

# Electric Car Hot Swap Power Packs Recharge In One Minute - Report

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Every year since 2000 our research group has checked in with consumer car owners and auto industry suppliers. The bottom line has always been that no consumer electric car market will EVER happen until every consumer can charge their car at their home garage or home apartment parking spot. NOBODY, in any significant numbers, is going to drive many miles to a charging station, wait in line to get to the charger and then wait more than 4 minutes for their car to charge. The current time to charge most electric cars is 40 minutes with all of the fussing around accounted for.

We proposed a hot-swap battery system that any consumer can use, without driving to some special location. A consumer can hot-swap a wheeled battery in less than two minutes.

Senators and government officials don't like that because they bought stock market investments in the ways that don't work. Those White House and Department of Energy officials get bribes and stock market payola from Proterra, Ener1, Tesla and the old school suppliers, so they will not allow non-lithium-ion batteries and they will not allow fuel cell and ultra-capacitors to exist. Those politicians will not allow the only solutions that work to get to market. Here is what we told the Department of Energy and the White House, in writing for the last decade:

The United States has about 100,000 public chargers, far fewer than Europe and China. It needs 10 times as many, auto experts say, to complete the switch from combustion engine vehicles.

Over the past year, the electric vehicle charging industry has been swept up in a Wall Street gold rush because of growing optimism about electric cars and trucks.

In President Biden's vision of a green future, half of all new cars sold in 2030 will be electric. But something really basic is standing in the way of that plan: enough outlets to plug in all those cars and trucks.

The country has tens of thousands of public charging stations — the electric car equivalent of gas pumps — with about 110,000 chargers. But energy and auto experts say that number needs to be at least five to 10 times as big to achieve the president's goal. Building that many will cost tens of billions of dollars, far more than the \$7.5 billion that lawmakers have set aside in the infrastructure bill.

Private investors are pouring hundreds of millions of dollars into building chargers, but the business suffers from a chicken-and-egg problem: Sales of electric cars are not growing fast enough to make charging profitable. It could be years before most charging companies break even, let alone mint big profits like Exxon Mobil and Chevron.

Fast chargers — ones that can fill up an electric car battery in 20 to 40 minutes — cost tens of thousands of dollars but are typically used less than humdrum gas pumps. Yet the auto and energy industries need to build them to reassure people that they won't be stranded in an electric car with no plug in sight.

"E.V. charging infrastructure is the single biggest barrier to E.V. adoption," said Asad Hussain, a senior analyst at PitchBook, a research firm. "You talk to anyone who's on the fence about buying an E.V. and the No. 1 concern that comes to mind is range anxiety."

The European Union, which is further along in electrifying cars, had nearly 200,000 public charging points last year. China, where electric cars are even more common than in Europe, had more than 800,000 in 2020.

European and Chinese officials have offered better incentives and imposed tougher regulations in part because they want to win a global race to build the cars and trucks of the future. U.S. policies, including the infrastructure bill, have been more modest because most Republicans and some Democrats oppose the regulation and spending needed to quickly ditch fossil fuels.

Soon, even \$7.5 billion won't be enough to lay the groundwork for the electric age, Nick Nigro, founder of Atlas Public Policy, a consulting and research firm based in Washington, said about the proposed federal spending on charging stations.

"Is it sufficient? No," he said. "But it gets things going."

Most drivers today plug in their electric cars at home, and only occasionally use public charging stations. But those stations will be crucial, especially to those who live in apartments and people who drive long distances.

For years, start-ups, automakers and other companies have been slowly building chargers, mainly in California and other coastal states where most electric cars are sold. These businesses use different strategies to make money, and auto experts say it is not clear which will succeed. The company with the most stations, ChargePoint, sells chargers to individuals, workplaces, stores, condo and apartment buildings, and businesses with fleets of electric vehicles. It collects subscription fees for software that manages the chargers. Tesla offers charging mainly to get people to buy its cars. And others make money by selling electricity to drivers.

Once the poor cousin to the hip business of making sleek electric cars, the charging industry has been swept up in its own gold rush. Venture capital firms poured nearly \$1 billion into charging companies last year, more than the five previous years combined, according to PitchBook. So far in 2021, venture capital investments are up to more than \$550 million.

On Wall Street, publicly traded special purpose acquisition companies, or SPACs, have struck deals to buy eight charging companies out of 26 deals involving electric vehicle and related businesses, according to Dealogic, a research firm. The deals typically include an infusion of hundreds of millions of dollars from big investors like BlackRock.

"It's early, and folks are trying to wrap their heads around what does the potential look like," said Gabe Daoud Jr., a managing director and analyst at Cowen, an investment bank.

These businesses could benefit from the infrastructure bill, but it is not clear how the Biden administration would distribute money for charging stations.

Another unanswered question is who will be the Exxon Mobil of the electric car age. It might well be automakers.

Tesla, which makes about two-thirds of the electric cars sold in the United States, has built thousands of chargers, which it made free for early customers. The company could open its network to vehicles made by other automakers by the end of the year, its chief executive, Elon Musk, said in July.

Volkswagen also owns a charging network, Electrify America, which is already available to all makes of cars. In Europe, Volkswagen, BMW, Ford Motor, Daimler and other automakers jointly own a charging company called Ionity. Drivers pay fees to charge in both cases, but some automakers offer free charging for a few years to entice car buyers.

Energy giants like BP and Royal Dutch Shell have gotten into the business, too, by buying charging companies in Europe and the United States.

And 14 electric utilities from Maine to Texas have formed the Electric Highway Coalition to build stations at intervals of 100 miles or less. Utilities elsewhere are also building chargers, as are cities like Los Angeles and New York.

They are all competing in a tiny market: Less than 4 percent of new car sales and less than 1 percent of vehicles on U.S. roads are electric.

Charging companies claim they can succeed even if it takes years for electric vehicles to take over. Some businesses like ChargePoint have been around for more than a decade, while others raising money don't have much of a track record.

The chief executive of ChargePoint, Pasquale Romano, says his company avoids some costs by using contract manufacturers to build equipment and selling stations to employers who own electric vehicle fleets, retailers and others, who also buy software and maintenance subscriptions.

"Everyone thinks this can go fast, and it can't," Mr. Romano said. "You have to get in and start pedaling to help shape what it looks like."

Volta, a smaller charging company, places chargers near the entrances of retailers like Whole Foods Market and Walgreens. The chargers show ads, generating revenue, and the stations pay for themselves within a few years, said the company's president and a co-founder, Chris Wendel. "It's a sponsored service brought to you by brands that care about what you're doing."

But some companies have stumbled. In December, TPG Pace Beneficial Finance, a SPAC backed partly by TPG, the private equity firm, announced that it would buy EVBox, an Amsterdam-based maker of charging equipment, valuing the company at \$1.4 billion.

In January, Jim Cramer, the host of CNBC's "Mad Money," said EVBox was his favorite charging company because it is an established player in Europe. Shares of TPG Pace Beneficial climbed to \$31 in February, from around \$10.

But this month, the companies delayed the merger's closing because EVBox has not yet released its audited financial statements for 2020. TPG Pace said in a regulatory filing that there was "significant uncertainty" about the deal's completion, and its shares have fallen back to about \$10.

A spokeswoman for EVBox declined to comment.

Mr. Cramer no longer stands by the EVBox pick. "I suppose we put too much faith in the financials as presented to investors at the time," he said in an email.

Since the start of 2020, 16 proposed SPAC mergers have been canceled or withdrawn. And investors and regulators have raised questions about the optimistic claims made by executives and promoters of SPACs.

Yet investors continue to pour money into charging. One charging company, EVgo, completed a SPAC deal and started trading in July. Trading in Volta started last month. Several other deals have been announced in recent months, including for Tritium, which makes fast chargers; Wallbox, which sells charging equipment, software and related services; and Allego, which operates a large charging network in Europe.

Some investors think that charging cars might not be the best approach.

Last month, Ample, which aims to build stations where drained E.V. batteries are replaced with charged ones, raised \$160 million. Raed Masri, founder of Transform VC, an investor in Ample, said battery swapping would be better for people without a place to plug in their cars because it is much faster.

"They need a quick energy delivery system, and only swapping provides that," Mr. Masri said.

Other investors are making lots of bets. Energy Impact Partners, a private equity firm based in New York, has invested in several charging networks, a repair app for charging stations and an app that optimizes charging.

Cassie Bowe, a principal at the firm, said that with electric vehicle sales growing fast, it was urgent to build a network to support them. "There's no more time," she said. "We need this infrastructure fast."

The reality is that the current plan can never work. There is not enough money, consumer interest, logistical embrace or other support for public chargers to ever be more than a feel good fancy. The consumer desire for speed-of-delivery increases over 10% per year. Nobody is going to put up with the wait, especially after sitting in rush-hour congestion every morning and night.

Electric cars will never happen in any volume unless every home and apartment has a charger, the rates for the chargers are less than gasoline and the batteries or energy cassettes can be instantly hot-swapped. The United States Government paid us to build such a system. We did. It worked perfectly. Then the White House and the Department of Energy black-listed it because it obsoleted the stock market payola and the invasion of Afghanistan that the White House and Department of Energy executives had profited their stock money into.