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EMERGING SPACE BRIEF

Electric Vehicle Charging Infrastructure

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Trending companies



Overview

Electric vehicle (EV) charging infrastructure supports the electrification of the mobility sector. Startups in this space are developing a network of charging solutions for personal and commercial purposes—including charging stations, location apps, and fleet management. The number of charging outlets has significantly expanded as awareness and adoption of EVs has increased, and this trend is expected to continue and accelerate as large automakers such as GM continue to make investments into EV development. Charging infrastructure is currently geographically limited and expensive, although with recent government-supported initiatives this could change.

Applications

Charging stations

Public charging stations are reminiscent of gas stations. Stations can either be found in retail parking lots or at “supercharger” stations, usually attached to an existing gas station or convenience store. The business case of these can either be through subscription services, advertisement sales on chargers, or partnerships with retail stores that draw lots of foot traffic.

Software

The software component of EV charging infrastructure encompasses location and management apps. Location apps, generally offered through either EV manufacturers or charger companies, pinpoint where charging stations are located and are usually provided by the charging company itself. Management apps, which sometimes offer location services as well, are used to optimize and monitor charging centers or EV fleets. Examples of such startups include EVConnect and GreenFlux.

Charging-as-a-service

Subscription based turnkey charging infrastructure allows for a combination of hardware and software provisions and continuous maintenance for a small fee. This allows users to save money on capital expenditure and outsource risk. Companies such as ChargePoint, EVGo, and EVBox all provide charging-as-a-service pricing models.

Technologies and processes

EV chargers are segmented into four levels, based on the amount of power supplied to the battery:¹

- Level 1 chargers are for standard charging at home. It takes about 20 hours to charge for a 100-mile range. Level 1 charging encompasses about 80% to 90% of all charging.
- Level 2 chargers are for public use—typically found in workplaces, retail stores, public parking lots, etc. Level 2 chargers take about four hours to fully charge a vehicle’s batteries.
- Level 3 chargers are for drivers in transit—equivalent to a gas station. These take about 40 minutes to charge batteries.
- Level 4 chargers are also for drivers in transit, usually provided by OEMs (original equipment manufacturers) as “superchargers.” These take about 25 minutes to charge batteries.

Higher capacity chargers are generally more expensive to build than lower capacity ones. Operating costs for all types of chargers, however, are low and fixed. Thus, level 3 and level 4 chargers require high utilization over time to become cost-efficient, especially since most of the charging for ordinary users will be done at home.

Alternative charging methods

- Battery swapping is one solution outside the traditional charging station paradigm. Essentially, drivers pull into a station and swap out their depleted battery for a fully charged one. This method is being tested in China and takes as little as five minutes. For heavy use or time contingent applications such as trucking, long-hauls, and taxis, battery swapping may prove to be a promising alternative to traditional charging stations.
- Electric roads provide a wireless charge to vehicles passing over a built-in charging strip. The charge is not necessarily strong enough to fill up the battery, only to stop it from depleting. Accordingly, this technology is likely to be used on more heavily traveled, pre-defined routes.

Outlook

Opportunities

With adoption of EVs expected to grow rapidly, immense opportunity exists to deploy charging solutions across a multitude of use cases, including logistics, personal travel, and public transportation. Startups such as ChargePoint and

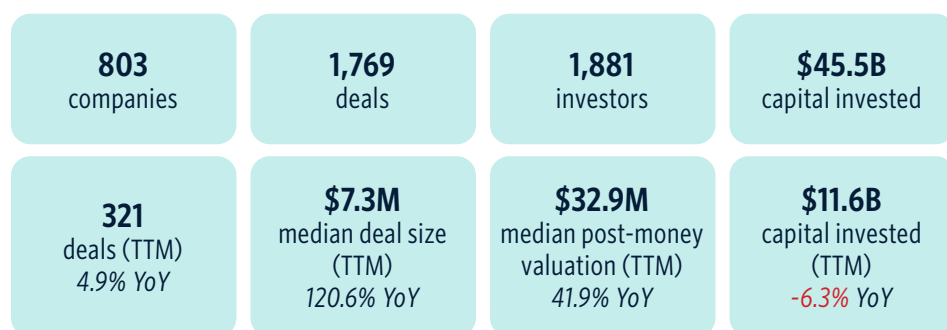
¹: “On-the-go’ Charging Is Key to EV Growth,” pwc, Accessed November 7, 2022.

EVGo aim to use a comprehensive tool set of software, business partnerships, and continuous hardware maintenance to develop cost-effective charging solutions.

Challenges

The EV charging infrastructure market is dependent on the expansion of EVs, which is still limited to urban areas. Furthermore, the infrastructure is ultimately built on electricity grids—which in some cases need to be updated to handle the energy throughput required for charging. The former can be addressed by cost-reducing innovations in EV manufacturing. Both issues, however, will likely need to be solved through government policies that directly and indirectly subsidize the cost of such upgrades.

Key electric vehicle charging infrastructure metrics



*As of November 8, 2022

Recommended reading

[“Building the Electric Vehicle Charging Infrastructure America Needs,” McKinsey & Company, Philipp Kampshoff et al., April 18, 2022.](#)

[“Electric Vehicles and the Charging Infrastructure: A New Mindset?” pwc, Accessed November 7, 2022.](#)

[“Research & Innovation Platform for Electric Road Systems,” RI.SE, August 2021.](#)

[“We Need to Invest in Infrastructure for Electric Vehicles: Here’s Why,” World Economic Forum, Maya Ben Dror and Oren Ezer, March 1, 2022.](#)

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