



THE ELECTRIC VEHICLE EVOLUTION



As your Touchstone Energy® cooperative, we want to be your source for energy and information. Since electric vehicles (EVs) are becoming more mainstream, we put together a variety of fact sheets and information to help answer questions you might have.

Contact us for more information about EVs.

Electric vehicles (EVs) are a growing market for new car purchases, with more and more people making the switch from the gas station to a charging station to fuel their vehicles.

EVs use electricity as their only fuel (battery electric vehicles) or electricity along with a conventional engine for backup (plug-in hybrid electric vehicles). Drivers are purchasing EVs for all kinds of reasons, including the financial savings, driving performance, and reduced environmental impact. The influx of EVs has been accompanied by expanding charging infrastructure. Throughout the country, businesses, governments, and electric cooperatives and other utilities are installing EV charging stations. According to the U.S. Department of Energy's Alternative Fuels Data Center, there are more than 100,000 vehicle charging connectors across the country.

This trend toward EVs is expected to continue, especially with the billions of dollars that auto manufacturers are investing in the technology.

But how and why did this all get started? Let's step back and take a look at the history of electric transportation.



EARLY SUCCESS

EVs actually have their origin in the 1800s. The first American electric car was developed by William Morrison in 1891. His six-passenger wagon reached a top speed of 14 mph (and in 1899 the land speed record was set by an EV at 66 mph). Morrison's invention was considered the first practical example of an EV, and it spurred interest in electric transportation.

The end of the 19th century and the beginning of the 20th century saw great progress for EVs. In fact, electric cars made up close to 40% of the U.S. market at one point, and electric taxi fleets were transporting passengers in both New York City and London. These cars were known for their smooth and quiet rides, unlike their steam- or gasoline-based counterparts, and they were easy to drive and maneuver. Early gasoline cars required a hand-crank to switch gears, which was a hassle and potentially dangerous.



EVs quickly became the transportation method of choice, particularly for short trips around the city. Hybrid electric vehicles also appeared at this time. For example, Woods Motor Vehicle Company produced the Dual Power with both an internal combustion engine and an electric motor. For speeds below 15 mph, the electric motor was used, and beyond that (and up to 35 mph), the conventional engine took over.

THE FIRST CHARGING STATIONS

How did these early EVs charge? At least one public charging station existed during the beginnings of electric transportation. In the early 20th century, General Electric produced the "Electrant," which offered street charging in New York City. EVs could also be charged at the dealer's own charging location, and batteries could be removed and charged separately. With more and more city homes being wired for electricity, home charging setups were developed as well, and personal charging equipment could be used for both DC and AC service. However, the process was more involved than it is today.

BUMP IN THE ROAD

Despite the initial popularity of EVs, they began to disappear from the streets after just a few years. A number of events triggered this decline. For one, roadways improved beyond the city limits, and people wanted to get out and explore. With their slower speeds and shorter ranges, EVs were not ideal for this type of travel.

At the same time, gasoline cars began to improve. In 1912, Charles Kettering designed the electric starter, which eliminated the need to manually hand crank vehicles and provided safer and more efficient travel. Furthermore, technology enhanced the internal combustion engine, and Henry Ford pioneered the Model T, which was both accessible and affordable. Falling gas prices made gas-based vehicles even more appealing, while electric models continued to be expensive. Indeed, they could be two- to three-times more expensive than gasoline cars. By 1930, EVs had basically vanished from roads.

BACK ON TRACK

Interest in EVs made a bit of a resurgence in the 1960s and 1970s, but it wasn't until the early 1990s that a more substantial push for driving electric was realized. This surge was mainly driven by regulations, acts and legislation, such as those from the California Air Resources Board, which pushed for more fuel-efficient and emissions-free vehicles. In 1996, General Motors (GM) developed the first mass-produced all-electric car, the EV1. The EV1 had a range of approximately 60 miles and a top speed of 80 mph. By 2002, though, GM discontinued it. The California Air Resources Board mandate had been weakened, and GM viewed electric transportation as an unprofitable sector of the market. Other EVs of the time saw similar fates.



Approximately half a decade after the EV1's discontinuation, GM was looking to re-enter the market, along with other auto manufacturers, such as Nissan. Elon Musk and Tesla (which was founded in 2003) were in the midst of producing their Roadster, an all-electric sports car that could travel 200 miles on a single charge. With reinvigorated interest, the focus centered on producing mass-market, affordable electric transportation. GM began working on the Chevrolet Volt, a plug-in hybrid electric vehicle with both an electric motor and a gasoline engine, and Nissan was gearing up for the LEAF, its battery electric car. With continued competition and improving technology, EVs seemed back on track, and it would only get better from there.

PLUGGING IN

With the renewed growth of EVs, there was also a need for charging infrastructure. In a way, history was repeating itself: In the early 20th century, during the first dip in electric transportation and rise of gas-powered cars, gas stations were relatively scarce. Drivers needed to memorize their locations when planning a trip, before they started popping up more frequently in the 1930s. Likewise, just two decades ago, EV charging stations were virtually nonexistent, but they are quickly becoming more numerous.

Today, just like a century ago, people primarily charge their vehicles at home. But there are also more than 100,000 public charging connectors in the U.S. Charging comes in three levels: Level 1, Level 2 and DC Fast Charge. Level 1 charging, which uses a typical 120-volt outlet, provides about 3 to 5 miles of range per hour of charge, Level 2 charging can supply 12 to 60 miles per hour of charge, and DC Fast Chargers can charge a car up to 80% in about 30 minutes.

EV charging stations are still outnumbered by gas stations, and charging with a plug still generally takes more time than fueling at a gas pump, but the rapid growth of this infrastructure is promising for the future of electric transportation.

DRIVING AND THE GRID

As technology improves, opportunities are arising to integrate charging with the electric grid. Bidirectional charging allows users and electric utilities to communicate with a charging vehicle to supply power back to the grid, to a home or to a building. This application has the potential to support grid operation during peak electricity demand periods and outages, and while these systems are still getting off the ground, they hold significant promise. Many EV owners across the country have also been installing solar arrays to either charge their vehicle or offset the electricity used for charging with renewable energy.

THE PRESENT AND FUTURE ARE ELECTRIC

With the foundation laid for both EVs and their infrastructure, driving electric is becoming the new norm. The concerns of the past – speed, driving distance and fueling time – are quickly diminishing. Purchase prices also continue to decrease and are expected to reach parity with gasoline vehicles in the next few years. Today, there are competitive electric options across all vehicle types, from sedans and SUVs to pickup trucks, vans, buses and more.

Improving and more cost-effective batteries (which make up a third of the cost of an EV) will further reduce prices, and technology continues to enhance vehicle durability. Those developments, coupled with the spread and progress of charging stations, paint an optimistic picture for the EV future. Increased education about the benefits of these vehicles will be needed, but in the not-too-distant future, we will have a new heyday of electric transportation.



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