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**Ample Inc Comments on Assembly Bill 2127 Electric Vehicle
Charging Infrastructure Assessment**

See attached PDF

Additional submitted attachment is included below.



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***Ample Inc. Comments on Assembly Bill 2127 Electric Vehicle Charging
Infrastructure Assessment***

AMPLE, Inc. appreciates the opportunity to provide comments to the California Energy Commission (CEC) regarding the second biennial AB 2127 Report.

The assessment indicates a number of prerequisites and challenges for large-scale rollout of infrastructure in California to support the state's transition to a 100% electric light duty vehicle (LDV) fleet. Key areas of focus include: meeting EV charging infrastructure demand; the economic viability of public EV charging infrastructure; utilization of DC Fast Charge (DCFC) infrastructure by transportation network companies and fleets; accessibility of EV charging infrastructure in population-dense areas; integration of DC fast chargers with expanding renewable energy generation; and operational requirements for public EV charging infrastructure.

As the California Energy Commission endeavors to develop a better understanding of EV infrastructure requirements, we urge them to consider the benefits of battery swapping for EV drivers who are unable to charge at home, require fast refueling or need to travel long distances. Battery swapping is also an ideal solution for electrifying fleets as it costs substantially less than installing other kinds of charging infrastructure and also facilitates higher utilization factors for fleet vehicles.

What is Ample and what is modular battery swap?

Ample, is a San Francisco-based company that has pioneered modular battery swap and solved the challenge of how to deliver energy to electric vehicles in under 10-minutes without straining the grid, while accounting for renewable energy intermittency and reducing the cumulative need for large carbon-intensive EV batteries. Ample's modular battery swap system is economically self-sustaining, flexible and has already been integrated into over a dozen distinct vehicle models from five different OEMs. Not only is Ample's refueling fast and affordable, installation of swap stations is too.

How can Ample accelerate deployment of EV charging infrastructure?

In order to limit climate change to no more than 1.5C, emergency measures must be taken to reduce carbon emissions. In America, transportation is the largest contributor to energy-related GHG emissions, and globally emissions must fall by roughly 50% within a decade. Over the same period demand for mobility will grow by ~70% thanks to economic expansion in countries like China, India and regions like sub-saharan Africa. The world needs technologies and business models that serve customers far beyond America's suburban two-car garages. Electrification must reach into cities with high-rise apartment buildings and densely packed street parking, rural communities, corridors for interstate travel and commerce, and mobility fleets -- which will account for a disproportionate share of vehicle miles traveled. Ample's solution fills this gap.

This is because Ample outcompetes DC fast charging and gasoline for a number of important use cases. Mechanical swapping takes roughly the same amount of time as stopping at a gas station and energy cost is competitive with the most affordable modes of fast charging.

Speed of deployment is also a key differentiator. Most EV charging stations take many months if not years to site and build. Because Ample stations are designed to be assembled onsite and require no construction (trenching, pouring concrete pads, etc.), Ample stations can be deployed in days. Perhaps most importantly, Ample battery swap stations can store renewable energy when it is available and deliver clean energy to an EV quickly and when it is needed. This energy storage capacity fills a huge gap in our energy supply system. Deploying an Ample pod costs less than deploying a DC fast charger, but fast swap times mean that Ample achieves much higher capacity factors -- thus offsetting demand charges and reducing the need for costly grid upgrades. On average, DC fast chargers operate less than 5% of the time. Battery swapping stations can charge batteries up to 100% of the time because batteries can charge while the vehicle is in use (a ~20X improvement).

Why not rely on home charging?

In the past, CEC's EV PRO modeling has assumed an extremely high rate of home charging availability for electric vehicles (92%). These numbers are unrealistic. According to research from Carnegie Mellon University only 22% of Americans have access to a dedicated parking spot with overnight charging available (this includes both standard 110 volt outlets and 240 volt level 2 charging). The International Council on Clean Transportation (ICCT) estimates fewer than half of Americans have access to a dedicated parking spot with overnight charging available. Extending overnight charging to the rest of Americans is prohibitively expensive and logistically unrealistic.

Why not rely on DC fast charging?

On the other hand, DC fast chargers are expensive to install and operate. Because of the logistics and economics of fast charging as well as the heavy toll they place on the grid, they are not an adequate solution for residents of multi-unit dwellings, fleets, or TNCs. With EVs approaching cost parity to ICE vehicles, charging solutions must serve communities beyond privileged early adopters and suburban commuters.

How should CEC update its EV infrastructure planning?

CEC's Electric Vehicle Charging Infrastructure Assessment omits the key variable of battery swapping. In China (which has over 80% of the world's public DC Fast Chargers) a major shift towards battery swapping is already underway, because China has learned through experience that public fast charging alone is not sufficient to expand EV use beyond early adopters. Most major OEMs in China now have battery swapping solutions for repowering electric vehicles. EV manufacturer NIO has over 1000 battery swapping stations in China and Europe and these stations likely deliver more electric miles than all the public fast chargers in the U.S. combined (because of the high capacity factor of their battery swapping stations). California should look towards these more developed EV markets for technological and market guideposts and learn from their experience.

The path forward

EV charging will be part of the solution for refueling electric cars. However, the economics and speed at which vehicles charge and infrastructure can be deployed means that battery swapping must increasingly be viewed as an important mode of public EV refueling. This shift is already under way in more developed EV markets like China. Battery swapping also bridges the gap between sustainability and convenience by absorbing renewable energy when it is available, storing it and refueling electric vehicles within minutes.