Fermata Energy

February 20, 2024

Honorable Chair Liane M. Randolph and
Honorable Board Members California Air Resources Board
1001 I Street
P.O. Box 2815
Sacramento, CA 95812

Submitted electronically via public Comment Notice of Public Hearing to Consider Proposed Low Carbon Fuel Standard Amendments
(https://ww2.arb.ca.gov/applications/public-comments?utm_medium=email&utm_source=govdelivery)

RE: Notice of Public Hearing to Consider Proposed 2024 Low Carbon Fuel Standard Amendments (LCFS)

Dear Chair Randolph and Honorable Board Members:

Fermata Energy is pleased to provide comments in response to the Notice of Public Hearing to Consider Proposed Low Carbon Fuel Standard Amendments.[1] In June 2023, Fermata Energy staff members had the opportunity to meet CARB representatives Joshua Cunningham, Analisa Bevan, and Leslie Goodbody at the California-UK Vehicle-to-Everything ("V2X") Global Expert Mission. The discussion in this meeting included the proposal to extend the LCFS program scope to value V2X benefits, which was supported by Fermata Energy, ev.energy, and others. Our first three proposals are not addressed in the proposed LCFS Amendments, and as such, we raise new issues for CARB's consideration. Our fourth recommendation supports the revisions to Section 5.b of the "Proposed Regulation Order: *Proposed Amendments to the Low Carbon Fuel Standard Regulation*," on the use of LCFS Holdback Funds for V2X Programs.[2]

Background: Founded in 2010, Fermata Energy is a leading Vehicle-to-Everything ("V2X") bidirectional charging services provider. Fermata Energy designs, supplies, and operates the technologies required to integrate electric vehicles ("EVs") into homes, buildings, and the electric grid. Fermata Energy's V2X platform incorporates CHAdeMO and CCS connectors in a

[1] See California Air Resources Board Notice Notice of Public Hearing to Consider Proposed Low Carbon Fuel Standard Amendments available at https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/lcfs_notice.pdf,

[2] See Section § 95483. Fuel Reporting Entities. < (c) For Electricity Used as a Transportation Fuel. (1) Residential EV Charging. (A) Base Credits. < 5b, at page 45,https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/lcfs_appa1.pdf

bidirectional charger and management software platform that connects the EV and electricity user to the grid. Fermata Energy's V2X platform extends the value of an EV and allows the vehicle to act as a dispatchable energy storage resource when the vehicle is not in use.

Fermata Energy's customers today are earning thousands of dollars per EV and EVSE pair through Vehicle-to-Grid ("V2G") and Vehicle-to-Building ("V2B") programs nationwide. The company's bidirectional EV charging system is the first to be certified by UL Solutions in North America to UL 9741, the Standard for Bidirectional EV Charging System Equipment and is the first to earn approval in the U.S. from a major OEM for battery warranty.

In addition to developing the hardware and software required to perform V2X activities, Fermata Energy has spent over 10 years studying how V2X can unlock additional value streams from EVs, including those that are commercially viable today without regulatory intervention and how to best monetize these value streams. Fermata Energy has extensive experience with analyzing use cases, monetization mechanisms, and business models to maximize the benefits of V2X technologies. Vehicle Grid integration ("VGI") encompasses both V1G (smart and managed charging solutions) and V2X (bidirectional power transfer to the grid, building, home, microgrid, or any other external load source). While V1G enables EVs to participate in off-peak charging programs and provide automated load management, V2X unlocks additional value streams and benefits for ratepayers and the grid by enabling the discharge of power stored onboard an EV. V2X that Fermata Energy provides unlocks the value of EVs to provide all of the services that that V1G does, in addition to backup power/resilience, demand charge management, demand response, system-wide peak shaving, and ancillary services, among others.

The interest in V2X commercialization is widespread and accelerating. In addition to the launch of the Ford Lightning (EV F150 pickup truck) V2H offering, 2023 saw several EV manufacturers announce plans to make their EVs bidirectional.[3] Furthermore, several electric vehicle supply equipment ("EVSE") manufacturers announced plans to bring bidirectional chargers to market, expanding the limited number of bidirectional chargers that are available today.[4] The ACC II amendments are timely and offer an opportunity for CARB to ensure that manufacturers' bidirectional EVs meet basic interoperability standards for bidirectional charging and demonstrate these capabilities through assurance testing.

Fermata Energy Recommendations

[3] See Automotive News, GM to offer bidirectional charging on all EVs by 2026 available at https://www.autonews.com/mobility-report/gm-evs-have-bidirectional-charging-technology-2026 and CleanTechnica, Tesla Plans To Adopt Bi-Directional Charging By 2025 available at https://cleantechnica.com/2023/08/19/tesla-plans-to-adopt-bi-directional-charging-by-2025/.

[4] See electrek, Wallbox and Kia team up to try and bring bidirectional charging capabilities to EV9 owners available at https://electrek.co/2023/08/25/wallbox-kia-bidirectional-charging-capabilities-ev9-owners-home/ and

1. **Proposed Methodology for Accounting for Energy for Transportation for V2X Customers:** We would like to propose the following formula to account for energy for transportation for V2X customers that wish to generate LCFS credits. Electricity dispensed from electric vehicle supply equipment ("EVSE") for transportation can be netted out from the overall electricity dispensed for a V2X system that includes a bidirectional charger that has an approved interconnection agreement with the electric distribution company ("EDC") according to the following:

Electricity charged for driving (kWh) = Total electricity charged (kWh) - Electricity discharged (kWh)

Note: Where charged and discharged electricity are the energy flows measured at the charger meter.

$$Electricity\ charged\ for\ driving\ (kWh)\ =\ [Total\ electricity\ charged\ (kWh)\ -\ Electricity\ discharged(kWh)]$$

The two energy uses of a V2X charger are 1) driving (transportation) and 2) exports to buildings or the grid, so the total energy charged at any charger will be equal to the energy required to refill the battery for those uses. This means that for V2X services, energy discharged (kWh) = energy charged (kWh). The remainder of charging at a V2X charger is to refill from driving uses. We understand and appreciate that this proposed methodology above can be adopted with a technical note (e.g., Guidance Document or similar) and therefore does not require an amendment to the LCFS program amendment. However, we take this opportunity to share our above proposed methodology to be included in the public record as CARB considers LCFS program amendments and would prefer the greater certainty that a regulatory amendment provides.

2. **Consideration for Account for V2X Discharge in LCFS Methodology**

The stated aims of the LCFS program are: "[...] to decrease the carbon intensity of California's transportation fuel pool and provide an increasing range of low-carbon and renewable alternatives, which reduce petroleum dependency and achieve air quality benefits."[5] Fermata Energy understands the scope and purpose of the program, and that LCFS is a fuels regulation aimed at decarbonizing the transportation sector. However, below, we expand upon how accounting for V2X discharge in the LCFS methodology will help CARB achieve the stated

[5] https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard/about#:~:text=The%20LCFS%20is%20designed%20to,and%20 achieve%20air%20 quality%20 benefits

goals of the LCFS program and further its mission.[6] CARB may have to expand the scope of LCFS to fully incentivize the potential of bidirectionally-enabled EVs to support transportation decarbonization and provide the associated air quality benefits.

Decreasing the Carbon Intensity of CA's Transportation Fuel Pool

Bidirectionally-enabled EVs decrease the carbon intensity of California's transportation fuel pool in the same way as other EVs: by displacing the emissions from mobility (driving) from a conventional fuel to an alternative fuel (electricity). This is included in the methodology proposed in (1) above. The formula is attractively simple, however it does not take into account the potential benefits of V2X for further lowering CO2 from transportation assets.

V2X Discharge Enables EVs to Generate Revenue for Grid Services, Lowering EV TCO, and Helping Accelerate EV Adoption and Renewables Integration in CA

EVs are the primary mechanism to achieve transportation decarbonization. V2X accelerates the transition to electric vehicles, by providing new value streams that increase consumer adoption of EVs by lowering EV total cost of ownership (TCO). This also increases the range of consumer options in selecting an EV, which is aligned with the goals of the LCFS program.

In addition to lower EV TCO, V2X supports renewables integration. By fully unlocking the ability of EVs to respond as grid-supporting, flexible load resources, V2X can help California achieve a cleaner generation profile. Bidirectional EVs can discharge to the grid during the CA system-wide peak and be aggregated into Virtual Power Plants (VPPs) to displace fossil-fuel powered peaker plants. Bidirectional charging can also charge when there is excess solar and wind power generation, thereby reducing renewable energy curtailment.

Achieving further air quality benefits from the transportation sector, beyond the transportation sector, by reducing both grid and transportation emissions

What an EV does when it is parked is just as important as what an EV does when it is driving. Recognizing V2X in LCFS can turn transportation assets into carbon sinks; bidirectional charging, when optimized for carbon-signals, can lead to a net displacement of CO2 emissions. By following a carbon signal and discharging at high Carbon Intensity (CI) times and charging at low CI times, V2X EVs create a net environmental benefit, turning EVs into potential carbon sinks. The LCFS market design may need to change to create the incentives for EVs to provide these additional environmental benefits. While this may necessitate an expansion of LCFS's

[6] "CARB's mission is to promote and protect public health, welfare, and ecological resources through effective reduction of air pollutants while recognizing and considering effects on the economy. CARB is the lead agency for climate change programs and oversees all air pollution control efforts in California to attain and maintain health-based air quality standards." https://ww2.arb.ca.gov/about

official scope, these goals do align with CARB's broader mission as an organization and the spirit of the LCFS program.

Proposed formula for CARB to include V2X discharged energy in LCFS accounting

Fermata Energy proposes that CARB make the total energy cycled through the vehicle battery in the course of V2X operations eligible for LCFS credits. The formula would account for the hourly energy charge and discharge flows and the associated hourly carbon emissions, which could lead to either adding or subtracting LCFS credits from a participants' credits earned depending on performance.

The proposed formula for V2X is then:

$$\sum_{h=0}^{h=H} Net\ Electricity(h) \times CI(h) \ = \ [Electricity\ charged(h) \ - \ Electricity\ discharged(h)] \times CI(h)]$$

Where H is the total number of hours in the year, h is the hour, Electricity charged and Electricity discharged are the hourly energy measurements at the charger, and CI is the carbon intensity recorded for hour h.

Worked example of V2X as net carbon sink

Here, we propose the example use case of a delivery truck at a warehouse with V2G charging infrastructure on-site. This medium-heavy duty vehicle has a usable battery capacity of 120 kWh, and is parked at its designated parking space and charger. At 7 am, as instructed by Fermata Energy's algorithms, the truck starts discharging electricity for 2 hours until 9 am, discharging a total of 40 kWh of electricity. During this time, the carbon intensity of the CA grid is 450 gCO2/kWh on average. Fermata Energy's V2X software ensures that the vehicle is left with enough state of charge to complete its morning duty cycle. At 9 am, the vehicle leaves the warehouse and drives 50 miles, for which it uses 15 kWh of electricity. When the vehicle returns to the warehouse, Fermata Energy charges it from about mid-day to 2:30 pm, recharging 15 + 40 kWh = 55 kWh, when the CI of the grid is 0 gCO2/kWh. This creates a carbon footprint for the vehicle of (55 x 0) - (40 x 450) = -18,000 gCO2/kWh, i.e. a net CO2 reduction of 18 kg.

Conclusion on including V2X discharge

In summary, supporting V2X EVs are still primarily transportation assets that are purchased for mobility as a primary use; but their full potential should be addressed via the LCFS program. CARB has an opportunity to incentivize EVs to generate far greater emissions reductions by making V2X eligible for carbon credits in the LCFS program. Standard EV charging, in comparison, can only minimize emissions from mobility, i.e. offset its own carbon footprint. V2X EVs can generate far greater emissions reductions, beyond the vehicle use itself by enabling

discharge to the grid during peak CI times. Fermata Energy recommends that the program fully incentivize these benefits for the state at large by making all V2X discharged and charged energy accountable for LCFS credits. This change would help achieve the program's goal of lowering emissions in the state.

3. Consideration of WattTime Data for More Accurate Carbon Intensities (CI) Values

Fermata Energy recommends that CARB consider using WattTime Data or a similar provider for LCFS CI values. More accurate, granular data on marginal carbon intensities of charging from grid electricity in California is widely available today, from data providers such as WattTime or electricitymaps.

WattTime provides average and marginal operating emissions rates (AOER and MOER) for California grid areas, at 5-min intervals. WattTime data is used in the Self-Generation Incentive Program (SGIO), which is another CA program that aims to reduce carbon emissions from subsidized assets (battery energy storage systems), for which the data is made available to registered users for free (via CEC's MIDAS open access portal).

Fermata Energy has assessed the difference in the CI assumptions required by the LCFS program vs. the marginal operating emissions rates (MOER) calculated by WattTime. We have compared the two data sets and their impact on emissions calculations for two representative vehicle profiles: a residential and a fleet use case over a year. We found that the LCFS CI assumptions significantly underestimate the emissions relative to using the WattTime MOER (see Appendix Table on page 8). This means that EV market participants optimizing against the LCFS CIs are not achieving as many emissions reductions as they could, even for standard charging technologies.

While Fermata Energy cannot comment on the differences in these underlying models, the extent of the difference between the two data sources (CARB vs. WattTime) warrants investigating the accuracy and reliability of the LCFS assumptions. Fermata Energy recommends that CARB consider re-evaluating the current CI methodology and updating the CI assumptions for the smart charging pathway calculations.

If WattTime data is correct, the current assumptions favor LCFS market participants (including Fermata Energy) by underestimating their CO2 emissions, and therefore giving them access to more credits than they would otherwise be able to obtain using more granular real-time CI values. This leads to potential over compensation of market participants, and unnecessary costs to the program and the state. Improving the data accuracy will therefore improve the actual environmental impact of EV charging (including V2X), incentivize market players to develop better charge management strategies, and lead to lower LCFS program costs by ensuring participants are not overcompensated.

Lastly, Fermata Energy recognizes that optimization for CI's and V2X monetization opportunities may sometimes conflict. The formula proposed on hourly CI accounting of V2X net energy flows is not necessarily aligned with our economic interest nor that of our commercial and residential customers. To avoid this misalignment, CARB should ensure that sufficient financial incentives are available through the LCFS program so that participants are incentivized to reduce the carbon emissions.

4. Support for Use of LCFS Holdback Funds for Grid-Supported V2X Programs

Fermata Energy supports CARB's proposal to use LCFS Holdback Funds on VGI and V2G programs.[7] However, we urge CARB to ensure that funding for V2G programs be limited to only those that use grid-supported or "grid-tied" technologies and use cases. Non-grid-tied forms of V2G, such as islanded backup power, do not provide the same decarbonization benefits to the grid. Fermata Energy agrees with the pre-approved uses for these other holdback projects. In addition, we proposed that the list of holdback projects be amended so that it is clearer that grid-tied V2G projects can qualify as both equity and non-equity holdback projects. The proposed regulation is unclear and it looks like V2G projects only qualify as non-equity holdback. This should be fixed as V2G projects can benefit the communities and individuals defined as equity in Section 95483 (c)(1)(A) 5.

Fermata Energy appreciates the opportunity to provide these comments in response to CARB's Proposed LCFS Amendments. We look forward to collaborating with CARB as they finalize the proposed amendments to LCFS.

Respectfully submitted,

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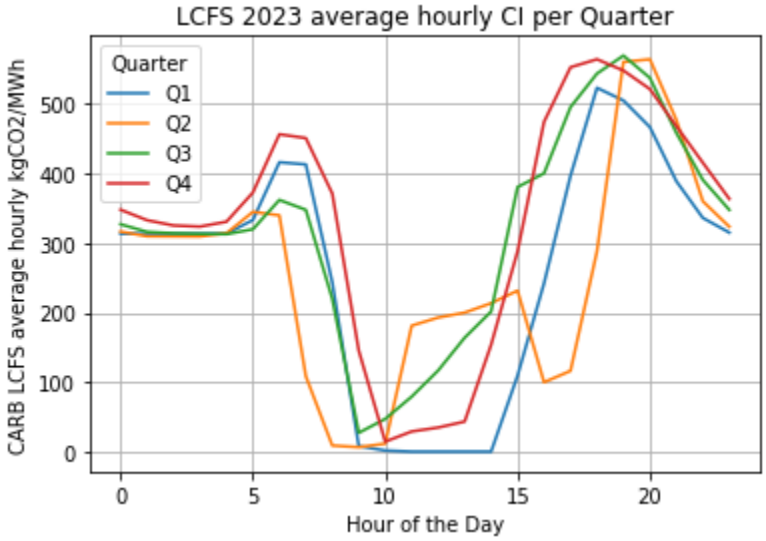
[7] See Section § 95483. Fuel Reporting Entities. < (c) For Electricity Used as a Transportation Fuel. (1) Residential EV Charging. (A) Base Credits. < 5b, at page 45,https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2024/lcfs2024/lcfs_appa1.pdf

Appendix

Fig A Comparison of quarterly average hourly carbon intensity data



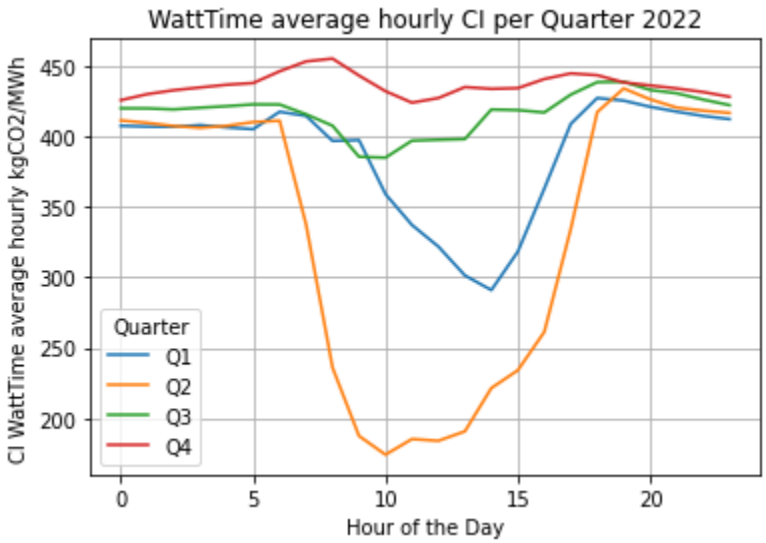


Table A - V2X emissions calculations for different user profiles and CI data sources

This table presents the environmental impact of two example V2X profiles in CA: one for a residential user and one for a V2G fleet vehicle, calculated using each of the two CI data sources for 2022

The charging and discharging profiles were obtained from Fermata Energy's optimization forecast. They represent the behavior of an EV owner aiming to maximize their economic revenue from V2X (detailed assumptions available upon request).

Units: kg CO2/year (for year 2022)	**LCFS Smart Charging CIs**	**WattTime MOER**
Residential	-716	-5,676
Fleet	6,559	-23,695

Note: A positive number reflects a net benefit in CO2 reduction i.e. carbon removal due to V2X discharge offsetting V2X charging. CARB's CI assumptions would lead to an estimation of a net carbon benefit of a fleet V2X EV.