U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Electric vehicles can offer several benefits, including improved fuel economy, lower fuel costs, and reduced emissions. *Photo by Erik Nelsen, NREL 64276.*

At a Glance: Electric Vehicles

Electric vehicles (EVs) include all-electric vehicles—also referred to as battery electric vehicles (BEVs)—and plug-in hybrid electric vehicles (PHEVs).

About the Vehicles

Why consider one?

EVs cost less to operate, so the higher initial vehicle cost can be offset over the lifetime of the vehicle. That's because electric drivetrains are very efficient, and electricity is much cheaper than gasoline or diesel fuel.

Because they use little or no gas, these vehicles minimize or even eliminate trips to the gas station. Most drivers find that they can primarily charge at home or at work.

All-electric vehicles are driven solely by one or more electric motors powered by energy stored in batteries. This makes BEVs very low maintenance, which saves on costs.

PHEVs use batteries to power an electric motor and use another fuel, such as gasoline, to power a conventional engine.

PHEVs produce fewer emissions than conventional vehicles because of their increased fuel economy, and in all-electric mode produce no tailpipe emissions, just like all-electric vehicles.

EVs provide instant torque, resulting in a fun, fast, and quiet driver experience!

What vehicles are available and how much do they cost?

Manufacturers' suggested retail prices (MSRPs) start at about $27,000 for PHEVs and $33,000 for all-electric vehicles.

Did You Know?

Electricity is much cheaper than gasoline or diesel fuel, costing about $1.20 per gallon (of gasoline equivalent) at a nationwide average, when accounting for vehicle efficiency.

EVs are about three times more efficient than conventional vehicles, earning these vehicles top spots on FuelEconomy.gov's list of most efficient vehicles (fueleconomy.gov/feg/topten.jsp).

Regenerative braking allows EVs to capture energy normally lost during braking by using the electric motor as a generator and storing that captured energy in the battery.

The average all-electric vehicle range was 260 miles in 2020, with some exceeding 400 miles. Larger batteries and growing access to charging are increasingly addressing "range anxiety," or the fear of running out of charge.

A federal tax credit of $2,500–$7,500 may be available for some EV purchases. Depending on your location, you may also be eligible for incentives from your state, city, or utility. Find relevant incentives by searching the Alternative Fuels Data Center's (AFDC's) Federal and State Laws and Incentives database (afdc.energy.gov/afdc/laws).

Search and compare dozens of models from all major manufacturers at FuelEconomy.gov.

Charging Batteries

Where can I charge?

Most EVs come with a 110-volt "Level 1" cordset that can be plugged in to a typical household outlet.

For quicker charging, homeowners can install a 240-volt "Level 2" unit, often with little or no required electrical upgrades because most homes have 240-volt service for appliances like dryers and electric ranges.

More and more workplaces are also installing charging units or making 110-volt outlets available to employees and visitors.

There are more than 100,000 public charging outlets across the country, including a growing number of "DC fast charge" units that enable rapid charging. To locate stations, use the Alternative Fueling Station Locator (afdc.energy.gov/stations) or download the Android or iPhone app.

This "Level 1" cordset can be plugged in to a typical dedicated, 110-volt household outlet. *Photos by Erik Nelsen, NREL 64271, inset 64274.*

Public charging stations typically include one or more "Level 2" units and may include "DC Fast Charge" units as well. *Photo by Dennis Schroeder, NREL 48757.*

How long does it take to recharge?

"Level 1" charging units add 2–5 miles of range per hour of charging.

"Level 2" charging units add 10–30 miles of range per hour of charging.

"DC fast" units can add 100–200+ miles of range in as little as 30 minutes.

How far can I go on a charge?

The distance an EV can travel on a single battery charge is known as its "all-electric range."

All-electric vehicles can typically go 100 to more than 400 miles on a single charge.

PHEVs can typically go 15–50 miles on battery power alone; their overall range is determined by the fuel tank capacity because the engine kicks in when the battery is depleted.

Several factors affect actual range, including driving conditions, driving habits, and use of climate controls.

What about safety and maintenance?

EVs and their battery packs undergo the same rigorous safety testing as conventional vehicles sold in the United States and must meet Federal Motor Vehicle Safety Standards.

Because PHEVs have a conventional engine, their maintenance requirements are similar to those of conventional vehicles.

BEVs have fewer maintenance requirements because they have fewer moving parts and fluids to change, and their electrical systems require minimal maintenance.

A manufacturer's battery warranty typically covers 8 years/100,000 miles. Expected battery lifetime is 10–12 years under normal operating conditions. Check with your vehicle's manufacturer for vehicle and battery warranty information. ■

Options for Going Electric

Below are the key differences between BEVs and PHEVs:

All-electric vehicles can travel about 100 to 400 miles on a single charge (depending on model). They are powered by an electric motor that uses energy stored in a battery (larger than the battery in a PHEV). EV batteries are charged by plugging the vehicle in to an electric power source and through regenerative braking.

A smaller battery allows PHEVs to travel on electricity alone for up to 50 miles (depending on model). The battery can be charged by plugging in to an electric power source, through regenerative braking, and by the engine.

Unlike all-electric vehicles, PHEVs don't have to be plugged in. They can be fueled solely with gasoline, like a conventional vehicle. However, they will not achieve maximum fuel economy or take full advantage of their electric capabilities without plugging in.

Two types of electric-drive vehicles not covered here are hybrid electric vehicles (which are powered by a conventional engine and an electric motor that uses energy stored in a battery) and fuel cell electric vehicles (which use a propulsion system similar to electric vehicles, where energy stored as hydrogen is converted to electricity by the fuel cell).

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