Methodology for Calculating Base Credits for Non-metered Plug-in Electric Vehicle (PEV) Charging

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Summary

- Background information for regulatory requirement to estimate non-metered residential plug-in electric vehicle (PEV) charging (base credits)
- Base credit calculation and energy consumption formulae
    - Methodology for estimating the number of PEVs in California
    - Methodology for allocating PEVs to each utility
    - Methodology for estimating the statewide average PEV charging rate -- updated February 2023, implemented for Q1 2023 reporting

Introduction

The California Air Resources Board's (CARB) Low Carbon Fuel Standard (LCFS) regulation (regulation), which appears at sections 95480 to 95503 of title 17, California Code of Regulations, is designed to reduce greenhouse gas emissions associated with the life cycle of transportation fuels used in California. CARB staff has prepared this document to address a frequently asked question (FAQ). Unlike the regulation itself, this document does not have the force of law. This document is not intended to, and cannot, establish requirements beyond those that are already in the regulation, nor can it supplant, replace, or amend any of the legal requirements of the regulation. Conversely, any omission or truncation of regulatory requirements does not relieve entities of their legal obligation to fully comply with all requirements of the regulation.

CARB is soliciting stakeholder feedback on the methodologies discussed in this FAQ document; submit comment to (jacob.englander@arb.ca.gov).

Background

Under section 95483(c)(1)(A) of the LCFS regulation, Electric Distribution Utilities (EDU)[1] may generate LCFS credits for metered and non-metered residential Plug-in

[1] "Electric Distribution Utility" is defined in the regulation in section 95481(a)(46).

Electric Vehicle (PEV)[2] charging. Credits generated by opt-in EDUs for supplying electricity with the California Average Grid Electricity[3] Carbon Intensity (CI)[4] for residential PEV charging are referred to as *base credits*.

Non-metered base credits are calculated and issued to EDUs pursuant to section 95486.1(c)(1) of the regulation.

Section 95483(c)(1)(A) paragraph 1. of the LCFS regulation requires opt-in EDUs to contribute a specified minimum percentage of the proceeds generated from the sale of base credits to the Clean Fuel Reward (CFR) program, a statewide point-of-purchase rebate program for PEVs in California. Under section 95486.1(c)(1)(A) paragraph 2. of the regulation, CARB reallocates base credits generated for estimated charging occurring in the service areas of non opt-in EDUs to large utilities. All proceeds from reallocated base credits must be contributed to the CFR. For more information about base credits and the CFR, please refer to section 95483(c)(1)(A) of the regulation.

The remaining base credits that are not contributed to the CFR are referred to in the LCFS regulation as *holdback credits*. Starting in 2022, opt-in EDUs are required to use a minimum percentage of holdback credit proceeds to support transportation electrification projects benefiting disadvantaged, low-income, and/or rural communities. This minimum percentage increases from 30 percent in 2022 to 50 percent in 2024 and subsequent years. Detailed information on the uses of holdback credit proceeds is provided in section 95483(c)(1)(A) paragraph 6.

Base credit calculation and energy consumption formulae

This section details the methodology that CARB uses to calculate base credits for non-metered residential PEV charging.

LCFS credits are calculated using the equation provided in section 95486.1(a) of the regulation specific for PEV charging:

$$Credits_{electricity}^{gasoline} = \left(CI_{standard}^{gasoline} - CI_{reported}^{gasoline}\right) \times E_{displaced}^{gasoline} \times C \qquad \text{Equation 1}$$

Where:

$Credits_{electricity}^{gasoline}$ is the number of LCFS credits generated, in metric tons, by electricity for PEV charging as compared to the gasoline standard;

$CI_{standard}^{gasoline}$ is the gasoline standard (in gCO_2e/MJ) for the year as described in Table 1 of the regulation;

[2] Plug-in Electric Vehicles include both Battery Electric Vehicles and Plug-in Hybrid Electric Vehicles as defined in 95481(a)(50).
[3] The California Average Grid Electricity CI is listed in section 95488.5 in Table 7-1.
[4] "Carbon Intensity" is defined in 95481(a)(26) of the regulation as the quantity of life cycle greenhouse gas emission, per unit of fuel energy, expressed in grams of carbon dioxide equivalent per megajoule (gCO_{2e}/MJ).

$$CI_{reported}^{gasoline} = \frac{CI_{grid}}{EER^{gasoline}}$$ Equation 1.a

Where:

CI_{grid} is the California Grid Average CI for the year as indicated in Table 7-1 of the regulation. $EER^{gasoline}$ is the Energy Economy Ratio[5] representing the fuel-feedstock combination displacing gasoline with a light-/medium-duty electric vehicle as described in Table 5 of the regulation. The EER for PEVs is 3.4;

C is a factor used to convert credits to units of metric tons from gCO_2e and has the value of: $C = 1.0 \times 10^{-6} \frac{(MT)}{(gCO_2e)}$;

$$E_{displaced}^{gasoline} = E_{kWh} \times EER^{gasoline} = E_{kWh} \times 3.6 \times 3.4$$ Equation 1.b

Where:

$E_{displaced}^{gasoline}$ is the EER-adjusted energy for PEVs in displacing gasoline vehicles;

E_{kWh} is the quantity of electricity, in kWh, that is assigned to each EDU according to the methods described in Equation 2 below;

3.6 is the conversion factor (from kWh to MJ) specified in Table 4 of the regulation;

$EER^{gasoline}$ is 3.4 as described above.

CARB determines the quantity of electricity used in non-metered residential PEV charging within a given EDU service area as specified in section 95486.1(c)(1)(A) paragraph 1. of the LCFS regulation:

$$Electricity_{Non\ metered}^{PEV} = N_{Non\ metered}^{PEV} \times Electricity_{Daily\ Average}^{PEV} \times T_{reporting\ period}^{days}$$ Equation 2

Where:

$Electricity_{Non\ metered}^{PEV}$ is the total estimated electricity use in kWh of non-metered residential PEVs assigned to the EDU for the reporting period;

$N_{Non\ metered}^{PEV}$ is the total number of non-metered residential PEVs within a given EDU service area for the reporting period. CARB uses data from multiple resources to determine this number (see heading c-d);

$Electricity_{Daily\ Average}^{EV}$ is the daily quantity in kWh of electricity used for residential charging of PEVs (see heading e.) during the reporting period;

[5] Energy Economy Ratio (EER) is defined in the regulation to mean the dimensionless value that represents the efficiency of a fuel as used in a fuel-feedstock combination as compared to a reference fuel used.

$T^{days}_{reporting\ period}$ is the total number of days in the reporting period.

a. Estimating the Number of PEVs in California

To estimate the number of PEVs in the state, CARB uses vehicle registration information from California Department of Motor Vehicles (DMV), vehicle description from National Highway Traffic Safety Administration (NHTSA) database, registration information in the LCFS Reporting Tool (LRT), and a Vehicle Identification Number (VIN) decoder maintained by CARB.

A VIN decoder is a list of 8-digit VINs corresponding to the PEV make and model identified in the NHTSA database. NHTSA data provides vehicle information such as drive train, type of electric vehicle (i.e. battery electric vehicle or plug-in hybrid electric vehicle) and primary fuel source. Each quarter, CARB staff compares vehicle descriptions in the NHTSA database against the prior quarter's VIN decoder along with information on each PEV manufacturer's webpage to identify a comprehensive list of PEV make and model information to update the decoder. At the end of each calendar quarter, CARB staff accesses VIN registrations from the DMV and queries the DMV registration data for PEVs using the VIN decoder. This query establishes the total number of PEV registrations in the DMV database for the quarter. The list of VINs are filtered to remove duplicate and inactive registrations (i.e. registrations not updated in the past 24 months). The VIN decoder can be found on the LCFS guidance document webpage, adjacent to the link for this document, and will be updated on a quarterly basis as discussed below.

As specified in section 95483(c)(1)(B) of the regulation, reporting entities must register VINs for incremental crediting.[6] CARB staff compares the list of VINs associated with PEV registrations identified in the DMV database to the list of VINs associated with registrations in the LRT for incremental crediting, and includes in the total PEV count those VINs that are registered in the LRT but not found in the DMV database.

b. Allocation of PEVs for each EDU

CARB allocates the total number of PEVs estimated for a given quarter to EDUs based on the proportion of cumulative California Vehicle Rebate Project (CVRP)[7] rebates

[6] Residential incremental credits are credits generated by entities supplying low-CI electricity to residential vehicles. Entities register VINs in the LRT according to the eligibility priority set out in section 95483(c)(1)(B) paragraph 2. These credits can be generated from metered data, which could be reported by at-home chargers or on-board vehicle telematics (as defined in 95483(c)(1)(B) paragraphs 1-2.) or by EDUs for non-metered residential charging (95483(c)(1)(B) paragraph 3). Non-metered residential incremental credits are calculated based on the estimated total electricity per vehicle described in under heading e of this document below: "Estimating Daily Average PEV Electricity Use."

[7] The Clean Vehicle Rebate Project (CVRP) is a CARB program administered by the Center for Sustainable Energy (CSE) to promote clean vehicle adoption. CVRP offers statewide rebates of up to $7,000 for the purchase or lease of new, eligible zero-emission vehicles, including electric, plug-in hybrid electric and fuel cell vehicles.

issued in EDU service areas. The CVRP rebate distribution is determined by considering all rebates issued to-date and as recorded in the CVRP Rebate Statistics.[8]

$$PEVs_{EDU} = PEVs_{Total} \times \frac{CVRP\ Rebates^{EDU}}{CVRP\ Rebates^{Total}} \quad \text{Equation 3}$$

c. Estimating Daily Average PEV Electricity Use

Section 95486.1(c)(1) of the LCFS regulation requires CARB utilize the best available data to estimate residential EV charging in the calculation of base credits issued to utilities that opt-in to the program. Starting with the Q1 2023 reporting period, CARB staff will use data reported by entities as part of residential incremental crediting (as specified under 95483(c)(1)(B) and 95491(d)(3)(B)3.).[9] Entities who participate in incremental crediting must report dispensed electricity per vehicle (or VIN) for each reporting period. Utilizing the charging data reported per vehicle, CARB will audit data quarterly and calculate a single statewide average charging.

d. Calculating Base Credits for Non-metered Residential PEV Charging

CARB uses the estimated number of PEVs in each EDU service area as described in headings a and b, and the statewide daily average charging rate as described in heading c above to calculate the total estimated electricity used for residential PEV charging.[10] The estimated electricity amount is used to calculate base credits for non-metered residential PEV charging for each EDU using Equation 1.

Base Crediting Data to be Published

Total base credits are published as part of the quarterly data summary posting.[11] To improve transparency regarding the various data feeding into these calculations, CARB staff will also publish the VIN decoder used for querying the DMV from the previous quarter, the number of PEVs used in the base crediting calculation, the number of vehicles registered in the LRT for residential incremental crediting per 95483(c)(1)(B), and the statewide average charging rate.[12]

[8] CVRP rebate statistics https://energycenter.org/clean-vehicle-rebate-project/rebate-statistics.
[9] Because CARB will no longer rely on utility-provided data as the best available data to calculate base credits, it is no longer necessary for utilities to report residential EV charging for that use as specified under 95491(d)(3)(A)1. of the LCFS regulation. However, if CARB determines that reporting of utility data is necessary as an element of the best available data for that specified use, residential EV charging data must be reported as specified.
[10] For the EDUs that provide metered residential charging data, CARB staff subtracts the quantity of electricity reported as metered data from the estimated non-metered electricity to avoid double counting. Metered data is reported directly in the LRT by the EDUs.
[11] LCFS Quarterly Data Summary spreadsheet https://ww3.arb.ca.gov/fuels/lcfs/lrtqsummaries.htm.
[12] The decoder, PEV, and charging rate information will be published on the guidance document webpage. https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard/lcfs-guidance-documents-user-guides-and-faqs

CONTACT

For additional information concerning the methodology described in this document or the LCFS program, please visit the LCFS contacts webpage at https://www.arb.ca.gov/fuels/lcfs/contact.htm.