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WattTime Comments on the LCFS Smart Charging and Electrolysis Pathway

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Intro

WattTime views smart-charging, and the timing of electricity consumption broadly, as a valuable tool to help California achieve its climate goals. As such, WattTime commends the California Air Resources Board on the important and innovative development of the smart charging and smart electrolysis pathway. We view the smart pathway as an important first step to demonstrating that EV consumption can be modified to achieve California's dual goals of reducing emissions from transportation and upgrading the electricity grid to better integrate renewables and low carbon sources. However, the current smart charging pathway 1) achieves less than half of the emissions reductions possible through changing the dispatch of EV load, and 2) in practice is unlikely to incentivize smart charging.

WattTime analysis, presented here, shows that by incentivizing EV charging based on the real world, real-time emissions signal being developed to guide dispatch of California's energy storage systems (the SGIP signal), the same vehicles could eliminate over four times more emissions than if guided by an hourly pre-estimated lookup table. Allowing EVs and EV supply equipment to deliver these emissions benefits will likely require rulemaking that allows them to stack credits generated by smart charging on top of credits generated by charging from renewables.

Background on SGIP Marginal Emissions Model

The CPUC staff has issued a draft ruling requiring subsidized energy storage systems in the SGIP program to measure carbon impact according to a marginal emissions signal delivered in real-time. This signal will become the signal of reference for the assessment of the carbon emissions of devices that store energy in California. This heat-rate based model is substantively similar to the avoided cost model, but is produced in 5-minute intervals based on real-time grid conditions.

WattTime Analysis

Because the SGIP marginal emissions signal will likely become the marginal emissions indicator of record, WattTime used it to determine the emissions of "smart-charging" sessions guided by two smart charging scenarios:

- 1) a smart-charging scenario in which EV charging was dispatched according to the avoided cost model lookup table
- 2) a smart-charging scenario in which EV charging was dispatched according to the 5-minute SGIP sgip signal

In order to make an apples to apples comparison of emissions, the SGIP data was used in both cases to calculate the emissions impact of the charging schedule.



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Inputs

WattTime looked at night charging and day charging with a Level II EVSE and charging speed of 6.6 kW. The vehicle was assumed to need 9.1 kWh, which is the energy associated with driving 30 miles per day. The day charging window is 9 hours long, beginning at 9:00 and ending at 18:00. The night charging window is 12 hours long, beginning at 19:00 and ending at 7:00.

Results

In the results discussed below, baseline refers to “dumb” charging, where a vehicle is plugged in, begins charging immediately and stops when the battery is full.

Daytime Charging Results:

Optimizing charging based on the avoided cost model created 173 kg of CO2 emissions between January 1st and February 28th 2019, a 5.35% reduction from baseline.

Optimizing charging based on the 5-minute SGIP signal created 130 kg of CO2 emissions between January 1st and February 28th 2019, a 28.9% reduction from baseline.

Nighttime Charging Results:

Optimizing charging based on the avoided cost model created 200 kg of CO2 emissions between January 1st and February 28th 2019, a 25% reduction from baseline.

Optimizing charging based on the 5-minute SGIP signal created 170 kg of CO2 emissions between January 1st and February 28th 2019, a 37.1% reduction from baseline.

Discussion

The granularity and real-time nature of the SGIP 5 min signal allows dispatch that captures lower marginal emissions generation than the hourly dispatch allowed by the avoided cost model. With this added granularity, this analysis shows in very simple scenarios that charging EVs based on the 5-minute signal can reduce up to 5 times the emissions of an hourly signal.

Stacking Credits and Incentives for Smart Charging

Currently, opt-in generators crediting EVSE must choose between a pathway based on low or 0 CI renewables or the smart charging pathway. Our analysis shows an 8% increase in credit volumes under the hourly smart charging pathway (compared to using the grid average CI), while the use of RECs to achieve a 0 CI delivers a 36% increase in credit volumes. In addition to the benefit of increased volumes, the simplicity of book and claim REC accounting makes this pathway simpler



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administratively and the volumetric benefits easily compensate for added REC costs. The relative attractiveness of the grid average and low CI pathways make it highly unlikely that the smart charging pathway will be used for a material volume of charging, and therefore the power of EV charging flexibility to reduce emissions and create a renewables friendly grid will not be demonstrated.

As renewable penetration on the grid increases alongside electrification of multiple industries, flexible load will need to be incorporated to avoid expensive grid updates and curtailment of renewable generation. The ARB has the ability to influence the adoption of such technologies before the negative consequences of additional EV load increase costs in a way that may ultimately complicate the electric transition.

Conclusion

Moving forward, as the grid becomes increasingly renewable, it will be important for flexible resources like EVs to react to signals that reflect real-time grid conditions. This will allow EVs to charge on cleaner electricity with fewer grid infrastructure updates. WattTime encourages the ARB to begin the process of deploying a real-time signal pathway, and encouraging such behavior by allowing smart charging credits to be incremental to low and 0 CI credits claimed using RECs or other renewables. To achieve state energy transition objectives, the Smart Charging pathway needs further revision to benefit renewable energy deployment and GHG emissions reductions from electricity use in transportation.