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California Air Resources Board

Subject: Comments to ARB Staff Discussion Paper on Electricity as a Transportation Fuel (November 23, 2016)

Electric Motor Werks, Inc. ("eMotorWerks') appreciates the opportunity to provide the Air Resources Board comments on the Electricity as a Transportation Fuel component of the Low Carbon Fuel Standard Regulation ("the Regulation"). Electricity provides the quickest and most cost-effective path to reducing the carbon intensity of transportation fuel by leveraging the existing electric system infrastructure and service provider ecosystem as well as the benefits from declining costs across the electric transportation value chain from economies of scale and learning. eMotorWerks developed and operates JuiceNet®, the leading electric vehicle (EV) cloud-based smart charging platform, and the company is the manufacturer of best-selling and best-rated residential EV charging station, the JuiceBox Pro, through Amazon.com and its own web store. eMotorWerks embeds the JuiceNet platform in its own residential and commercial EV charging stations, as well as third-party electric vehicle supply equipment (EVSE), including models from AeroVironment, Clipper Creek, General Electric, Nayax, and a growing list of other manufacturers. JuiceNet is also being integrated into a number of automobile models for direct smart control of EV charging via vehicle telematics. eMotorWerks is an "Opt-in Party" to the Regulation for EV charging.

Introductory Summary

In these comments, eMotorWerks will propose three opportunities, not currently contemplated in the Regulation, for CARB to incentivize intentional, dynamic EV charging scheduling which reduces the CI of transportation fuel: (a) custom CI values for EV charging based on marginal emissions signals, (b) CI values for residential EV charging from direct renewable energy sources, and (c) CI values for EV charging from off-site renewable energy sources, including community or shared renewables programs or individual LSE RPS portfolios. In each case, the CI values associated the EV charging would be materially lower than ELC002_1, the average emissions rate of California's electric grid. To enable these EV charging opportunities to flourish as enhanced credit generation sources, CARB should codify and expand the role of aggregators as recipients of LCFS credits, including for residential EV charging when aggregators provide or have access to direct metering and implement intentional, dynamic EV charging scheduling.

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In these comments, eMotorWerks also provides feedback on the CARB Staff Discussion Paper topics, including proposing a revision the entity roles related to "Non-Metered EV Charging," codifying the "Third-Party Aggregator Designation" and requirements, providing options for a "Revised Lookup Table Pathway for Grid Electricity," improving the "Flexibility for Non-co-located Renewable Power," rejecting the proposal to "Allow EDUs to Claim Credits for all Light- and Medium-duty EV Charging that are not Claimed by Other Stakeholders" and clarifying the requirements for "EV Fueling Facility IDs."

These comments are organized in the following topic areas:

1. Intentional, Dynamic EV Charging Scheduling Opportunities within LCFS
    - GHG Minimization with Intentional, Dynamic EV Charging Scheduling
    - Synchronizing EV Charging with On-Site Renewable Energy Generation
    - Synchronizing EV Charging with Off-Site Renewable Energy Generation
2. Considerations for Incremental LCFS Credit Generation from Intentional, Dynamic EV Charging Scheduling
    - Rationale for Incentivizing Intentional, Dynamic EV Charging which Specifically Reduces CI
    - Recipient Parties of EV Charging from Electricity with Lower CI Values
3. Specific Comments on CARB Staff Discussion Paper
    - Non-Metered EV Charging
    - Third-Party Aggregator Designation
    - Revised Lookup Table Pathway for Grid Electricity
    - Consideration of Flexibility for Non-co-located Renewable Power
    - Whether to Allow EDUs to Claim Credits for all Light- and Medium-duty EV Charging that are not Claimed by Other Stakeholders
    - EV Fueling Facility IDs

1. Intentional, Dynamic EV Charging Scheduling Opportunities within LCFS

Under the current regulation, electricity from the electric grid supplied to an EV charging station qualifies for the CI value associated with ELC002_1, which is supposed to equal the average emissions rate of California's electric grid. For EV charging that is not directly metered, ELC002_1 is a reasonable estimate of CI. For EV charging that is directly metered but occurs without intentional, dynamic charge scheduling to mitigate the coincident emissions of the electric grid, ELC002_1 is a reasonable estimate of CI as well. However, for EV charging that is directly metered and intentionally, dynamically scheduled to mitigate coincident emissions of the electric grid over each charging session, ELC002_1 is not the appropriate CI value as it would materially over account for the actual emissions associated with the electricity supplied to an EV charging station.

1(a). GHG Minimization with Intentional, Dynamic EV Charging Scheduling

eMotorWerks' JuiceNet platform actively meters EV charging and can modulate charging on a real-time basis for a given use case, including mitigation of GHG emissions. Today, eMotorWerks offers its customers the option of minimizing the amount of GHG emissions resulting from EV charging sessions. JuiceNet Green, as it is known, has been available and utilized since July 2015.

In development of the technology behind JuiceNet Green, eMotorWerks partnered with the nonprofit organization, WattTime, whose mission is to help companies reduce GHG emissions. WattTime software detects real-time variation in the marginal rate of emissions in specific areas of electric grids and utilizes these rates to continuously revise custom charging schedules through JuiceNet. EVs charging with JuiceNet Green are actively monitoring and mitigating marginal GHG emissions in real-time, thus scheduling charging at moments of lower marginal emissions intensity and directly reducing emissions at power plants on the same grid. Furthering the ability of the grid to integrate higher penetrations of renewable energy is an intentional byproduct of the smart charging performed by JuiceNet Green.

The marginal emissions detection algorithms employed by WattTime are based on consensus opinion among peer-reviewed journal articles from researchers at University of California Berkeley, University of California San Diego, Carnegie Mellon, and Yale, among others. The algorithms work by combining real-time operational data from grid operators such as the California Independent System Operator, historical marginal emissions data from the EPA's Continuous Emissions Monitoring System, and other sources such as weather data.

As a result of intentional, dynamic EV charging scheduling, the coincident CI of these EV charging sessions is lower than it would otherwise be by a meaningful and growing amount. According to a third-party analysis by the nonprofit Rocky Mountain Institute, use of WattTime technology has been shown to lower emissions up to 15%.

eMotorWerks proposes that the Board allow opt-in parties for EV charging to request a custom CI pathway which would grant incremental credits based on the CI of intentional, dynamic EV charging scheduled to reduce GHGs emissions by optimizing against real-time marginal emissions. The party proposing the custom CI pathway would be responsible for providing verifiable charging data on an aggregate portfolio basis as well as anonymized individual basis that shows when a defined portfolio of EVs charged. Depending on the verification and credit allocation process, "baseline," or counter-factual, scenarios may be necessary as well. The charging session baselines would be defined as the time when equal kWh sessions would have occurred had the intentional, dynamic charging not been undertaken.

The most appropriate CI value for intentional, dynamic EV charging is the actual grid wide average CI value for each charging session. While the EV charging is optimized against marginal emissions to maximize the GHG benefit, the CI of the EV consumption is not the marginal rate because EVs are contributing the overall coincident consumption. To ascribe a marginal CI value to the EV charging may actually result in a *higher* CI value than the generic annual average grid wide emissions.

Currently, there is no public data set for interval-level detail of California grid GHG emissions . However, the California Independent System Operator (CAISO) began publishing monthly wholesale electricity GHG emissions in December 2016, along with the applicable total electric load served.[1] eMotorWerks understanding is that this report is compiled from a summation of the five minute emissions data estimated by the CAISO, including imports, exports and the energy imbalance market.[2]

CARB and the CAISO should coordinate to allow public reporting, or CARB-only access, in arrears, to this real-time interval GHG emissions and total load served by second quarter 2018 for use in generating LCFS credits from intentional, dynamic EV charging in first quarter 2018.[3] For purpose of innovation and GHG reductions, CAISO should make this data available in real-time via its OASIS site, as soon as feasible.

If CARB is not able to obtain this CAISO data or other viable average grid GHG emissions for real-time intervals, the alternative formula for credit generation for intentional, dynamic EV charging would:

- Sum credits generated from
    - A) the kWh amount using annual the ELC002_1 CI value, and
    - B) the same kWh amount reflecting the reduction in the marginal CI value for each charging session as a result of the intentional, dynamic EV charging.

To calculate the reduction in marginal CI for each charging session, CARB will need to have access to the historic real-time marginal emission rates on a local or regional basis. Given WattTime's expertise in this field and its nonprofit status, eMotorWerks would support CARB engaging with WattTime for this data source, either directly or through a CARB-approved verification body.

[1] http://www.caiso.com/market/Pages/ReportsBulletins/DailyRenewablesWatch.aspx#ghgreport
[2] Does not include load served by behind the meter renewables. Data only for CAISO balancing area and does not include non-CAISO member municipal utility portfolio emissions.
[3] Non-CAISO participating utilities should be encouraged to consult with the CAISO to provide consistent data to CARB in a similar timeframe.

1(b). Synchronizing EV Charging with On-Site Renewable Energy Generation

The Regulation currently allows for EV charging direct from renewable energy to receive a CI value of 0.0 gCO2e/MJ; however, this pathway has not been utilized for various reasons. Co-location of EV charging with a renewable energy generator can result in renewable energy fueling the associated transportation, but largely due to proximity and fortune, rather than intention and synchronization.

Smart EV charging platforms, such as eMotorWerks' JuiceNet, can schedule and synchronize EV charging with on-site renewable power generation to maximize the amount of renewable energy utilized for EV charging. This is achieved with a combination of installed hardware and software algorithms to monitor the instantaneous generation of renewable energy, with existing or additional metering, and align EV charging to the maximum extent possible with that generation. In addition, forecasting the likely occurrence of renewable generation can increase the coincidence with charging during each session. This solution is available for both commercial and residential EV charging today.

For behind the meter solar, much of EV charging consumption can be directly sourced from solar, depending the owner's EV use case, driving patterns and charging behavior. In the case of a residential solar installation, the EV capture rate is as much as 25% of the solar generation.

Encouraging on-site EV consumption of rooftop solar not only reduces the CI of the transportation fuel for EVs, but it also has benefits to the distribution system by reducing the amount of electricity exported to the grid. In instances of low residential electricity demand on a local circuit and high rooftop solar generation, distribution infrastructure can become stressed the reverse flow of electrons, known as backfeed, which can reduce useful life of infrastructure or even cause faults or outages, if not managed properly. Currently, net energy metering (NEM) tariffs in the California do not incentivize self-consumption, but NEM tariffs may not be available for new solar customers in two or three years' time. The extension of LCFS credits that explicitly reward EV-consumption of rooftop solar could be a valuable incentive to reduce exports and a market-based alternative to NEM in the future.

Currently, the Regulation does not allow for residential EV charging from renewable generation to access the 0.0 gCO2e/MJ CI value. Electricity distribution utilities receive all LCFS credits from residential EV charging. These credits are allocated based on the estimation methodology because the availability to the EDUs of direct metering information is minimal. Because the estimation methodology is allowed and there is no incentive currently within the Regulation (or within NEM tariffs) to encourage directly metered and intentional, dynamic residential EV charging, synchronizing charging with on-site residential renewable generation does not occur. eMotorWerks proposes that residential EV charging from renewable generation be eligible for

use of the 0.0 CI value, when active timing controls are employed to maximize self-consumption.

1(c). Synchronizing EV Charging with Off-Site Renewable Energy Generation

The same smart charging controls can be applied to synchronize EV charging with a specific off-site renewable generator, like a community solar facility, or a portfolio of renewable generation, such as a load-serving entities' (LSE) portfolio of bundled Renewable Portfolio Standard (RPS) eligible (or non GHG-emitting) generation. Through a combination of forecasting from LSE partners and real-time communications, individual and aggregations of EVs charging can be synchronized with zero emitting generation on the electric grid.

Many LSEs offer tariffs with significantly higher components of RPS or non GHG-emitting generation than required by the RPS law. As long as those tariffs and the supporting bundled RPS or non-emitting procurement is purposefully synchronized with EV charging, then those LSEs and, by extension their customers who are actually paying for the electricity including any costs of higher RPS content, and have opted into charging their EVs with the intent of reducing

or minimizing GHG emissions, should be incentivized and able to access lower composite CI values.

In the case of both on-site and off-site renewable generation, eMotorWerks proposes that EV charging be granted credits based on a CI value of 0 gCO2e/MJ for the verifiable electricity consumption which is coincident with on-site or off-site renewable, or non GHG-emitting, generation. The non-coincident portion of EV charging would be attributed the average CI value of California electricity, i.e., ELC002_1. The party proposing this CI treatment of EV charging from renewable, or non GHG-emitting, generation would be responsible for providing verifiable interval data on an aggregate portfolio basis as well as anonymized individual basis that shows the time series of the relevant generation (portfolio, if applicable) and EV charging, which would identify the amount of consumption utilizing the dedicated renewable generation and the amount from generic grid electricity.

2. Considerations for Incremental LCFS Credit Generation from Intentional, Dynamic EV Charging Scheduling

2(a). Rationale for Incentivizing Intentional, Dynamic EV Charging Which Specifically Reduces CI

The goals of the Regulation are to reduce the carbon intensity of transportation fuel. The Board has encouraged innovative means to reduce carbon intensity by providing opportunities for Regulated and non-Regulated Parties to generate credits, such as instances where electricity is

used as a transportation fuel. While EV charging certainly contains lower CI than traditional transportation fuels, unmetered and unmanaged EV charging is largely ignorant to the CI of the electricity employed.

By creating avenues within the Regulation to explicitly incentivize intentional, dynamic EV charging scheduling which minimizes coincident emissions, the Board can not only encourage innovation but also initiate a virtuous cycle of emissions reductions. EV charging equipment that is intentionally and dynamically operated to minimize marginal emission rates does lower the CI of transportation fuel for that EV, but it also simultaneously assists with the integration of renewable energy on the electric grid, thereby enhancing the power system's ability to increase the share of renewable energy and lower average CI. In addition, incentivizing intentional, dynamic EV charging will serve to lower the total cost of EV ownership, which can spur technology adoption across the EV value chain - EVs, smart charging infrastructure and intentional, dynamic EV charging. The cycle of more EVs charging attuned to coincident GHG emissions further enables the reduction of CI of the electric grid for transportation fuel and all other electricity end uses.

2(b). Recipient Parties of EV Charging from Electricity with Lower CI Values

If the Board were to expand the potential CI pathways for EV charging to include 1(a) custom CI values for EV charging based on marginal emissions signals, 1(b) CI values for residential EV charging from direct renewable energy sources and 1(c) CI values for EV charging from off-site renewable energy sources, the Board should authorize credits to be received by aggregators of the relevant EV charging data. The likely scenario would be for these aggregators to provide the direct metering information as well as the modulation of EV charging to achieve the lower CI.

In the case of residential EV charging, the Electric Distribution Utilities (EDUs) are currently the only authorized recipient of credits. eMotorWerks proposes that the Board create an additional recipient for residential EV charging credits to allow, but not require, in those instances where intentional, dynamic EV charging is associated with lower CI values that a non-EDU may receive the credits, subject to provision of data and verification processes.

By encouraging aggregator participation and intentional, dynamic EV charging, the Regulation would be improved by capturing a larger proportion of residential EV charging with direct meter data, which will reduce the volume of credits generated from the estimation methodology. In addition, this incentive will encourage innovation by aggregators and/or EV service providers (EVSPs) and greater deployment of electrified transportation, particularly that is optimized to reduce CI.

3. Specific Comments on CARB Staff Discussion Paper

3(a). Non-Metered EV Charging

On page 6 of the Discussion Paper, the process for producing the kWh basis for credits generated from residential EV charging is outlined. However, the allowance for LCFS credits to be sourced from non-metered EV charging, residential or otherwise, should be phased out as the technical capabilities needed to accurately meter EV charging are already low cost and could be supported unto itself by LCFS credits. This phase out should begin in 2018 by allowing 3rd party aggregators to earn LCFS credits for both residential and non-residential EV charging where direct metering data is available and provided to CARB. In 2019, any EV charging which is not directly metered would be eligible for credit generation; however, those credits would be granted to a non-profit organization, like the Center for Sustainable Energy, or a government agency, like the California Energy Commission, that would be responsible for using those funds to incentivize smart, metered EV infrastructure, with those credits proceeds separately earmarked for investment in the domain from which derived, i.e., residential, private-workplace, etc.

3(b). Third-Party Aggregator Designation

eMotorWerks supports CARB's proposal to codify a new "aggregator" designation within the Regulation, as described on page 8, as this is an important recognition for cost-effectively scaling third-party reporting on behalf of sophisticated entities. However, it is not clear that these aggregators should be a "Regulated Party" with the same requirements as those Regulated Parties with an LCFS compliance obligation to reduce CI. Aggregators do not have the compliance obligation, so they should be not be regulated in the same manner. Secondly, the default scenario would not likely involve aggregator buying LCFS credits. As originally written, the Regulation greatly limits the ability of external parties to the fuel system to take ownership, buy and sell LCFS credits. By creating aggregators as a Regulated Party with rights to buy and sell LCFS credits, this could introduce unanticipated actors into the trading markets for LCFS. It is not clear why an "Opt-in" status to the Regulation is not more appropriate than a Regulated Party status for aggregators.

The Discussion Paper also proposes that a written contract between facilities and an aggregator be provided to CARB. This may be administratively burdensome for aggregators and undesirable for host customers. Currently, LCFS quarterly transactions reporting for EV charging is done in aggregate per Opt-in party, and will now include fueling station (FS) location information as of 1st quarter 2017. There is no higher level reporting at the entity level, such as FEIN, let alone at group affiliates under different FEINs. An aggregator could potentially have hundreds of customers to report for, and CARB would have to have a new mechanism, at higher level than the fueling station, but lower level than the aggregator, to collect individual

contracts. As proposed, a unique contract from every counter-party could potentially be negotiated, competitively sensitive and amended from time to time. Rather than require aggregators to produce a unique contract, which may have terms that are not relevant to CARB or appropriate for government disclosure, eMotorWerks proposes that those parties interested in becoming an aggregator work with CARB staff to consider whether the development of a standard LCFS aggregator addendum could be added by rule to an aggregator's custom agreement with a host customer. If so, then these stakeholders with CARB would develop this addendum prior to the aggregator designation goes into effect in the Regulation.

3(c). Revised Lookup Table Pathway for Grid Electricity

On page 3 of the Discussion Paper, CARB staff requests alternative data sets and sources for more frequently updating information regarding the carbon intensity of California's electric mix. There are a variety of sources available with more current information than currently used for the ELC002_1 CI pathway. As noted above, the CAISO is now producing monthly GHG emissions, and total load served, one month in arrears. For any EDU served by the CAISO, this would be very current and accurate information to utilize for CI values.

In the discussion paper, CARB Staff proposes the California Energy Commission (CEC) Quarterly Fuel and Energy Report (QFER), which provides power generation source totals, net of imports and exports, statewide and in six month arrears after year end. If CI can be accurately assessed from this level of data, then Load Serving Entity Power Content Labels could similarly be used to assess CI value. Power Content Labels are provided annually as well, at least 3 months in arrears.

According to the CEC website: "On September 26, 2016, Governor Brown signed into law Assembly Bill (AB) 1110 (Ting, Chapter 656, Statutes of 2016). This legislation requires the additional disclosure of a retail supplier's greenhouse gas (GHG) emissions intensity factors for its retail electricity offerings. Retail suppliers will begin disclosing their emissions in 2020 for the 2019 calendar on the Power Content Label (PCL)."

If a Load Serving Entity can provide its GHG emissions intensity sooner than for the 2019 calendar year, these CI values should be available for use by entities seeking LCFS credits as would occur today with ELC002_1.

3(d). Consideration of Flexibility for Non-co-located Renewable Power

On page 4 of the Discussion Paper, CARB staff is seeking feedback on the potential ability for non-co-located renewable power procured via enrollment in a Green Tariff Shared Renewables (GTSR) Program and delivered to EV charging at a host customer facility would be "eligible for

an improved carbon intensity score." The Paper is not explicit regarding the value of the CI score.

eMotorWerks supports eligibility for a host customer to receive a 0.0 CI value for EV charging when enrolled in a GTSR program, *only* when for the EV charging is intentionally and dynamically operated to coincide with the underlying GTSR portfolio renewable production.[4] This would require coordination between the LSE offering the GTSR program, its Scheduling Coordinator and the EV Service Provider of the host customer. See eMotorWerks proposal (1(c) above) regarding "Synchronizing EV Charging with Off-Site Renewable Energy Generation."

To provide incremental LCFS credit value to EV charging, which is uncoordinated with the renewable generation, only serves to exacerbate the growing over-generation and curtailment challenges in California, whereas intentional, dynamic EV charging coordination serves to cause EV charging to mitigate over-generation from incremental renewables procured for GTSR programs.

3(e). *Whether to* Allow EDUs to Claim Credits for all Light- and Medium-duty EV Charging that are not Claimed by Other Stakeholders

On page 9 of the Discussion Paper, CARB staff proposes to increase the volume of LCFS credits generated and allocated to EDUs from non-metered EV charging sources. In contrast, eMotorWerks propose above that CARB phase out EDU credit generation from non-metered EV charging by 2019. As the volume and sources of EV charging proliferates with the adoption of long-range EVs in California and across the West, the risk of double counting or over counting EV charging does not need to be faced, when low-cost direct metering is available and should be encouraged in order to reduce overall CI of the electricity grid. If direct metering is not available for EDUs or non-EDUs to utilize for reporting purposes, then CARB staff should propose a reasonably conservative estimation methodology to allocate credits to a non-profit entity. This entity would be responsible for using those funds to incentivize smart, metered EV infrastructure, with those credits proceeds separately earmarked for investment in the domain from which derived, i.e., residential, private-workplace, fleet, etc.

Granting LCFS credits to EDUs for non-metered charging may also have competitive implications as aggregator business models, which may utilize LCFS credits, are not yet established. In the case of residential charging, EDUs in some cases are granting multiple years' worth of LCFS value to a customer based on submission of a Vehicle Identification Number,[5] whereas third-parties do not have the regulatory protections against price volatility or

[4] This would include the use of energy storage to time consumption coincident with renewable generation, and then dispatch storage to supply EV charging or other host loads coincident with EV charging.
[5] See PG&E's Clean Fuel Rebate Program

vehicle ownership changes. In the case of non-residential, EDUs may or may not return the benefits of LCFS credit proceeds to a non-metered host customer; however, if an EDU offer or feels compelled to provide direct compensation to a host customer for the entirety of LCFS proceeds arising from the host's charging volumes (with values potentially protected against price volatility), this establishes an unequal competitive playing field with third-party aggregators, who could be providing direct metering and intentional, dynamic EV charging for the purposes of reducing CI (and renewables curtailment). As such, eMotorWerks requests that CARB not replicate the same structure of default EDU credit receipt for non-metered charging for the non-residential customers.

3(f). EV Fueling Facility IDs

On page 7 of the Discussion Paper, CARB Staff proposes that Opt-in parties provide the unique fueling station identification numbers in LRT-CBTS on a quarterly basis. eMotorWerks notes that OEM serial number is but one unique ID associated with a fueling station. In the case of EV service providers, a combination of hardware and software make a fueling station directly metered. This metering technology may or may not have a separate identification number, depending on whether the metering technology, including remote monitoring software, is also provided by the hardware OEM. In this instance, without coordination with the technology provider of the remote monitoring software, these stations essentially do not have direct metering. As such, CARB should consider these unique identification numbers to be valid for use in reporting to CARB.

CARB has begun implementing its new Fueling Station reporting process before all parties have commented on its proposal here, so eMotorWerks appreciates CARB Staff's willingness to consider these circumstances as its new reporting process is finalized.

In addition, eMotorWerks proposes that Fueling Station location reporting be required by 45 days following the end of a reporting quarter to allow for data collection from newly installed EV charging infrastructure to occur subsequent to quarter end. By requiring submission of quarterly fueling station information upon or prior to quarter end, new installations (along with necessary contracting as proposed by CARB) and the associated EV charging occurring close to the end of the quarter may be omitted from quarterly transactions if additional time is not granted for fueling station reporting.

Conclusion

eMotorWerks appreciates the opportunity to provide the Air Resources Board comments on the Electricity as a Transportation Fuel component of the Low Carbon Fuel Standard Regulation. The LCFS Regulation can play a critical role in better coordinating the decarbonization of the transportation and electricity systems, rather than pursued in isolation.

eMotorWerks would welcome the opportunity to discuss its comments and proposals during an upcoming working meeting on these topics. For questions about our comments, please contact david@emotorwerks.com.

Sincerely,

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