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## OVERVIEW OF ELECTRIC VEHICLES (EVs)

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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.

**Electric vehicles (EVs) are a “hot item” in the auto world, with many auto manufacturers offering at least one model. Improved versions are on the near horizon, too, for good reason. Electric vehicles provide environmental advantages and, even though they may carry a higher price tag initially, tax credits and lower operating costs often balance out the initial investment.**

### IS IT SMART TO RELY ON SUCH A “NEW” TECHNOLOGY?

Electric powered autos are not a new technology. Although EVs may seem like the latest and greatest invention, in reality the technology has been around for more than a century. In the 1890s, electric cars were more popular than gas-powered autos because of their simplicity, reliability, and low cost of operation. In fact, Henry Ford’s wife drove an EV. For a variety of reasons, EV technology languished with the rise of gas-powered engines, but today, EVs - once again—are charging to the auto transportation forefront. This resurgence is fueled by significant advancements in power electronics and energy storage technologies.



## WHAT DO THE TERMS MEAN?

We are most familiar with conventional combustion-engine vehicles, the standard for many years. The market is changing, and it's hard to keep up with the newest technologies, models, nomenclature and more. For simplicity, this continuum separates the options into four basic types of vehicles. In our listing, the range is from most to least amount of fossil-fuel used in operation.

1. Conventional vehicles have an internal combustion engine; the most common fuels are gasoline and diesel.
2. Hybrid vehicles have both a gasoline engine and an electric motor and battery; both gas and electricity power the wheels. The electric motor and battery are designed to improve fuel economy, so less gasoline is used to operate the vehicle. The battery is charged solely by operating the vehicle; no plug-in is required or possible.
3. Plug-in Hybrid Electric Vehicles (PHEVs) have larger batteries than hybrids and use both gas and electricity to power the wheels of the car. These vehicles vary in their electric range, but shift to gasoline-only operation when battery power is depleted. These vehicles must be plugged in to recharge the battery.
4. Battery Electric Vehicles (BEVs) are powered solely by electricity and are recharged by plugging in the vehicle.

## WHAT IS THE COST TO OWN AND OPERATE AN EV VS. A GAS-POWERED CONVENTIONAL VEHICLE?

It's hard to compare apples to oranges. While battery electric vehicles and plug-in hybrid electric vehicles may have a higher purchase price, that can be at least partially offset by lower operating costs and incentives for battery-containing vehicles.

Touchstone Energy has calculated the annual energy costs and savings for owning electric vehicles vs. gas-powered vehicles. Assumptions include: driving the vehicle 15,000 miles a year, with 225 days of 50 miles each, and 50 days of 75 miles each. EPA fuel economy numbers and average costs of energy as reported by the U.S. Energy Information Agency were used.

### Comparison method 1:

Comparing electric vehicles to a hypothetical gas-powered vehicle that gets 25 mpg; this gas-powered vehicle would cost approximately \$1,320 for gas per year. In this comparison:

- A typical BEV would save \$730 in annual energy costs per year; electricity costs would be less than half the cost fuel for the gas-powered vehicle.
- A typical PHEV would save \$600 per year when combining the cost of gas plus the cost of electricity to operate the vehicle.

### Comparison method 2:

Several manufacturers produce both gas and electric versions of the same - or similar - vehicle (Ford has BEV and gas versions of the Focus as well as gas, hybrid and PHEV versions of the Fusion; Hyundai has gas, hybrid and PHEV versions of the Sonata; and Nissan has the Leaf and a somewhat comparable Versa). In comparing the gas vehicles with the electric versions, Touchstone Energy makes these comparisons of products by the same manufacturer:

- BEVs offer the lowest annual energy costs (running \$570 to \$600 per year). That is a savings of \$370 to \$490 over the conventional gas-powered "sibling."
- PHEVs offer reduced annual energy costs of \$600 to \$800 per year. That saves \$300 to \$370 over the conventional gas-powered "sibling."

### Other considerations to add into the calculations:

- Tax credit. Most BEVs receive a \$7,500 credit, while PHEVs generally get somewhat less. The credit is based on the battery size. Note that the battery installed in hybrid vehicles is too small to qualify for a tax credit.
- Other incentives. Some states and cities have additional credits or perks for electric vehicles.

**Lower maintenance costs:** Most BEVs have much lower maintenance costs, because of the simplicity of the design and components (fewer moving parts, etc.) PHEVs are more complex, with have both gas and electric components, but some maintenance costs can be lower. For example, regenerative braking leads to less wear on the brake system.

## RESOURCES FOR FURTHER INFORMATION

These sources of information may help as you explore options for the purchase or lease of a BEV, PHEV or hybrid.

- Consumer Reports has several articles about electric vehicles.

Check out “The Guide to All Your Electric Car Questions” (<http://www.consumerreports.org/cro/2013/03/electric-cars-101/index.htm>) and “Why Buy a Hybrid or Electric Car.” (<http://www.consumerreports.org/cro/cars/hybrids-evs/buying-guide.htm>)

- Green Car Reports published an article defining the various types of electric vehicles.

([http://www.greencarreports.com/news/1098066\\_electric-cars-defining-battery-electrics-plug-in-hybrids-range-extended-more](http://www.greencarreports.com/news/1098066_electric-cars-defining-battery-electrics-plug-in-hybrids-range-extended-more))

- Plugincars.com provides a list of electrically powered cars, along with pricing and other details. (<http://www.plugincars.com/cars>)

- EVObsession includes information on electric vehicles, including an article on charging that includes info on types, networks, and apps. (<http://evobsession.com/electric-car-charging-101-types-of-charging-apps-more/>)

- To find charging stations nationwide, check out Plugshare, (<http://www.plugshare.com/>) ChargeHub (<https://chargehub.com/en/charging-stations-map.html>) or U.S. Department of Energy Alternative Fuels Data Center ([http://www.afdc.energy.gov/fuels/electricity\\_locations.html](http://www.afdc.energy.gov/fuels/electricity_locations.html)).

For Tesla charging network options only, see Tesla’s guide. (<https://www.tesla.com/supercharger>)

- To compare the total (or true) cost of ownership, or to find calculators on driving for various types of vehicles, there are several resources available, including Edmunds ([www.edmunds.com/tco.html](http://www.edmunds.com/tco.html)), U.S. Department of Energy (look for the Electric Drive Cost Calculator on this site) (<http://www.afdc.energy.gov/vehicles/electric.html>) and Carbon Counter (a chart based on a study by MIT). [www.carboncounter.com](http://www.carboncounter.com)

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