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## NUTS AND BOLTS OF BATTERY ELECTRIC VEHICLES (BEVS)

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As your Touchstone Energy cooperative, we want to be your source of power and information. Since electric vehicles are rapidly becoming more widely available, we put together this information to help answer questions you might have. Contact us for more information about electric vehicles. See other fact sheets in this series.

### IS A BATTERY ELECTRIC VEHICLE (BEV) MORE EXPENSIVE THAN A GAS-POWERED VEHICLE?

The answer is both “yes” and “no.” The purchase price of a BEV or hybrid may be somewhat higher than a standard vehicle. But operating costs may be considerably less. Maintenance and energy costs are lower for BEVs, and there may be tax advantages and other incentives available.

### ADVANTAGES AND DISADVANTAGES OF BEVS

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

- BEVs cost less to operate than gas-fueled autos because electricity costs are equivalent to approximately \$1 per gallon gasoline. The savings depend on current gas prices and your driving habits. Using an average cost of about 13 cents per kilowatt hour, a BEV using 95 cents of electricity will take you as far as one gallon of gasoline in a gas-powered car that gets 25 mpg.
- Electricity prices are far more stable than fossil fuel prices, and 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 energy efficient, converting 80% of their energy input into moving the car. In contrast, gas-powered cars are only about 20% energy efficient; the remaining 80% of the energy input is wasted in tailpipe emissions, heat and noise.
- Most BEVs have a regenerative braking system that captures energy and restores it to the battery when you stop.
- Recharging 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 kWh to recharge; that is between \$325 and \$390 per year assuming an average residential cost of electricity of 13 cents. In comparison, this is approximately the same amount of energy used to operate an electric water heater for a family of four.

## ADVANTAGES AND DISADVANTAGES OF BEVS CTD.

### What are the “green” advantages of BEVs?

- A reduced dependence on fossil fuels is a key benefit in owning and operating BEVs.
- EVs have less negative environmental impact than gas-powered vehicles because of higher efficiency, lower energy consumption and no tailpipe emissions.
- Electricity is not a “fuel” in the same way coal or oil are. Cooperatives and other utilities produce energy from many sources, including hydro, nuclear, and increasingly, wind and solar generation, in addition to coal and natural gas. As the source of electricity gets greener, so does the vehicle.

### What are other advantages of BEVs?

- Very little maintenance is required beyond changing windshield wipers and tires. There are far fewer moving parts than in gas-powered vehicles, so less can go wrong with them. Even brake pads last longer because of regenerative braking.
- Electric vehicles produce no tail-pipe emissions.
- BEVs are extremely quiet, as there is no combustion noise produced.
- The acceleration of an electric vehicle is surprisingly good.
- Electric vehicles actually get a better range in stop-and-go traffic than on 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 Underwriter’s Laboratory (UL).

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

- A federal tax credit with a top rate of \$7,500; the amount is tied to battery size.
- 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, usually at night or during off-peak times.
- Some states cities, or utilities offer incentive programs to offset the purchase and installation of a charging unit.
- To find incentives in your region, visit [goelectricdrive.com](http://goelectricdrive.com).

### What are the disadvantages of BEVs?

- BEVs are not yet ideal for long-distance driving, as the battery range may be limiting. Range varies by vehicle, driving conditions, speed and more, but 2016 range averages 60-100 miles. Several vehicles with 200 mile ranges are scheduled for introduction in 2017. However, longer trips will still require planning for recharging.
- If you must charge partway through a trip, you may be stopped for far longer than it takes to fill up a gas-powered vehicle - often for hours, rather than minutes.
- It may be difficult to find a charging station when and where you need one. This is changing as BEVs become more common. Several apps help you locate the nearest spot to recharge.
- If you live in an apartment or condo, you may not have access to charging, a critical function.



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## OTHER COMMON QUESTIONS

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

There are several levels of charging. How you charge and how often you charge depend on how far you drive your vehicle and the charging method.

- A standard 120-volt home receptacle on a dedicated circuit will provide five to eight miles of driving range for every hour of charging.
- A 240-volt connection will provide 12 to 75 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 offer charging stations.
- DC fast charging will provide 100 to 200 miles of driving range in about an hour of charging. However, this option requires special equipment and isn't compatible with all vehicles.

### How safe is charging a BEV?

There are safety features built into electric vehicles and charging equipment. The charging cable is not live while you handle it, only when the cable is connected to the 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 milli-amps of current leak.

### If many, many consumers charge electric vehicles, will this drain the electric grid?

Charging battery powered vehicles will not drain the grid. Information from the U.S. Department of Energy's Pacific Northwest National Laboratory concludes that the grid has enough excess capacity to support about 150 million electric vehicles without having to add new power plants. There are only about 500,000 electric cars on the road in the U.S. (this includes both BEVs and plug-in hybrids), so there is much opportunity for growth - particularly if vehicles can recharge off peak, during period of low demand for electricity.

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

- Turning on the heater and AC drain the battery faster, as can running headlights, wipers and the defroster.
- Lithium-ion batteries (actually, all batteries) are affected by extreme temps.
- Your driving style can affect the battery life.
- The type of driving (in-city vs. highway miles) has an impact. Surprisingly, BEVs do best in stop-and-go traffic, because when you brake, the battery recovers some energy.

### What does the future look like for electric vehicles?

- New fuel economy standards will promote increased production of both BEVs and plug-in hybrids.
- More production of electric vehicles should bring down prices.
- As electric vehicles become more common, public charging stations will be more available.
- Advances in design and energy storage will improve the range of BEVs and decrease charging time too. The anticipated range for 2017 is expected to be greater than 200 miles in some vehicles. Improved batteries, fuel cells and other technologies will all help improve the distances BEVs can travel between charges.

### How can my electric cooperative help me?

- Because utilities, including your cooperative, often have excess capacity at night and other periods of lower demand, the cost of electricity can be lower at those times. That is why some cooperatives can offer special charging rates for night-time electric vehicle charges.
- Some cooperatives offer incentives or assistance with the installation of a home charger to ensure the process is done correctly and safely.