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LIFESTYLE | CARS

I Really Like Electric Cars. These Technologies Would Make Me Love Them.

I've been buying EVs for more than 10 years. But innovations on the horizon will make a big difference to me—and lots of other skeptical consumers.

By Amy Myers Jaffe

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As an energy and sustainability expert who has been driving EVs since 2014, I am committed to electric cars. But I won't lie: My experience as an early adopter hasn't been a totally smooth one.

In fact, a few events almost made me swear off electric cars. My first-generation hybrid came with lighter tires to boost fuel efficiency—but they were also pothole sensitive and kept blowing out. When I bought a second-generation EV, everything was going great until a faulty software update made the car sporadically reject level-two chargers, with an annoying "car isn't connected" message. Then there was the day this year that was so cold the car wouldn't charge.

Sometimes I run into hassles that don't have anything to do with my own vehicle. Occasionally, a public charger's credit-card payment system won't work. On longer road trips, I might plan a recharging stop only to find that multiple chargers there are out of service.

Even with these challenges, I see innovations on the horizon that excite me and ensure I stick with EVs. Some advancements are already here for the next generation of cars or are coming out in the next year or two. Others remain a few years away. But when and if these features get here, they could make a big difference for most EV owners.

Fast-charging, long-range batteries

There is a race on to build better EV batteries. These projects use either cheaper, less-rare materials; battery systems that deliver more power, are lighter weight or safer; or all of the above.

From where I sit, the real promise is the crop of solid-state batteries potentially slated to come to market in the next two or three years. These batteries could enable faster, safer, more-weatherproof charging. Based on test data I've seen, solid-state batteries have can get 600 to 700 miles per single charge, instead of the current 250 to 400 or so. That is farther than most traditional cars can go on a single tank of gasoline.

For me, and a lot of other people, a 600-mile range would be a game changer. Going by tests others have done, I could go from my house to any city in the Northeast and back without charging, even if there were unexpected (or expected) traffic.

Basically, solid-state batteries have greater energy density than current ones—in other words, more energy in a smaller package—and the battery isn't as heavy as today's, so it doesn't eat up as much energy per mile of driving. Car companies have been competing to get solid-state battery technology off the ground for years, but Japan recently made a show of confidence in those efforts: The nation announced it was breaking ground on a plant to produce lithium sulfide, the raw material for solid-state batteries.

From my conversations with people involved, it could mean the batteries will be in cars within the next two to three years, although there have been delays in the past.

China is also working on solid-state batteries. Meanwhile, the nation has introduced yet another new battery and charging technology—one that delivers superfast charging time with extended range. If solid-state efforts don't pan out, the new Chinese vehicle might present formidable competition to current electric cars in some markets.

BYD has started selling a new model that can travel 250 miles on a single charge. PHOTO: CHALINEE THIRASUPA/REUTERS

This month, BYD 002594 **-0.70%** ▼ , the Chinese battery and auto manufacturer, began selling its new Han L vehicle, which can travel 250 miles on a single charge. The cars use a new type of battery and more-powerful chargers, and have two charging ports as well: If drivers use both, the batteries can charge in an incredible five minutes.

That said, the power requirements of the new chargers might be a deal killer for places that don't have a very stable electric grid.

Recharging without human help

Better batteries aside, my real fantasy is a car that will charge itself with less, or no, intervention on my part. That isn't as pie in the sky as it might seem. On the horizon are at least three ways I could get this wish: wireless e-roadways, solar panels on the car or automated driving that allows the car to take itself to a charging pad and then come back when I need it. None of these options are commercially feasible right now, but all are in someone's lab or test-pilot demonstration, perhaps arriving in the coming decade.

• **A road that delivers a recharge.** Imagine if key highways near your house had special lanes with charging coils embedded under the road that recharged your car as you drove. For a lot of people, it would end range anxiety and frustration with charging stations overnight. It would also eliminate planning for where and when to charge on longer trips. Eventually, it would pave the way for automated vehicles to charge themselves.

The basic technology of wireless charging of devices is already established: Think of the charging pads you can use to charge your cellphone without plugging in a power cable. A number of places—including Detroit, China and Sweden—have even tried wireless charging-road demonstration projects.

But the commercial feasibility of e-roads hasn't been proved as cost effective, which means they may be a decade away. To date, a significant portion of energy gets lost as it is transferred from the road to the car. It is also costly to add the equipment that a car to needs receive electricity through a road. Moreover, for some locations, like the pothole-ridden Northeast, maintaining the charging equipment in road asphalt could be expensive. Still, to a technophile like me, e-roads seem like a technology that might find its time.

An in-road wireless charging coil before being installed in a street in Detroit in 2023. PHOTO: PAUL SANCYA/ASSOCIATED PRESS

• **Cars that drive themselves to charging stations.** Picture this: An autonomous car could learn to drive itself to a charging pad, park on it—and then come back to its owner when summoned. No need for a human hand to plug it in. It isn't as far-fetched as it sounds. Automation in some existing EVs allows the vehicles to park themselves. Two of my current cars can do that with a push of a button, if I drive to the lot or open curb. The twofer of having the car park itself and charge in the same autonomous operation would kill off my interest in a gasoline car that will never be able to fuel itself.

• **Charging with sunlight.** You think you use your car all the time, but on average, cars are parked for 95% of their useful life. My own car sits outside in a driveway most of the day, so I can mostly keep it plugged in at home, much the way you set your

cellphone on a charging pad when you aren't using it. But if my EV had some kind of efficient solar panels on its roof, something that is close to feasible, it could always be charging and not just when it was plugged in. Emergency solar-charging kits that fit on your roof rack and integrate with a car's charging port are already on the market. Some sellers say their solar emergency kits can get you a dozen miles or more, presumably helping you get to a full-on charging station.

Questions remain about whether there would ever be sufficient surface area to practically be useful. On the one hand, experts say that even if the average car's entire surface were a solar panel, with today's technology, the charge would likely not take you more than 25 to 30 miles, possibly less. On the other hand, how many miles do people need regularly? When I had a hybrid electric car that had a 25-mile battery and a home charger, I found that was sufficient battery charge to keep me all electric almost every day (if I plugged in routinely after each local trip). Most Americans don't travel more than 30 to 35 miles a day, so a solarized vehicle that could go 30 miles might be enough to be useful.

Turning your car into a generator

Technology that is getting more popular lets your car supply power *to* your home if you want it—say, during a blackout—and allow it to send some energy back to your utility when the grid is under stress.

Already, some EVs on the market let you run an appliance or two on your car's battery, simply by plugging into the car using a customized adapter. The next generation will make the car battery part of a home-management system: Instead of just plugging in individual appliances, these cars will be able to essentially act as a power supply store for your whole house.

A typical U.S. home uses around 30 kilowatt-hours of electricity a day. At this amount, a good EV battery could power a house for a couple of days. It could keep a refrigerator on for several months.

Eventually, cars will likely have a capability that could turn the vehicle into a profit center instead of a drain on household finances. With this technology, I would be able to sell my utility some of the power from my car battery to help the grid when demand was highest (late afternoon and early evening). I would then be able to recharge the car during off-peak hours when the rates were lower, at nighttime and on weekends. Already, many utilities across the country are launching initiatives called virtual power-plant programs that work along those lines.

The bidirectional electric Nissan Leaf is able to power a home and provide power back to the grid.

PHOTO: NICK CAREY/REUTERS

Whether payments programs will ever take off at a wide scale will depend on several details, such as regulatory frameworks and financial incentives. The big question is how much will utilities be willing to pay residential customers for the electricity stored in their cars.

Right now, the level of payments for batteries in many of the locations I have studied probably won't deliver a quick payback on the hardware a car owner needs to make the program work (such as wires, connectors and adapters).

But, as these programs go mainstream, utilities may start offering customers more money as a lure. EV owners may also be more interested in these deals as battery capacity goes up: The more power your battery can store, the more likely that you would be willing to sell some of it to the utility.

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