

Should I buy an alternative vehicle?

By Douglas G. Tiffany, University of Minnesota Extension educator
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There are many factors to consider when buying a new car: price, miles per gallon, environmental impact, maintenance costs, interior space, ride, personal taste and more. The availability of hybrids, electrics, and other alternative vehicles can complicate this decision even further for many people.

An Excel spreadsheet was developed to help you organize your thinking as you consider the purchase of an alternative or conventional vehicle. Car purchase decisions are highly personal, and there are no absolute answers to be determined from using this tool. In the end, you may have excellent reasons for choosing a car which will cost you more; however, this tool should help you perform analysis to support your decision.

How it works

1. Enter information in the yellow cells for each type of vehicle you are considering. For vehicle types you do not wish to consider, leave the columns of yellow cells blank. As you enter the key figures for each type of car, results are shown in the graph at the right.
2. The tool calculates **differences in costs of ownership and operation** and **differences in greenhouse gas emissions**.
3. Experiment with various scenarios and see how the graph responds. For example, note the effect of higher gasoline prices and miles driven per year on the costs of ownership and operation of the various vehicles.

Input factors

Listed below are the cells (shaded yellow) in which you can enter data. Default values currently populate the yellow-shaded cells.

Car pricing and performance assumptions

- Purchase price of conventional car—default value is set at \$19,000
- Purchase price of hybrid car—default value is set at \$24,000
- Purchase price of electric car—default value is set at \$34,780
- Purchase price of extended range electric car—default value is set at \$43,000
- Amount of down payment, if financed—default value is set at \$5,000
- Interest rate charged on car loan—default value is set at 5%

- Availability of an income tax credit on a new hybrid—see [this IRS page](#) to determine if the model you are considering is eligible for this credit; default value is set at \$8,500 for the two electric models, assuming \$7,500 for the car and \$1,000 for its charging station.
- Cost of battery service in year 8—default value is set at \$2,000 for the hybrid and \$8,000 for the extended range electric vehicles. Used batteries are currently available from salvaged vehicles for prices at half those costs. Battery life has been an infrequent issue for hybrid and electric vehicle owners, to date.
- Miles per gallon of gas expected for the conventional car—default value is set at 29
- Miles per gallon of gas expected for the hybrid car—default value is set at 45
- Miles per kilowatt-hour is 4.0 in electric mode for the electric vehicle and extended range electric vehicle
- Miles of annual driving expected—default value is set at 15,000

Gasoline price and discount rate assumptions

- Price of gasoline represents an average gasoline price for the 15-year life of the car—default value is set at \$4.00
- Price of premium gasoline that is needed for the extended range electric vehicle is assumed to be \$.25 higher than regular unleaded gasoline.
- Price of residential electricity purchased is assumed to be \$.0974 in Minnesota. You can enter alternative prices for other states. Consult the tab "ElectPrices" for your state's average price.
- Cost of gasoline engine maintenance is assumed to be \$60.84 every 3,000 miles, including oil, antifreeze, and service.
- Discount rate you consider appropriate for your money—this number represents the rate of return you expect on your money; default value is set at 6%.

Still have questions? Contact Extension educator Douglas Tiffany at tiffa002@umn.edu or 612-625-6715.

What do my results mean?

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There are many lessons to be learned by using this tool and experimenting with various input factors. Most users should focus on the following key factors:

- price differences between the conventional, hybrid, electric, and extended range electric cars
- the differences in mileage per gallon performance of the four vehicle types
- the expectation of gasoline price for the life of the car

- the number of miles per year that you expect to drive

For a range of input factors, it is often necessary for the owner to drive the car for many years until the savings in gasoline overcome the higher purchase price of hybrids or extended range electrics. The assumption of higher gasoline prices is helpful when trying to recover the additional costs of alternative vehicles. The effect of an income tax credit, if available on a new car purchase, can be readily determined in the spreadsheet. The number of miles driven per year is also a critical variable in determining whether or not an alternative vehicle can be cheaper to own and operate at some point during its expected fifteen year life.

Electric vehicles may not be appropriate for some owners needing to take longer trips; however, electric vehicles have very low operating costs and are very efficient in converting the energy flowing from their batteries to motion. Consumers probably focus too much on the daily price changes of gasoline because they are reminded of these prices everywhere they go and each time they refill their tanks. However, in terms of the effect on total accumulated discounted cost, the costs of ownership typically have a greater impact than fuel costs.

Fuel prices for the life of the car

At the time this content was prepared, July 2011, retail gasoline is selling for \$3.80 per gallon at a time when crude oil is around \$100.00 per barrel. As the world economy recovers, we should expect that prices of crude oil and gasoline will rise. Electricity prices are unlikely to be as volatile as gasoline because U.S. electricity is largely produced from cheap coal, cheap natural gas, and veteran nuclear power plants. In addition, if climate change legislation is enacted, additional taxes or emissions fees will be added to the price of gasoline and electricity to encourage consumers to reduce their use of energy sources that contribute to the production of greenhouse gases (GHG) that are responsible for global warming. Owners of electric vehicles will often be offered favorable prices for power purchased at off-peak times by their utilities. Some electric vehicle owners may elect to pay more for wind or other renewable energy, if offered this option by their utility.

Understanding your desire to reduce your carbon footprint

The green-shaded area of the input/analysis sheet quantifies monthly costs of gasoline and ownership for the first five years and shows the differences in gasoline usage and GHG emitted. If the car buyer chooses to buy an alternative vehicle when its monthly costs are higher than the conventional vehicle, the spreadsheet calculates the effective rate of tax per metric ton of CO₂ that the car buyer is effectively paying by buying and operating an alternative vehicle. If negative figures are shown in expenditures per month or in terms of effective carbon tax, the use of a hybrid or electric vehicles lower total monthly costs of ownership and operation in that scenario. In such a case, consumers "pay" a negative tax or receive a financial benefit by buying and operating an alternative vehicle versus costs associated with a conventional vehicle.