS credit. The effect of the amendment at the start of 2013 is very apparent in the graph.

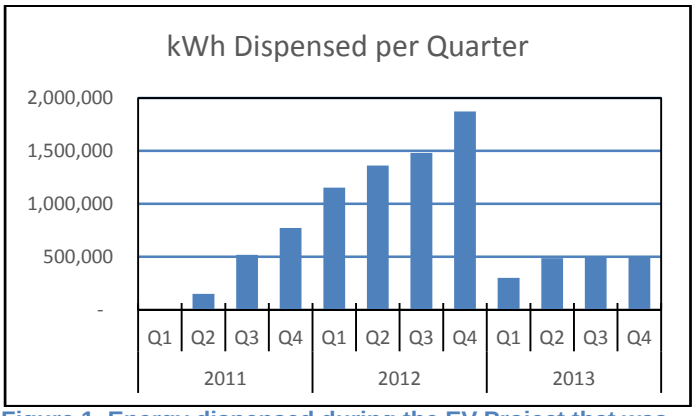

Figure 1. Energy dispensed during the EV Project that was eligible for California's LCFS credits.

The EV Project, as the regulated party, did not generate carbon emissions; therefore, all credits accumulated could be sold to carbon emitters who were subject to LCFS.

Discussion of Results

The process for accumulating and accounting for LCFS credits utilized the capabilities of the Blink smart charging unit and network. The Blink alternating current Level 2 and Level 2 direct current fast chargers measure energy dispensed by each charging unit with its onboard meter, transmitting the information to a Blink database and ultimately, to the data center at INL via a wired internet connection or a cellular network. INL data experts tally and report to EV Project management the results of EV charging with the project's EVSE on a quarterly basis. These data were submitted as a total number of kWh in the quarter to the ARB via its LCFS reporting tool. This tool calculates $MTCO_2e$ avoided and accumulates the associated LCFS credits earned from the charging activity.

The credits (and $MTCO_2e$ avoided) accumulated based on use of charging infrastructure, which increased in numbers each quarter as more infrastructure was installed by the EV Project.

The quarterly credits and $MTCO_2e$ avoided can be seen in Figure 2. Accumulation over the EV Project can be seen in Figure 3. By the end of 2013, the EV Project had accumulated 5,618 LCFS credits, representing 5,618 megatons of CO_2e avoided.

Market Price for LCFS Credits

LCFS credits can be transferred (sold) to other regulated parties. These other regulated parties can use the credits obtained to meet their regulatory requirements to reduce the carbon intensity of the transportation fuel they produce or distribute. These credits are exchanged between regulated parties either directly or through commodity brokers operating in California.

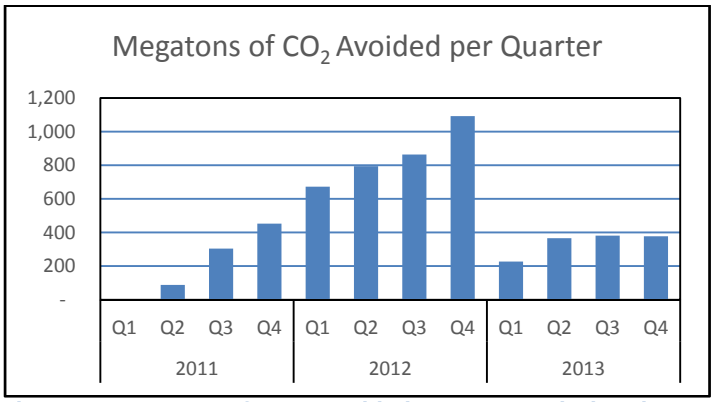

Figure 2. Megatons of CO_2e avoided per quarter during the EV Project per California ARB LCFS calculations.

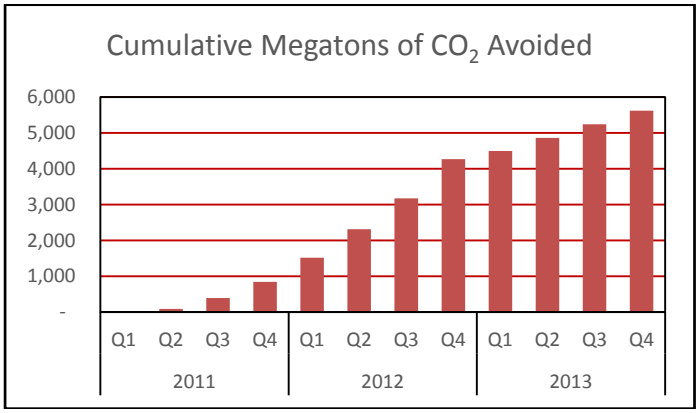

Figure 3. Cumulative megatons of CO_2 averted through use of EV Project charging infrastructure.

Three important factors governed these transactions: (1) an agreed price for the credits exchanged, (2) evidence of fuel dispensed to generate the credits that satisfied the buyer, and (3) recording transfer of credits within ARB's LCFS system.

Because this is a transfer between two parties voluntarily agreeing on a price for the transfer, the value of the LCFS credits is subject to market conditions. Supply and demand plays a large part in the prices paid for the credits. Figure 4 demonstrates the variation in the average price per credit according to reports found on ARB's LCFS website. However, these averages show only a portion of the fluctuation in prices paid for credits.

Although the average was $17, reports from ARB state that the prices paid for credits in 2012 varied from $10 to $31 per credit.

When examining prices in a bit more detail, Figure 5 shows the quarterly averages for 2013 and 2014. LCFS credit prices increased from an average of $17 per credit in 2012

to $75 to $85 per credit in November 2013 and dropped to around $50 per credit in December 2013.

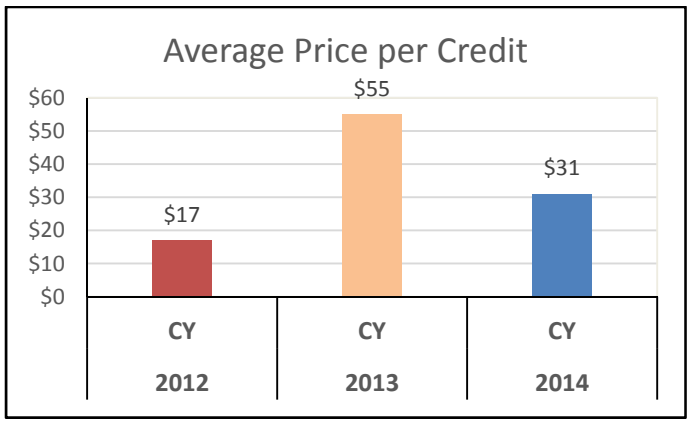

Figure 4. Average price paid per LCFS by calendar year.

The price rise shown in Figure 5, which tripled over the course of 2013, stabilized in 2014. ARB reported in its April 2014 LCFS Trading Activity Report that the price range for credits bought and sold in the month ranged from $18 to $54, which compared with $30 to $85 in March. For the year 2014, the average price was $31.

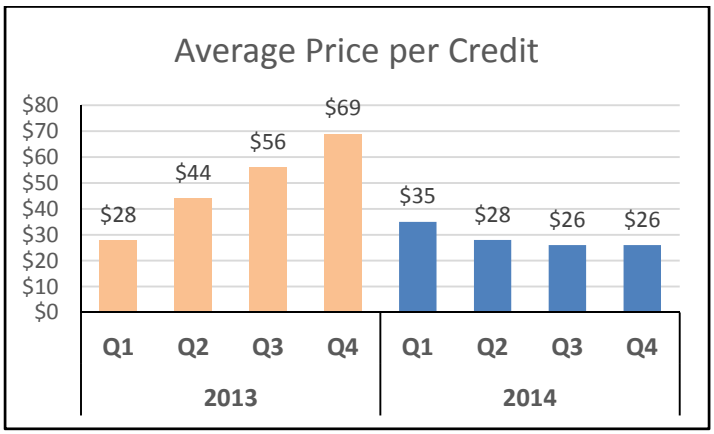

Figure 5. Average price paid for LCFS credits by quarter in 2013 and 2014.

Price stabilization in 2014 was likely due to proposed controls on the credit prices and reports that excess credits had been generated (increasing supply) at the same time that California was on schedule to deliver the 10% reduction in carbon intensity by 2020.

Conclusion

Amongst the EV Project's objectives was examination of additional revenue and value streams for away-from-home charging.

The EV Project, which was an electric vehicle infrastructure study, assumed that, on its own, the sale of electricity at away-from-home locations could not sustain the installation and operating costs of the charging stations. Either the price of this electricity would be too high to attract sufficient use or the credit price would be too low to cover the cost to install and operate the charging infrastructure. Without additional value propositions, the low cost of charging at home would keep electric vehicles tethered to their overnight parking location.

In California, the sale of LCFS credits proved to be one way of adding value for EVSPs and supporting their business plans to establish a sustainable commercial charging business.

In February 2014, ECOtality transferred all 5,241 LCFS credits it had accumulated for $213,640 ($40 per credit).

About The EV Project

The EV Project was the largest plug-in electric vehicle infrastructure demonstration project in the world, equally funded by the U.S. Department of Energy (DOE) through the American Recovery and Reinvestment Act and private sector partners. The EV Project deployed over 12,000 alternating current Level 2 charging stations for residential and commercial use and over 100 dual-port direct current fast chargers in 17 U.S. regions. Approximately 8,300 Nissan LEAFs™, Chevrolet Volts, and Smart ForTwo Electric Drive vehicles were enrolled in the project.

Project participants gave written consent for The EV Project researchers to collect and analyze data from their vehicles and/or charging units. Data collected from the vehicles and charging infrastructure represented almost 125 million miles of driving and 4 million charging events. The data collection phase of The EV Project ran from January 1, 2011, through December 31, 2013. INL is responsible for analyzing the data and publishing summary reports, technical papers, and lessons learned on vehicle and charging unit use.

Company Profile

INL is one of DOE's 10 multi-program national laboratories. INL performs work in each of DOE's strategic goal areas: energy, national security, science, and the environment. INL is the nation's leading center for nuclear energy research and development. Day-to-day management and operation of INL is the responsibility of Battelle Energy Alliance.

For more information, visit avt.inl.gov/evproject.shtml.

References

LCFS regulation, reports, and notifications cited in this paper came from the California ARB website at http://www.arb.ca.gov/fuels/lcfs/lcfs.htm.