

# NUTS AND BOLTS OF BATTERY ELECTRIC VEHICLES



*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.*

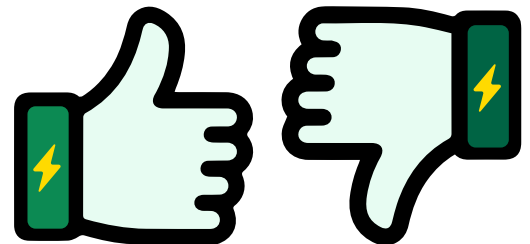
## Is a battery electric vehicle (BEV) more expensive than a gas-powered vehicle?

The answer is both “yes” and “no.” The initial purchase price of a BEV may be higher than a similar gasoline vehicle (though look out for tax credits, rebates and other incentives), but BEVs cost less to operate. Driving on electricity is cheaper than driving on gasoline, and BEVs have fewer moving parts, which means less maintenance and fewer repairs.

## ADVANTAGES AND DISADVANTAGES OF BEVS

### What are the operating cost advantages of BEVs?

- Though specific savings will depend on gas prices and your driving habits, BEVs cost less to operate than gas-fueled vehicles because electricity costs are equivalent to approximately \$1 per gallon of gasoline.
- Electricity prices are far more stable than gasoline prices, which means more consistency in how much you'll pay each month. Furthermore, because the U.S. electric supply does not rely on imported petroleum, the long-term outlook for pricing is better.



## What are the energy efficiency advantages of BEVs?

- BEVs are highly efficient, converting about 80% of their energy input into moving the car. In contrast, gas-powered cars are only about 20% efficient; the remaining 80% of the energy input is lost to engine inefficiencies or used to power accessories.
- BEVs use regenerative braking to capture energy and restore it to the battery when you slow down.
- Charging a BEV at home is not a huge power drain. A BEV driven 10,000 miles a year may use between 2,500 and 3,000 kilowatt-hours (kWh) to charge; that is between \$325 and \$390 per year assuming an average residential electricity rate of 13 cents. This is approximately the same amount of energy used to operate an electric water heater for a family of four.

## What are the environmental advantages of BEVs?

- BEVs run on locally generated electricity and reduce dependence on fossil fuels.
- The vehicles have a smaller environmental footprint because of their higher efficiency, lower energy consumption and lack of tailpipe emissions.
- Electricity is not a “fuel” in the same way gasoline is. Cooperatives and other utilities produce electricity from many sources, including hydropower, nuclear, natural gas, coal, and increasingly wind and solar. As the source of electricity gets cleaner, so does the vehicle.

## What are other advantages of BEVs?

- BEVs require little maintenance beyond changing windshield wipers and tires. They have far fewer moving parts than gas-powered vehicles, so less can go wrong. Even brake pads last longer because of regenerative braking.
- BEVs are quiet, as there is no combustion noise produced.
- BEVs have quick acceleration and are fun to drive.
- BEVs are more efficient during city driving than highway driving.
- BEVs are very safe to operate and charge. The vehicle inlet and charging equipment are required to be safety tested, certified and listed by UL.

## What incentives are available when purchasing or operating a BEV?

- There is a federal tax credit worth up to \$7,500 for new BEVs. The amount you'll receive will depend on several factors, including how the vehicle is built, its cost, your income and more.
- There is an additional federal tax credit worth up to \$4,000 for used BEVs.
- Some states and cities offer incentives, including access to high-occupancy vehicle (HOV) lanes and special parking spots.
- Some cooperatives offer special electric rates for charging during off-peak times (such as overnight).
- Some states, cities and cooperatives offer rebates and incentives to offset the purchase of a BEV or charging station.
- To find incentives in your region, visit [GoElectricDrive](http://GoElectricDrive).

## What are the disadvantages of BEVs?

- Although vehicle ranges keep improving and charging stations continue to be installed, long-distance travel in a BEV will require more planning.
- If you need to charge partway through a trip, you will be stopped for longer than had you filled up a gas-powered vehicle.
- It may be difficult to find a charging station when and where you need one. Fortunately, this is improving as BEVs become increasingly common and more stations are added. Several apps can help you locate places to charge.

## OTHER COMMON QUESTIONS

### How often and how long will my BEV need to charge?

There are several levels of charging. How often you charge and where you plug in depend on how far you drive and the charging method.

- **Level 1:** A standard 120-volt home receptacle on a dedicated circuit will provide three to five miles of driving range for every hour of charging.
- **Level 2:** Level 2 charging, which can be installed at home or found in public settings, will provide 12 to 60 miles of range for every hour of charging.
- **DC Fast Charge:** DC Fast Charging, often found along highway corridors, can charge a car to 80% in about 30 minutes.



## How safe is charging a BEV?

Safety features are built into BEVs and charging equipment. The charging cable is live only when it is connected to a vehicle. The charger senses that the connection is properly made before the electric current is turned on. Also, the charger has a ground-fault interrupter (GFI). To prevent shocks, charging stops immediately if even a few milliamps of current leak.

## If a lot of people plug in to charge their BEVs, will this drain the electric grid?

Charging BEVs will add to electricity demand on the grid but not as much as you might think. Furthermore, BEVs are a flexible load, meaning they can be incentivized and managed to charge during times of low demand for electricity, putting limited strain on the power network.

## What factors affect the driving range of a BEV?

- Using heating and air conditioning
- Extreme temperatures, particularly cold
- Your driving style
- The type of driving (city vs. highway) – with the benefits of regenerative braking, BEVs perform better in city driving

## What does the future look like for BEVs?

- More production of BEVs should bring down prices.
- As BEVs become more common, so too will public charging locations.
- Advances in design and battery storage will improve the range of BEVs and decrease charging times.

## How can my electric cooperative help me?

- When considering a BEV, reach out to your electric cooperative to talk about your purchase and any rebates or programs they offer.
- Utilities, including your cooperative, often have excess capacity at night and during other periods of lower electricity demand. Electricity is cheaper at those times, so some cooperatives offer special electric rates.
- Some cooperatives offer incentives for or assistance with installing a home charger to ensure the process is done correctly and safely.

*This article was provided by Advanced Energy, a nonprofit energy consulting firm. For more information, visit [www.advancedenergy.org](http://www.advancedenergy.org).*

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