



November 12, 2013

Mr. Lindsee Tanimoto
Electric Vehicle Team Lead
Emerging Fuels and Technologies Office
California Energy Commission

RE: Docket Number 13-ALT-02, 2014-2015 Investment Plan Update

Dear Mr. Tanimoto:

WAVE (Wireless Advanced Vehicle Electrification, Inc.) is hereby submitting this Comment Letter related to the California Energy Commission's 2014-2015 Investment Plan Update. The CEC has been instrumental in supporting the development and use of electric vehicles in California and its 2014-2015 Investment Plan Update outlines how it will continue to play a vital role in the advancement of electric vehicles in the future. This letter focuses on WAVE's ideas for improving the funding priorities for the CEC to support wireless en-route charging in 2014 and beyond.

According to the California Office of Environmental Health Hazard Assessment and the Air Resources Board, the transportation industry is the largest emitter of criteria pollutants in the state, and is responsible 38% of greenhouse gas emissions in California. We believe the single most important contribution the CEC can make through its investments is to electrify the transit, delivery truck, and port industries in California. Electrifying transportation in particular would be transformative for California. Not only would it remove polluting fossil-fueled vehicles from the roads, it would also make public transportation more attractive to California's citizens because of the enhanced user experience associated with quiet, smooth riding, and clean vehicles; prompting people to use public transportation instead of their cars. Greater ridership for public transit would push transit agencies to further invest in their fleets and a positive feedback loop would ensue whereby more attractive clean public transit opportunities continue to develop in response to customer demands, air quality improves, and GHG emissions are reduced.

As the CEC is well aware, the biggest obstacle preventing the widespread adoption of electric buses, medium duty delivery trucks, and heavy-duty vehicles, is the battery. Electric vehicle batteries are too heavy and expensive to allow buses and trucks to meet the same duty cycles as their diesel, gasoline, or natural gas counterparts. The only viable solution to this battery problem is wireless en-route charging. Traditional transit, delivery and port vehicle routes have built in time throughout the day where the vehicle is stopped at the same place. This idle time represents an opportunity for the vehicle to charge and extend its daily range to meet the duty cycle. Charging the vehicle wirelessly is an elegant solution that requires no user interaction, unlike a

conductive charge, and is visually appealing, unlike overhead charging options. It is also the only en route charging option that enables variable-vehicle use of the same charger (*i.e.*, utility trucks can charge of the same infrastructure as buses)

While the CEC plans to support electric vehicle charging infrastructure in its Investment Plan, WAVE believes the CEC should specifically earmark funding for wireless or inductive charging infrastructure for buses, medium-duty, and heavy-duty vehicles. Due to the transformative nature of wireless en-route charging – namely, its ability to facilitate the use of electric vehicles in industries where battery and conductive charger limitations have prevented adoption – we suggest the CEC make a significant investment in both demonstration and deployment projects. The 2014-2015 Investment Plan should provide for demonstrations and deployments over multiple platforms (transit bus, drayage trucks, delivery vehicles, etc.), and push the industry towards high charging power levels. WAVE recommends the CEC allocate at least \$10 million to this effort, and up to \$20 million. The investment in wireless charging will be a game-changer and be paid back many times over in improved air quality, health benefits, and economic development related to new electric vehicle industries that will launch in California.

WAVE's Wireless Power Transfer (WPT) system is currently being deployed as a full, in-service commercial solution with three transit agencies in the United States for use with electric buses. This system can provide 50 kW of WPT across a functional and practical (7-9 inch) air gap with greater than 90% system efficiency (by comparison conductive charging systems operate at approximately 92% overall system efficiency). In this system, the on-vehicle pad is completely sealed from the elements, electrically insulated, and is attached to the underside of a transit bus. It has no moving parts and does not require an automated guidance system. The system meets international guidelines concerning Electromagnetic Field exposure for humans and other electronic devices.

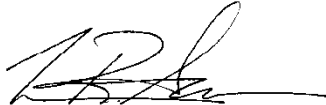
WPT is created through magnetic fields that move power from underneath the roadway to the vehicle, without wires or cables, while the vehicle is stationary and loading/off-loading passengers. Charging vehicles wirelessly reduces the required on-board battery size, increases battery life by avoiding deep cycling—the discharge of a significant percentage of the battery charge—and extends vehicle range. WPT sends electric power from a source into a transmitter, then across a magnetic field air gap to a receiver coil attached to a vehicle. Already used in many applications (e.g., industrial cranes, consumer electronics, roadway lighting, and medical devices), WPT has recently undergone technological improvements in transfer distances, power levels, and efficiency that now allow for cost effective solutions for electric vehicles in key applications such as electric buses and delivery trucks.

WAVE is one of a number of companies working on this state of the art technology. An investment by the CEC in the area of wireless charging would go a long way toward electrifying key sources of pollution – transit vehicles, drayage trucks, delivery trucks, port vehicles – in California.

Please do not hesitate to contact me if you have any follow on questions.

Thank you.

Sincerely,

A handwritten signature in black ink, appearing to read 'Wesley Smith', with a long horizontal flourish extending to the right.

Wesley Smith
Chief Development Officer
WAVE, Inc.