



## NUTS AND BOLTS OF BATTERY ELECTRIC VEHICLES

### 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 somewhat higher than a similar gasoline vehicle (though look out for tax credits, rebates and other incentives), but BEVs cost much less to operate. Driving on electricity is cheaper than driving on gasoline, and BEVs have fewer 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 less fluctuation in how much you’ll pay throughout the year. 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.
- Most BEVs have a regenerative braking system that captures energy and restores it to the battery when you stop.
- Charging an electric vehicle 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 less of a negative environmental impact because of higher efficiency, lower energy consumption and no 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 generation. 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 extremely quiet, as there is no combustion noise produced.
- BEVs have quick acceleration and are fun to drive.
- BEVs get better range in stop-and-go traffic than during highway driving, making them ideal for in-city commuting.
- 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, though the amount depends on the vehicle, manufacturer and your tax liability.
- 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 an electric vehicle or charging station.
- To find incentives in your region, visit GoElectricDrive - [www.goelectricdrive.org/you-buy/incentives](http://www.goelectricdrive.org/you-buy/incentives).

## 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 advanced 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: A 240-volt connection will provide 10 to 20 miles of range for every hour of charging. Note that this connection must be installed by an electrician who understands BEVs. Some public areas and workplaces also offer Level 2 charging stations.
- DC Fast Charge: DC fast charging can charge a car to 80% in about 30 minutes. However, this option requires special equipment and isn't compatible with all vehicles.

## 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 electric vehicles, will this drain the electric grid?

Charging BEVs will not drain the grid. An investigation by the U.S. Department of Energy's Pacific Northwest National Laboratory found that the grid has enough excess capacity to support about 150 million electric vehicles without having to add new power plants. With under 2 million electric vehicles on the road today in the U.S. (this includes both BEVs and plug-in hybrids), there is much opportunity for growth. Furthermore, electric vehicles are a flexible load, meaning they can be managed to charge during times of low demand for electricity, putting limited strain on the grid.

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

- Using heating and air conditioning, as well as running headlights, wipers and the defroster
- 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 electric vehicles?

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

## How can my electric cooperative help me?

- When considering an electric vehicle, reach out to your electric cooperative to talk with them about your purchase and any rebates or programs they offer.
- Because utilities, including your cooperative, often have excess capacity at night and during other periods of lower electricity demand, electricity is cheaper at those times, and 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.  
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