Hybrid Vehicle Technology Information Report

What you need to know about Hybrids:
Hybrid technology comes in many forms, and not all hybrids are ultra efficient. Our data shows that full-hybrids (those capable of driving on electric power alone for at least short distances) yield the biggest improvements in fuel economy.

All that technology comes at a price, though. Hybrids usually cost more than comparable conventional cars, although the cost difference is often not prohibitive and in many cases the expenditure is offset by energy savings. The cost of a plug-in hybrid is about $3,000 to $5,000 more than an average comparable vehicle. A very efficient car and one in high demand on the resale market, you can come out ahead financially over a short ownership period. But some other hybrids come with lots of extra luxury features and sometimes a fancy nameplate that don't contribute to fuel economy, but do add significantly to the price. If you pay more than about $5,000 above the cost of an equivalent conventional vehicle, it will be hard to save enough fuel to recoup the extra costs, even at high gas prices.
Hybrids' main competition comes from diesel, which gets similar mileage improvements at a similar cost, albeit often with costlier fuel.

Electric Cars:
Electric cars are very efficient, but can travel only short distances before their battery has to be recharged, a process that can take several hours. Electric vehicles (EVs) today cost thousands more than conventional cars, although much of that expense is offset by federal and provincial tax rebates, and automaker incentives.

The selection is limited, and many electric cars are sold only in certain regions of the country, so where you live may well determine what type of electric car you buy. Different regions of the country are also better suited to using electric cars. Some have more services available within electric cars' short range and more favorable electric rates.

Hybrid Technologies:
Hybrids combine the power of a gasoline engine with an electric motor and batteries in a variety of ways, some more efficient than others. The hybrids with the best gas mileage tend to be full hybrids. Newer, plug-in hybrids allow you to burn even less gas by running exclusively as electric cars for some distance. There are several significant variations that we'll explain in detail.

Parallel vs. Series Hybrids:
Most full hybrids use a parallel design in which either the gas engine or the electric motor alone can drive the wheels, or they can work in unison. Hybrids can also have a series configuration, in which primarily the electric motor drives the wheels, although the gas engine may generate electricity for the motor or provide power directly as needed.

Full Hybrids vs. Mild Hybrids:
Full hybrids can run for a limited time on electricity alone, and they use the gas engine to travel longer distances and/or at higher speeds. Mild hybrids are the opposite of series hybrids. Only the gas engine turns the wheels and the electric motor's role is limited to boosting power to take some load off the gas engine and

improve fuel economy. Only full hybrids can be designed to plug in and act as full electric cars.

Plug-in Hybrids:
Plug-in hybrids can (and should) be charged from the wall to work as electric cars some of the time. They normally use their electric range of 15 or 40 miles up front and then switch to normal hybrid operation whether they happen to be a parallel or series hybrid design. Plug-in hybrids allow you to recharge the batteries and maximize electricity use, running solely on electricity until the battery charge runs down. Should your trips, or commute, be within the electric-only range, plug-ins can provide the benefits of a pure electric car, while having the engine available for longer trips without worries about getting stranded.

Full Electric:
Studies show that most drivers travel less than 40 miles a day, making even a short-range electric car capable enough for most urban dwellers or families in need of a second car. Finite battery storage and long recharge times, however, limit their appeal for many. Most EVs have a real-world range of 60 to 100 miles, though the range depends heavily on driving style and speed. Unlike gasoline cars, EVs get better range in stop-and-go traffic than on fast highway runs.

Even long battery charge times are starting to come down, though the quickest-to-charge full electrics still need about 3-1/2 hours to recharge fully using a 240V charger. Some EVs have quick-charging capability that allows a nearly empty battery to be charged to 80 percent or so of its capacity in 30 minutes or less using a special 480-volt charger. However, this sort of charging is rough on the battery and most EV manufacturers only recommend quick charging in a pinch.

Fuel Cells:
A fuel-cell car is an electric car that produces its electricity on board. Fuel cells generate electricity from hydrogen (the most abundant chemical element on Earth) through an electrochemical reaction whose only major byproduct is water. But the cars require pure hydrogen, which does not occur naturally. Hydrogen is almost always bound up in minerals, hydrocarbons, or water and has to be extracted. One option is taking electricity from a nonpolluting source such as solar, wind, or hydropower and using it to split water into its hydrogen and oxygen components. The problem here is that it takes more electricity to make the hydrogen than the hydrogen generates in a fuel cell. Another problem is that hydrogen gas carries very little energy per cubic foot, so it has to be stored in a car at very high pressures up to 10,000 psi.

Several automakers, including Hyundai, Toyota, and Honda, have rolled out fuel-cell cars to the public in California in 2015. These are essentially electric cars with a range of 200 to 300 miles per refill and relatively short refill times of five to 10 minutes. These cars are pleasant to drive, typically with punchy and silent acceleration off the line. But as nice as the cars are, widespread use of fuel cells remains a long way off. Challenges to producing and distributing hydrogen in large quantities are enormous, and no companies have yet committed to developing such a large new infrastructure nationwide.