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Ample, Inc Comments on EV Charging Infrastructure Reliability

Additional submitted attachment is included below.

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Ample, Inc. Comments on Electric Vehicle Charging Infrastructure Reliability Workshop

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AMPLE, Inc. appreciates the opportunity to provide comments to the California Energy Commission regarding its docket on Zero Emission Vehicle Infrastructure Barriers and Opportunities. Ample, Inc. is a San Francisco-based company that is in the process of deploying battery swap-based energy delivery service for electric vehicles. It is Ample's intention to install and maintain a significant network of battery swap stations within the state of California, throughout the United States and internationally. The CEC has requested feedback on whether it should develop reliability metrics for public charging, and if so, how to measure reliability. This response will address questions raised in the EV infrastructure reliability workshop of March 10, 2022.

Ample is an electric vehicle battery swapping company based in San Francisco. It currently operates seven battery swapping stations for rideshare drivers in the Bay Area, through a partnership with the rideshare rental vehicle company Sally. Ample's battery swap system allows transportation network company (TNC) drivers and fleet owners to go electric without installing expensive charging equipment or implementing complicated charging logistics to accommodate lengthy charge times.

Ample's battery swap system is more reliable than DC fast charging, and its network of swapping stations will have staff dedicated to immediately fixing problems that arise. Ample's modular battery swap stations provide a fully charged EV at a speed comparable to a gas station, and at a price more affordable than gasoline or DC fast charging. Because Ample recognizes the reliability challenges of existing DCFC systems, Ample is not opposed to the development of strong reliability standards for electric vehicle supply equipment (EVSE). However, Ample is concerned that certain metrics for reliability may not be appropriate to battery swapping infrastructure. Therefore, Ample proposes the following principles as guiderails for policies to improve reliability.

Fundamentally, reliability standards should focus improving customer experience – not mandating hours of business.

Ample's swap stations will provide a full charge at a speed comparable to filling a gas tank, at a lower price than gasoline.

Because Ample's battery swap stations will initially service fleets, they might be closed during non-business hours. Accordingly, the time that the station is closed outside of posted business hours should not be counted as downtime or an outage. Even after Ample opens its network to non-fleet customer, these customer-drivers will be aware of swapping station operating hours, and will not expect 24-hour access. Accordingly, a battery swapping station operator should not be penalized for planned closures that are not a surprise to drivers.

EVSE should continue to function even if there is a power outage.

Many gas station operators have installed backup power so that they can continue to operate even if the power is down. Given the increase in extreme weather events due to climate change, EV drivers will need reassurance that they will be able to charge even when the power goes out. Accordingly, downtime due to grid power outages should count against EVSE uptime. This will encourage EVSE operators to install batteries or other backup power so that the EVSE can operate even when the power is out. This reliability will be necessary in order to transition to a 100% EV market.

The California Energy Commission should include delays caused by long lines in its reliability metrics.

Outages at an individual charging connection or inadequate capacity for peak driving times can leave EV drivers waiting in long lines to use EVSE that is functional, but not providing the expected levels of service or customer experience. The CEC should consider measuring wait times using consumer survey data or allow drivers to report delays through an app in order to determine if drivers are waiting unreasonably long times to repower their EVs. This would create a more accurate picture of customer experience and actual EVSE capacity.

Companies that accept public funds for EVSE should refund the money to the State of California if they cannot meet reasonable reliability standards.

In order to encourage a favorable customer experience at publicly funded EVSE, the CEC should be allowed to recover funds from EVSE providers that fail to meet reasonable reliability standards. Because DC fast charging can be slowed down due to high demand from nearby charge points, cold weather, or other conditions, EVSE providers should also be discouraged from making overly optimistic claims about charging speeds.

Additional background on the benefits of EV battery swapping in California

Modular battery swap as a solution to California's ZEV infrastructure challenges.

Embracing technology-neutral approaches to EV infrastructure would allow for transformative technologies like Ample's modular battery swapping to expand access to EVs in California. Allowing batteries to charge external to the vehicle results in cascading benefits. To understand all of the benefits of modular battery swap, it is useful to examine it from a number of different perspectives, including: user/driver, grid, EVSE operator, environmental, infrastructure buildout and a resource-use.

Driver perspective

From a driver perspective, modular battery swap allows refueling in a fraction of the amount of time fast chargers require. Modular battery swap allows people who street park, park in urban garages, travel long distances, and can't afford installation of expensive EV charging infrastructure at home or in fleet applications to own and operate EVs. Because modular batter swap trickle charges batteries it also significantly extends the life of EV batteries.

The grid

Modular battery swap strengthens the grid by evening out demand and providing flexible energy storage for renewables – a result of the ancillary battery banks that are core components of the system. By absorbing renewables when they are plentiful and dispensing them quickly via swap when and where they are needed, modular battery swap fills a critical gap in our energy infrastructure. Swap systems can also curtail energy consumption when desirable or feed energy back into the grid when demand peaks.

EVSE operator

Modular battery swap is profitable. Because modular swap stations allow for higher capacity factors, they can service roughly 10X as many vehicles as an equivalently powered fast charger does today. This means swap stations can absorb demand charges and profitably refuel electric cars.

Environmental

Modular battery swap allows EV batteries to fill up with zero carbon energy when renewable energy is plentiful and dispense that energy quickly when it is needed. Counterintuitively, a modular battery swap system utilizes fewer batteries in aggregate (this is not true for standard battery swap). This is because a modular battery swap system can dynamically adjust the amount of battery storage dispensed to a vehicle depending on the driver's needs. For example, a fleet vehicle may only require 30 miles of range most days, while occasionally traveling much farther. A modular battery swap system can meet that daily demand with a smaller battery pack (by utilizing fewer battery modules) then add additional battery modules for longer trips on demand.

Infrastructure deployment

Modular battery swap allows for rapid, economical deployment of charging infrastructure. This is because modular battery swap stations do not require construction. They can be assembled, onsite, in a matter of days because they are largely prefabricated. Infrastructure sufficient to cover a medium-sized city can be deployed within the space of weeks and easily scaled thereafter.

Resource efficiency
Modular battery swap stations allow for extremely high throughput (similar to a gasoline station) for a much smaller geographic footprint and lower system cost than chargers. Each station requires only two parking spots. Because modular battery swap has the capacity to charge continuously, a less powerful grid connection can charge more batteries (ergo vehicles). Modular battery swap also allows for variable battery pack capacity and more intensive duty cycles for electric vehicles (because of faster refueling).

These last two characteristics improve the economics of electrifying fleets and, even more importantly, reduce embedded GHG emissions and resource consumption.

Electricity grid challenges and opportunities

Battery swapping is a cost-effective means of building out the storage capacity required to decarbonize the grid. Conversely, the costs of integrating electric vehicle charging systems into the U.S. grid without battery swapping are astonishing. The Boston Consulting Group (BCG) pegs the cost of upgrading the grid for electric vehicles through 2030 at between $1,700-$5,800 per car.[1] Assuming annual auto sales of 1.7 million units in California, a 100% EV sales scenario would equate to between $2.9 billion to almost $10 billion in grid system upgrades annually. Further, BCG's analysis shows that higher numbers of EV sales will result in higher (not lower) per vehicle grid integration costs.

A significant portion of this cost can be offset by grid storage assets in the form of battery swap stations. By separating the process of charging from the action of transferring energy into an electric vehicle, battery swap stations allow for better managed, more constant and more efficient utilization of existing grid assets as compared to charging. The potential for improving the integration of renewable energy is particularly important. Significant static storage capacity combined with battery swapping allows the electrical system to capture the energy from intermittent low carbon energy sources (e.g. wind and solar) when available and to dispense that energy quickly when it is needed.

Conclusion

Ample strongly urges CEC to pursue technology neutral, performance-based programs that are open to innovation, while taking into account the ways in which battery swapping differs from charging. Technology neutrality will be a critical variable dictating whether California is successful in achieving the state's electrification and decarbonization goals and accomplishing maximum decarbonization at the lowest possible cost. In general, CEC should avoid restrictive, prescriptive, and technologically deterministic incentives and policies. No government agency and no single corporation, NGO or individual possesses the capacity to foresee the exact convergence of ideas and technologies that must emerge in order to address the climate crisis. Accordingly, well-designed CEC policies will avoid command and control-style technology

[1] Sahoo, Anshuman, et al. "The Costs of Revving Up the Grid for Electric Vehicles." United States - EN, United States - EN, 8 Jan. 2021, www.bcg.com/en-us/publications/2019/costs-revving-up-the-grid-for-electric-vehicles.

requirements in favor of performance-based requirements and technology-neutral criteria. Efforts to promote particular technology standards or approaches are unlikely to solve the climate crisis or to age gracefully.

On the other hand, aggressive policy that incentivizes performance and penalizes environmental externalities has the very real prospect of dramatically accelerating the critical transition to a zero-carbon clean energy economy.