



by Ideanomics

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Matthew Botill
CARB
1001 I Street
Sacramento, CA 95814

**Re: WAVE Comments on July 7, 2022 Public Workshop:
Potential Future Changes to the Low Carbon Fuel Standard (LCFS) Program**

Dear Mr. Botill:

WAVE (Wireless Advanced Vehicle Electrification) appreciates the opportunity to comment on the California Air Resources Board's (CARB) July 7, 2022, public workshop on Potential Future Changes to the Low Carbon Fuel Standard (LCFS) program.

About WAVE

Founded in 2011, WAVE is the leading developer of high-power inductive charging solutions for medium- and heavy-duty vehicles. WAVE is a subsidiary of Ideanomics (NASDAQ: IDEX) headquartered in Salt Lake City, UT, and operates as a stand-alone subsidiary with approximately 80 employees. Our teams include manufacturing, engineering, design, operations, sales, marketing, and HR. Our focus is on creating practical and economical wireless electric vehicle (EV) charging solutions for transit, airport, trucking, port, and off-road industrial EV markets worldwide.

With 125kW and 250kW chargers available for commercial deployment and 500kW and 1MW chargers in development, WAVE's hands-free charging technology reduces the impact of added electric infrastructure, location constraints, and additional labor costs, all while enabling battery-electric vehicles to go further. When compared with other available charging technologies, WAVE technology provides a lower total cost of ownership and higher operational efficiency.

Heavy-duty vehicles use up to 10 times more power than passenger vehicles, meaning higher power chargers are also necessary for charging these vehicles. Utilizing plug-in chargers for smaller-scale demonstration or pilot deployments are already starting to show complications related to space constraints, safety concerns, weight issues, and more. As medium- and heavy-duty (MHD) EV fleets move from this trial stage to full-scale fleet-wide adoption, the challenges associated with using manual plug-in chargers will scale accordingly.

WAVE's roadway-embedded, high-power wireless chargers provide the durability, reliability, and affordability of maintenance demanded by people-movement and goods-movement fleets that have intense duty cycles and highly trafficked depots with little room to spare. Flush to the ground, the WAVE system eliminates the overheard charging gear, ground clutter, and heavy cables of other charging technologies and, with no moving parts, is less susceptible to wind and solar damage, collisions, corrosion, vandalism, and theft.

In addition to durability and reliability, hands-free, wireless charging initiates within seconds of parking and reaches full power quickly, equating to significant amounts of additional power added that accumulates throughout the day that would otherwise be lost when plug-in chargers are used. Since incorporating ten years ago, WAVE has been successful in extending the range and duty cycle of MHD EVs in ways that manually operated and mechanical systems cannot.

July 7, 2022 Public Workshop Comments

As noted in our previous comments on the December 7, 2021 workshop, the LCFS program has been a key driver in the development of the high-power wireless charging. We believe that high-power, hands-free wireless inductive charging will be critical to accelerating the elimination of harmful MHD emissions due to operational efficiencies. As such, WAVE supports maintaining a robust LCFS program and strengthening it through 2030 and beyond to align with the State's greenhouse gas reduction goals.

However, there were some items in the July 7, 2022 workshop presentation that we have some concerns we would like to raise. First, CARB's assertion on Slide 24 that "Advanced Clean Trucks and proposed Advanced Clean Fleets show substantial need for public retail charging and refueling" appears conclusory since it was not presented with any supporting evidence. WAVE believes that there is likely some need for public retail charging, but it is not clear at this point that that need is substantial. As the market currently stands, there is a substantial need for private or semi-private depot or "behind-the-fence" charging. This is because many of the fleets and industry-types that are currently the focus of electrification are "return-to-base" type operations and/or much of their operators' "down time" happens behind a fence. WAVE believes that it would be helpful for CARB to more fully flesh out this assertion to show how applicable it is to the markets most likely to convert to electric in the near future.

WAVE does believe, as CARB believes, that some charging will be public charging, but it is not clear that the Direct Current Fast Chargers (DCFC) that are currently eligible for the Fast Charging Infrastructure (FCI) program are the right solution for fleet operators. As noted above, near term fleet operators are likely to be primarily focused on private charge due to the nature of their operations. Moreover, even if these operators could fit in a charging break at a public site, a short stop will only provide minimal additional mileage considering (a) the plug-in charging power available – typically ~120kW-150kW for currently-available vehicles and (b) the time needed for the driver to get out of the vehicle, initiate the charging sequence, and plug in the charger. Therefore, CARB should consider reducing the scope of the FCI program to something akin to a pilot, preferably one that is based on detailed evaluations of the duty cycles of vehicles likely to convert to electric in the near- and medium-term. This can free up credits for customers to deploy chargers that they will frequently use and – as far as they are concerned – best suited and sited in a way that is conducive to their specific duty cycles.

Lastly, CARB and the state's focus on equity for this and all programs should be lauded; equity in opportunity and outcomes are critical to historically underserved and disadvantaged communities. However, LCFS should be seen as a market driver that is likely to directly benefit these communities whether or not these funds are made available directly to constituents of these communities. First, many of the trucks that are subject to ACT and ACF regulations are domiciled in these communities. This means that even if the LCFS funds go to companies that are located in these communities – but not going directly to constituents – the constituents will still benefit from improved air quality due to increased deployment of electric vehicles. Second, even if the chargers are not sited in these communities, it is likely that the trucks being charged by these chargers are traveling through these communities, for example, communities along the 110, 710, 880 that provide access to the Ports of Los Angeles, Long Beach, and



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Oakland. This will also reduce emissions in these communities. Third, by making these credits available beyond public chargers to the fleets likely to charge at a depot mentioned above, this maximum flexibility can allow those best suited to deploy the most electric vehicles much more quickly, meaning costs of production and economies of scale can kick in, further accelerating the deployment of these electric trucks, which in turn can further accelerate air quality improvements in these communities that are currently overburdened with diesel emissions.

In sum, WAVE greatly supports and appreciates CARB's work with respect to the LCFS program and believes that maximal flexibility in access to LCFS credits will beget the maximal uptake of electric trucks, meaning maximal air quality for all communities, including those that are historically underserved and disadvantaged.

Thank you for the opportunity to comment. Please let us know if you have any questions.

Sincerely,

Vincent Pellecchia
Director of Policy
and Market Development