

August 03, 2020

EV fast charger technology floors it

[LAURENCE ILIFF](#)



ABB sells EV chargers to networks. Some put out 350 kilowatts.

In the middle of the Mojave Desert, between Southern California and Las Vegas, lies the future of electric vehicle charging.

An EVgo station in Baker, Calif., promises a refueling experience that's about as close to a gas station for EVs as currently possible. In fact, no EV on the market can handle all the power coming from the liquid-cooled cables of the 350-kilowatt direct-current charger.

DC chargers have become the next wave of technology in this second front in the battle for auto electrification.

While auto manufacturers and their suppliers figure out how to make EVs appealing to America's gasoline-addicted consumers, the industry is also pushing for newer, better and faster technology to speed the recharging process.

At the Linq Hotel in Las Vegas, Tesla is also showing a big push forward. Its new V3 Supercharger unit in the hotel parking lot puts out 250 kW — enough to give a Tesla vehicle up to 75 miles of fresh range in just five minutes, with peak charging rates of 1,000 miles of range per hour, the automaker said.

Next door in Arizona, Volkswagen Group and charging partner Electrify America are running 350-kW units at a global test center in Maricopa.

As a crush of new EV models are set to hit the market in coming years, ultrafast chargers are in the works to ease chronic consumer anxiety over battery range. And going forward, even faster technologies are on the horizon.

"This is happening. It's no longer a question of if or when. It's now," said Jonathan Levy, EVgo's senior vice president of business development. "And the question is how much faster it's going to happen."

EVgo has 800 fast-charging locations in 34 states. Most are the 50-kW units that have been the standard. But not anymore. Future installations will feature more 100-kW and 150-kW units, along with some of the 350-kW models, Levy said.

For the auto industry, DC fast chargers help fill the gap felt by consumers who want to take road trips with their pricey EVs, or when they don't have access to a charger at work or home, where 80 percent of fueling now occurs.

Not home

Indeed, that ability to charge at home and leave every morning with a full tank of electrons is one of the advantages of EV ownership. Home charging is also generally much cheaper than gasoline per mile when charging at nonpeak electricity rates.

But while early EV buyers put up with 45-minute charging sessions on longer trips, mainstream consumers considering one of the new-generation electric SUVs and pickups want bigger batteries and faster charging before they take the plunge, analysts said.

"Until there is near parity in the refueling process, EVs will languish with low adoption rates," said Tom Moloughney, who tests plug-in vehicles at InsideEVs. "Most people outside of early adopters and tech enthusiasts will believe recharging is too cumbersome for their fast-paced lives."

Tesla figured this out early on. Its proprietary Supercharger network helped fuel the California automaker's dominance of the EV industry in recent years, with charging of up to 120 kW — for much faster times than early competitors.

Tesla now has 1,971 Supercharger stations with 17,467 chargers, according to its website. It estimates that its new V3 chargers will cut average charging sessions from 30 minutes to 15.

Public charging networks such as EVgo and Electrify America have a long way to go to catch up to Tesla, but ultrafast charging and rapid expansion will help level the playing field.

"I want to plug in, walk inside the convenience store, use the restroom, maybe buy a coffee and walk out to my car and unplug and leave," said Moloughney. "You can do that with 150-kW charging because in that time, you've added more than 100 miles of range."

Can you handle this?

To be sure, there are limits to ultrafast charging. It is expensive compared with home charging, and the speed depends on the individual battery and software programming. Some EVs allow the charge to flow at the maximum rate for most of the hookup, while others start fast and then slow down to protect their battery.

While the Porsche Taycan can hit a peak charge of 270 kW and add 60 miles of range in four minutes, the next generation of mainstream EVs will post more modest numbers.

Ford's coming Mustang Mach-E electric crossover will be limited to 150 kW, which can add 61 miles of range in about 10 minutes, Ford said. The Audi E-tron also can reach 150 kW and add about 54 miles in 10 minutes, Audi said. Charging rates generally fall quickly once the battery is at 80 percent.

Whatever the real-world numbers, the ultrafast trend is underway. It's helped along by bigger EV batteries that require fewer fuel stops during long trips.

"Fast charging of 150 kW and 350 kW with liquid-cooled cables is now the norm, although we are seeing some charging networks staying a bit below 150 kW, likely for cost reasons," said Cliff Fietzek, director of technology for Electrify America.

"The high-power charging networks will be the fueling stations of the future, much like gas stations now, for passenger cars, buses and heavy-duty trucks," Fietzek said. As bigger vehicles with bigger batteries arrive, charging power will move more quickly to 350 kW.

Electrify America has 400 charging stations with more than 1,700 chargers nationwide and expects to have twice those numbers by the end of 2021, according to its website.

Swiss conglomerate ABB was the first to sell the 350-kW chargers with liquid-cooled cables to charging networks in North America, including Electrify America and EVgo. ABB's e-mobility unit also makes chargers for heavy commercial vehicles that deliver up to 600 kW.



Bob Stojanovic, head of EV charging infrastructure for ABB in North America, said there are practical considerations in the race toward faster charging times. Not many vehicles can charge at 150 kW, and many are still at 50 kW and 75 kW. So 100-kW chargers will likely be the most common until more vehicles arrive that can utilize higher rates.

Those 100-kW chargers don't offer gasoline-style refueling speed, but they're fast enough to help automakers make a better case for EVs.

"Buyers don't want a very specific use-case vehicle," Stojanovic said. "If they want to take it cross-country, they want to know they can do that."

Cost counts

John DeBoer, head of North American e-mobility at German conglomerate Siemens, said some fleet operators will need ultrafast DC chargers, but average consumers will still rely mostly on slower options.

"There is a desire in the market to have fast charging available as a comfort blanket, but we're not seeing the high utilization rates for our chargers in that segment today," DeBoer said, citing higher costs.

"There's been a little bit of counterintuitive behavior from the market intelligence we gather, where we see an end user interested in that experience, but they're not willing to pay for that experience," he said.

Rajit Gadh, director of the UCLA Smart Grid Energy Research Center, said one of the big benefits of EV use is paying roughly the equivalent of \$1 per gallon of gasoline for the same number of miles. But that low price is tied to off-peak residential rates.

Ultrafast DC chargers are more expensive to buy, install and operate, and the cost is passed onto the consumer. Chargers at 350 kW also may require expensive site upgrades. Add higher energy rates and service costs, and the equivalent price could be \$5 per gallon, he said.

"It's going to alleviate the range stress, but you're not going to do it every day," said Gadh, who drives a Tesla and has developed software to find the lowest-cost charging solutions as part of a tech startup.

ChargePoint, which supplies equipment and software to providers such as retailers, remains focused on charging options that don't require big infrastructure upgrades. But increasingly, it's getting involved in some "corridor charging" projects along highways, said Bill Loewenthal, senior vice president of product.

"There's a perception that we need DC charging everywhere, but from an electrical cost, infrastructure cost, it may not be the best utilization," Loewenthal said. "There are environments where it's mission critical."

ChargePoint and the National Association of Truck Stop Owners announced this year a \$1 billion partnership to install DC charging at 4,000 fueling locations across the country for passenger vehicles and delivery fleets.

Sam Abuelsamid, principal analyst for e-mobility research at Guidehouse Insights, said ultrafast DC chargers will help change the perception for people thinking about buying an EV and may even bring the cost of the vehicles down.

Car buyers tend to think of the worst-case scenario for EVs, such as the occasional family road trip or towing a boat. Ultrafast charging will help level the playing field with gasoline vehicles or hybrids.

Ubiquitous fast charging could also have a positive effect on EV pricing. Faster charging means consumers will worry less about battery size and range, encouraging automakers to build more models at a lower price point.

"The experience, while not exactly the same as going to the gas station, it's a lot closer," said Abuelsamid. "Most people don't drive 200, 300, 400 miles a day, so they don't have to fast-charge all the time. The challenge of DC charging is that it gets pretty expensive."