

The Hybrid

A hybrid car uses two types of energy or fuel to move. When people say hybrids, they are usually referring to gasoline-electric hybrids, but a hybrid can mean any two different fuels. Hybrid train engines use diesel and electricity while hybrid submarines use nuclear energy or diesel and electricity.

Hybrid Technology

Regenerative Braking

Nearly all of the new hybrids incorporate regenerative braking. In an average car, around 5% of the energy is lost in braking. Regenerative braking reclaims this energy before it is lost and puts the energy back into the batteries. During braking, the motor acts as a generator, transferring energy from the wheels to the batteries to stop the car.

Electric Motor Assist

In an all gas-powered car, the engine is chosen for peak performance when you need a lot of power. In a hybrid, the engine is chosen based on average driving performance. It is smaller and more efficient. When a hybrid needs more power, such as climbing steep hills, the motor assists the engine in supplying power to the wheels.

Automatic Start/Stop of Engine

When your gas-powered car is stopped at the drive-through waiting for your food, up to 6% of the car's energy is lost while the engine is idling. With automatic start/stop, the car's computer turns off the engine when you are stopped and then turns it back on when you are ready to move.

Plug-In Hybrids

What if you have a short commute to work or school, but occasionally take longer road trips? A hybrid that plugs into the electrical grid could be the solution. For driving around town, the car would run on electrical energy. For a long trip, the gas tank would supply the energy to run the engine to generate electricity for the motor.

For More Information, Visit:

<http://www.howstuffworks.com/hybrid-car.htm>

<http://www.fueleconomy.gov/feg/hybridtech.shtml>

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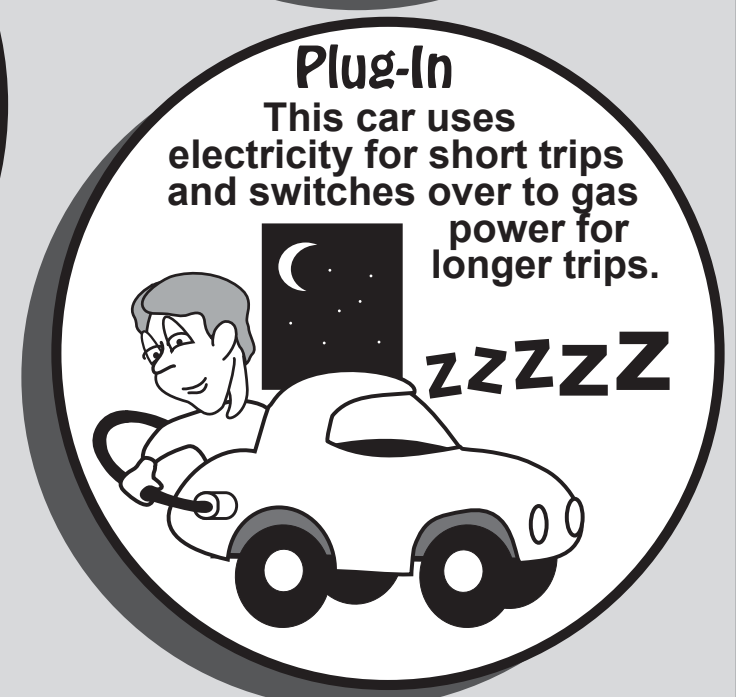
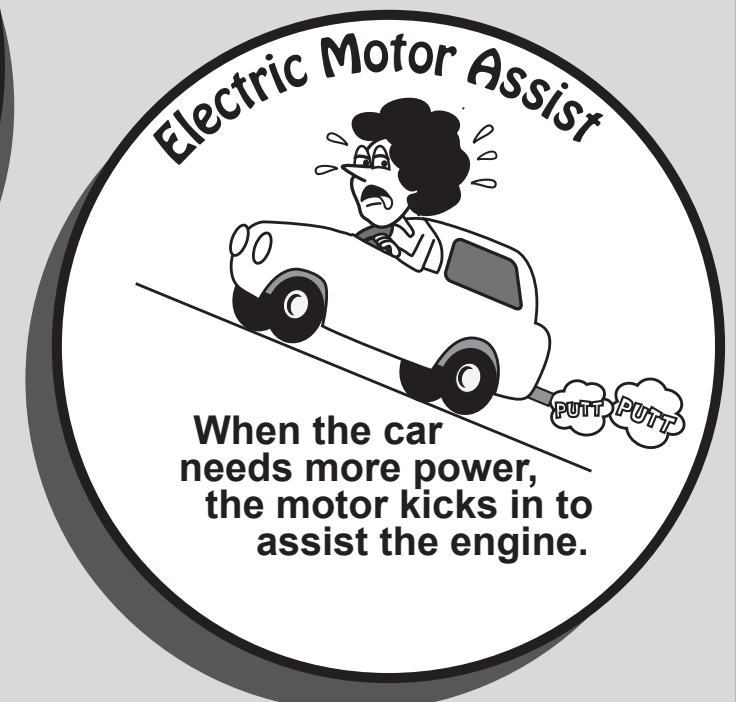
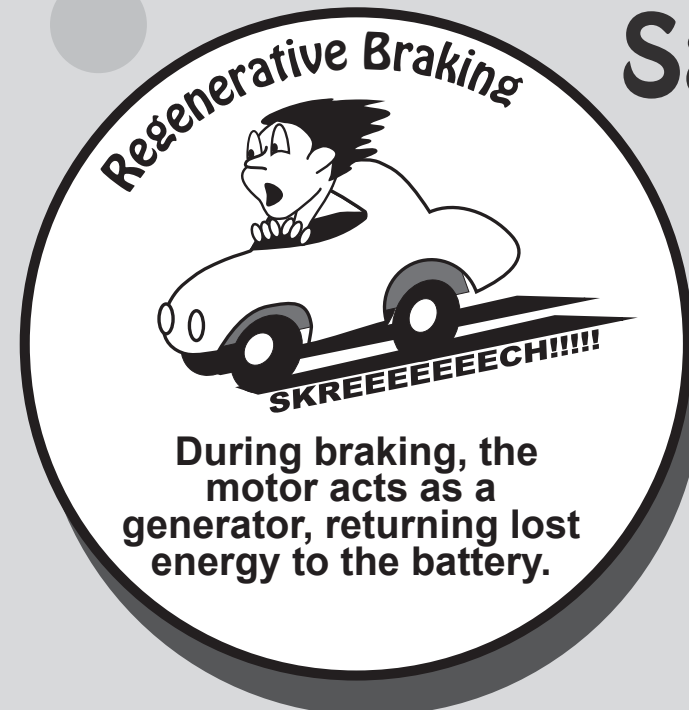
illustrated by Dennis Smith

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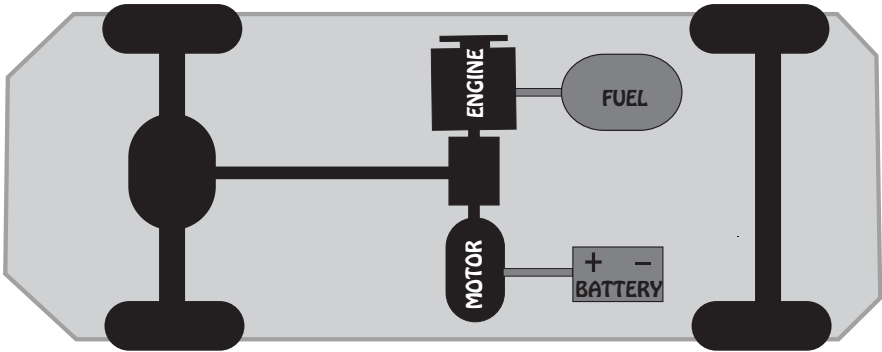


Unplugged: Say "Hi" to the Hybrid



Parallel Hybrid

In a parallel hybrid, both the engine and the motor are connected to the wheels. The motor operates at low speeds when the engine is least efficient and can also provide extra power to the car when going uphill. To start the motor, you have to complete the electric **circuit** by turning the key or pressing the ignition button. A circuit is a closed loop through which an electrical current can pass. Want to know more about circuits? Try this:

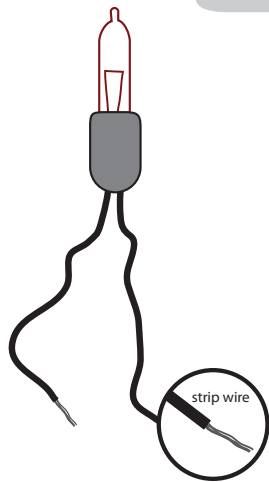


Build a Circuit

You will need:

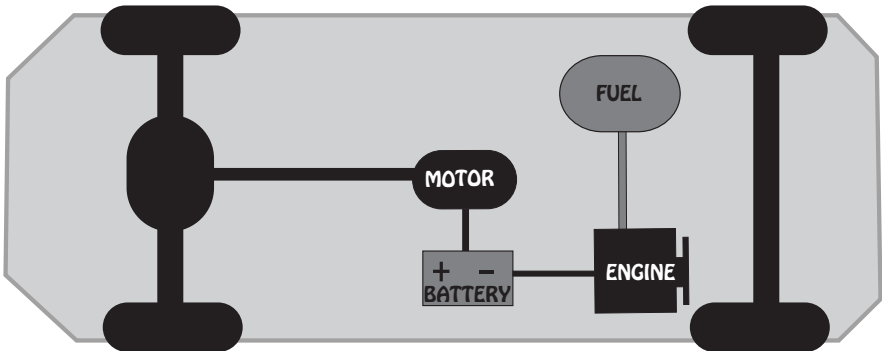
D battery, string of Christmas tree lights, wire cutters, paper, pencil

- Cut one bulb from the string, keeping a length of wire on each side.
- Strip the ends of the wires.
- Connect the wires to the battery. Experiment with different ways of making the connections.
- Can you make the bulb light up? If so, congratulations, you have completed a circuit!
- Can you turn the light off and on? If so, congratulations again, you have created a switch!
- Draw two diagrams, one that makes the bulb light and one that doesn't. What does a circuit need in order to work?



Series Hybrid

In a series hybrid, also called an extended range electric vehicle, only the motor powers the wheels. The engine acts as a **generator**, producing power which is used for the motor or stored in the batteries for later use. Want to know more about generators? Try this:



Build a Generator

You will need:

3-in. x 12-in. piece of cardboard, tape, 3-in. nail, 4 small, round ceramic magnets, 200 ft. of #30 magnetic wire, 1 LED (1.5 V or less), sandpaper

- Fold the piece of cardboard into a rectangular box. Two sides of the box will be about 3 inches long and the two other sides will be about 1.5 inches long.
- Using the nail, poke a hole straight through the center of the box, all the way through so the nail comes out the other side.
- Wiggle the nail a bit up and down and back and forth so that it moves freely in the hole.
- Check to see if your box is big enough. While the nail is through the box, place the magnets around the nail, inside the box. Make sure you can turn the nail without the magnets hitting the cardboard.
- Scrape the insulation off one end of the wire. You will need enough room so that you can twist the wire around the LED wire.
- Leave about 3 inches of wire free. Start wrapping the wire around the box or tube. You need to do this about 400 times.
- When you stop wrapping, leave about 3 inches of wire free. Scrape the insulation off that end of the wire.
- Connect the LED to the wires -- one LED wire at one end of the wire you wrapped and one end at the other end.
- Spin the nail as fast as you can! The LED should light up. If it doesn't, try spinning the other way.

