

# Batteries in Electric Vehicles (EVs)

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## What kind of batteries are in electric vehicles?

Most EVs use lithium ion batteries. This is the same kind of battery used in most cell phones and laptops.

## How far can an EV travel on a single charge?

It depends on the car, where you drive it, and how you drive it. The bigger the battery, the more expensive it is. Some EVs can run on gasoline in addition to electricity in order to extend their range.

Make/Model (2014)	Battery Capacity	All-Electric Range	Can it run on gas?	MSRP
Chevrolet Volt	16.5 kWh	38 miles	Yes	\$34,995
Nissan Leaf	24 kWh	84 miles	No	\$28,980
Toyota Prius	4.4 kWh	11 miles	Yes	\$29,990
Tesla Model S	60 kWh / 85 kWh	244 miles / 265 miles	No	\$69,900/\$79,900
Ford C-Max Energi	7.6 kWh	19 miles	Yes	\$32,920

## How long does it take to charge an EV?

An EV can travel about 4 miles for every hour it is charged using a household 120V outlet. A 240V connection, which can be found at a charging station or installed at home, can charge an EV at least twice as fast. The charging rate is limited by the outlet's power output and the EV's ability to quickly convert alternating current (AC) into direct current (DC).

DC fast charging can charge an EV battery to 80% capacity in *less than half an hour*. Fast charging is available for some EVs such as the Leaf and the Model S. A DC fast charger is expensive to install, so it is not likely to be implemented in homes.

What makes DC fast charging so fast? A DC fast charging station converts high voltage AC from the electrical grid into high power DC, which can be used to charge the car directly, bypassing the car's onboard AC adapter.

## How fast will an EV battery degrade?

Chevrolet reports that the Volt's battery capacity is expected to decrease by 10 to 30 percent over the warranty period of the battery (8 years / 100,000 miles). The Idaho National Laboratory\* is currently investigating the effects of DC fast charging on battery longevity. They found that after 40,000 miles, the 2013 Nissan Leaf battery capacity dropped about 22% when charged with a 240V outlet and about 25% when charged with a DC fast charger.

\*Shirk, M., Idaho National Laboratory; *DC Fast, Wireless, and Conductive Charging Evaluation Projects*, SAE Hybrid and Electric Vehicle Technologies Symposium. February 14, 2014.