

**DOCKETED**

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*Comment Received From: Vincent Pellecchia  
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**WAVE Comments on CEC Draft Zero-Emission Vehicle  
Infrastructure Plan**

Please see attached document for full comments from WAVE.

*Additional submitted attachment is included below.*



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May 13, 2022

Mark Wenzel, Ph.D.  
California Energy Commission  
715 P Street  
Sacramento, CA 95814

**Re: WAVE Comments on the Zero-emission Vehicle Infrastructure Plan (ZIP)**

Dear Dr. Wenzel:

WAVE (Wireless Advanced Vehicle Electrification) appreciates the opportunity to comment on the Draft Zero-emission Vehicle Infrastructure Plan (ZIP).

**General Comments**

As a manufacturer of charging solutions for medium and heavy-duty (MHD) electric vehicles (EVs), WAVE appreciates the time and effort the California Energy Commission (CEC) put into the ZIP. The CEC team clearly put a lot of effort into this comprehensive document, enabling the state to move in the right direction in its effort to decarbonize transportation. However, WAVE believes there are some items that require clarification in the document.

First and most importantly, wireless inductive power transfer charging technology is much more developed than the emerging technology it is described as in the ZIP. Just last month, the Antelope Valley Transit Authority (AVTA) became the first all-electric, zero-emission transit agency in North America – 18 years ahead of California’s 2040 mandate. AVTA is also home to the largest high-power inductive charging system deployment in North America. This is not a coincidence. AVTA has deployed 12 wireless chargers over 100 square miles, enabling battery-electric buses (BEBs) with a standard range of about 200 miles to cover routes as long as 600 miles.

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.

In November 2016, almost six years ago, Central Contra Costa Transit Authority (CCCTA) launched its first four electric trolleys on its Free Ride Trolley (Route 4). The Gillig-produced trolley fleet has grown to eight vehicles in total, each equipped with a WAVE charge-receiving pad. With only one 50kW wireless charger placed at the end of the route, and a small, 90kWh hour battery, all eight vehicles are able to operate continuously as a 1-1 replacement for the diesel buses previously operating on the route. The batteries never drop below an 80% state-of-charge in normal operation.<sup>1</sup>

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<sup>1</sup> A more detailed description of this project can be found at the CCCTA website, <https://countyconnection.com/electric-buses/>, and also in this white paper about the project, <https://waveipt.com/battery-electric-bus-reach-wireless-charging-milestone/>.



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Another example of how wireless charging can solve problems that other charging options cannot is at AVTA, where zoning restrictions kept AVTA from deploying overhead pantograph charging systems. Had the agency had to rely on plug-in depot charging, an extra 37 battery-electric buses would have been required to switch out depleted buses for longer routes. These WAVE chargers have provided over 3,000MWh of power in this time, extending the range of the AVTA electric buses by well over 2,000,000 miles.<sup>2</sup> Note, too, that in September of 2021, AVTA committed to adding more wireless charging stations and wirelessly equipping 28 additional BEBs.

Additional transit customers include PSTA in St. Petersburg, FL, and Twin Transit in Chehalis, WA. However, the most recent example of WAVE as a mainstream solution to solving the most challenging transportation electrification challenges is at Universal Studios Hollywood (USH), where four 500kW WAVE systems are now powering the World-Famous Studio Tour.<sup>3</sup> With a high priority on aesthetics, the inevitability of plug-in and overhead chargers cluttering landscapes was seen as daunting. And the small windows to load and unload passengers left little (or no space) for manually-operated plug-in chargers. Going live last month, tour visitors now enjoy a cleaner, quieter experience on WAVE-powered electric trams that can run all day, non-stop. It is USH's intent to convert its entire Studio Tour tram fleet to electric by 2025.

In addition, WAVE is launching several trucks and ports-related projects, including a project with a large warehouse customer and four projects at the Port of Los Angeles – involving ten electric utility tractor rigs (UTRs), two electric top loaders, and one electric over-the-road Class 8 tractor with charging powers ranging from 125kW to 500kW. In sum, as of today, WAVE customers have already deployed 30 chargers and almost 90 charge-receiving pads and, by the end of 2022, we expect those numbers will rise to 50 and 150, respectively.

Secondly, despite the foregoing clearly showing that WAVE wireless chargers are more than just an emerging technology, if CEC believes that wireless charging is indeed an emerging technology, WAVE would argue so are all of the other high-powered charging technologies currently on the market. For example, there are at most a few dozen high-powered chargers deployed that employ overhead pantographs to charge vehicles. And these chargers are typically incorporating the pantograph-down system, which is different than the pantograph-up system more commonly seen in Europe. Moreover, the CCS-1 standard is relatively new, having only been finalized a few short years ago, and is limited in the power levels it can achieve – currently about 180kW-200kW for plug-in high-powered charging. Accordingly, WAVE would suggest that if its technology – which has been proven effective in a number of deployments equal to and/or exceeding deployments of other types of charging platforms – is considered “emerging,” then all infrastructure solutions for MHD EVs should be considered “emerging.” Ultimately, with various options available at this stage of market development, the state should support any solution that best fits a fleet's needs and encourage those fleets to explore the array of technologies available to meet their duty cycles.

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<sup>2</sup> A comprehensive, free case study of AVTA's WAVE charger utilization can be downloaded here [https://s3-usa.s3.amazonaws.com/c/308492938/media/1624622774c5eac4620315731211005/WAVE\\_AVTA%20Case%20Study\\_03\\_22.pdf](https://s3-usa.s3.amazonaws.com/c/308492938/media/1624622774c5eac4620315731211005/WAVE_AVTA%20Case%20Study_03_22.pdf)

<sup>3</sup> <https://attractionsmagazine.com/universal-studios-hollywood-rolls-out-four-electric-studio-tour-trams/>.

### Specific Comments

In addition to the general comments above, WAVE also has the following comments regarding specific items in the ZIP document.

- Page 33 of the ZIP: states, “Wireless charging can offer convenience to consumers by providing a “touchless” charging experience and potentially charging many different types of vehicles and equipment. However, like battery swapping, it would require deployment of new infrastructure and standards. There are few wireless options, and vehicle manufacturers have not announced widespread inclusion of wireless charging capabilities with their vehicles. Monterey Salinas Transit has an electric bus that uses wireless charging, and the CEC recently awarded a project to demonstrate wireless charging for transit buses with the Solano Transit Authority.”
  - **WAVE COMMENT**: As detailed above, there are not few wireless options and the two projects mentioned in the ZIP are not representative of the true state of the wireless charging market. In fact, WAVE alone has deployed over 30 high-powered wireless chargers serving almost 90 vehicles, with many more chargers and vehicles set for deployment in the near future. These quantities are at least in-line with, if not exceeding, other high-powered output configurations like overhead charging or high-powered plug-in charging. WAVE respectfully asks that the CEC reconsider this paragraph in light of the true nature of the current high-powered charger market.
- Pages 34 and 35 of the ZIP: lays out “near-term actions” for “charging and hydrogen fueling for MDHD ZEVs” like the Budget Act of 2021, the Energize program and the CPUC-authorized installations of MHDV chargers.
  - **WAVE COMMENT**: None of these programs should have restrictions in terms of charger type. The market for chargers providing the high-power levels needed for MHD EV deployments has relatively similar numbers of available products across plug-in, overhead, wireless, etc. All of these programs should allow customers to procure the chargers that best meet their needs, including wireless.
- Page 36 of the ZIP: lays out “longer-term actions and decision” where the state will “distribute additional state funding for mdhd zev infrastructure” including the “ZEV Package.”
  - **WAVE COMMENT**: None of these programs should have restrictions in terms of charger type. The market for chargers providing the high-power levels needed for MHD EV deployments has relatively similar numbers of available products across plug-in, overhead, wireless, etc. All of these programs should allow customers to procure the chargers that best meet their needs, including wireless.
- Page 42 of the ZIP: discusses challenges regarding the effort to “understand and improve consumer benefits” related to high-speed charging. This section seems to rely on the concept that “high-powered” and DCFC are interchangeable.
  - **WAVE COMMENT**: WAVE would urge CEC to consider all high-powered charging options when discussing the impacts and benefits of high-powered charging. As noted above, WAVE has a significant number of deployments of power levels above 200kW. Moreover,



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these wireless chargers provide flexibility in operations that could reduce overall charger needs – meaning lower overall installed load.

- Page 42 of the ZIP: states “State funding and CPUC-authorized investments will continue to consider technological readiness and market developments to understand opportunities to advance promising emerging technologies.”
  - **WAVE COMMENT**: As noted above, WAVE would urge CEC to reconsider its definition of “emerging technologies.” WAVE has been providing high-powered wireless charging solutions to transit agencies for over half a decade. In sum, these deployments constitute dozens of deployments of these chargers with significant success to multiple customers in the U.S.

Sincerely,

*Vincent Pellecchia*

Vincent Pellecchia  
Director of Policy and Market  
Development