What's the greenhouse effect?
Excess carbon dioxide in the air traps the Sun's heat in the Earth's atmosphere like the plastic wrap does over your covered environment. This contributes to "climate change," an average increase in temperatures near the Earth's surface and in the lower part of the atmosphere.

Where does coal come from?
Coal is a fossil fuel that formed over hundreds of millions of years as plants died, were compressed and decomposed. Your activity simulates that slow pressure on the leaves and shows how much change occurs in only a few weeks. Coal is considered a non-renewable resource because it takes so long to make it.

What happens in a landfill?
You are seeing decomposition in action. Some of the objects you buried are breaking down and turning back into soil. Others may not have changed much at all. Objects that don't readily decompose are better off recycled or reused. Visit scientificamerican.com and search "landfill" to find out more about how landfills are constructed. Below are estimates for different objects' decomposition times.

Banana Peel	3-4 weeks
Newspaper	1-2 months
Cotton Rag	2-5 months
Plywood	1-3 years
Aluminum Can	80 years
Plastic Bottle	400 years
Styrofoam	Never

What does green mean?
In order to be environmentally friendly, it's important to consider the impact a product has over its entire lifetime. Electric vehicles are "green," not just because they don't burn gasoline, but also because electric motors use energy more efficiently than combustion engines and electricity can be made from renewable resources like solar and wind as well as fossil fuels.

Design. Every product begins with the design process: people decide how it should be made, how it will look and how it will work. Electric vehicles are designed to be lightweight and aerodynamic. Batteries can't store as much energy as gasoline can, so electric vehicles can't travel long distances unless they are designed to use less energy.

Materials. Materials can be taken from the environment or made from recycled or reclaimed products. Electric vehicles are made from metals and plastics. Their batteries usually require lithium, a metal that must be mined. The amount of lithium that is available on Earth is limited. The mining process doesn't have many byproducts, but it does use large amounts of water.

Electrical Energy. The process of making electricity from fossil fuels can pollute air and water. Scientists believe this is one cause of climate change, so they are pursuing processes that have less impact on the environment, using renewable resources like wind and solar. Electric motors are more energy-efficient than internal combustion engines and use less fossil fuel overall, even if the electricity comes from a non-renewable resource.

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Funded by a Grant from the U.S. Department of Energy

Unplugged: The Green Story for the Blue Planet

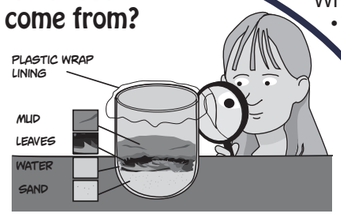
Why is a greenhouse warm?

You will need:
2 clear plastic containers with open tops, soil, rocks, ice, 2 thermometers, clear tape, plastic wrap, bright sunshine, timer, paper, pencil

- Using the soil, rocks and ice, create identical environments in each container.
- Tape a thermometer to the inside of each container, making sure it is not touching the dirt..
- Cover the top of one container with plastic wrap.
- Write a description of the contents of each container and record the two starting temperatures.
- Put the containers next to each other in bright sunlight.
- Record the temperature every minute for 30 minutes. What do you observe?
- Record changes in the two environments. What would you expect to happen if these conditions continue?

Where do fossil fuels come from?

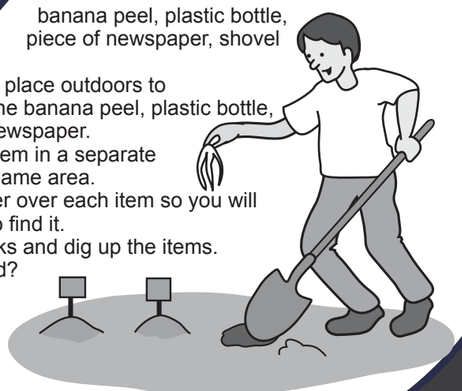
You will need:
2-liter bottle with the top cut off, plastic wrap, water, sand, small leaves, ferns, twigs, mud, newspaper



- Line the bottle with plastic wrap so that the edges extend over the top.
- Add a layer of sand and cover it with an inch of water.
- Add a layer of small leaves, ferns, and twigs.
- Check the bottle once a week and record any changes.
- After a few weeks, add a thick layer of mud on top of the leaf layer.
- Continue to record changes until the layers begin to dry out.
- Carefully grab the edges of the plastic wrap and lift everything out of the bottle in one piece, onto newspaper, draining off the water.
- Let the layers dry and harden. What happened to the leaves? Why?

What happens in a landfill?

You will need:
banana peel, plastic bottle, piece of newspaper, shovel



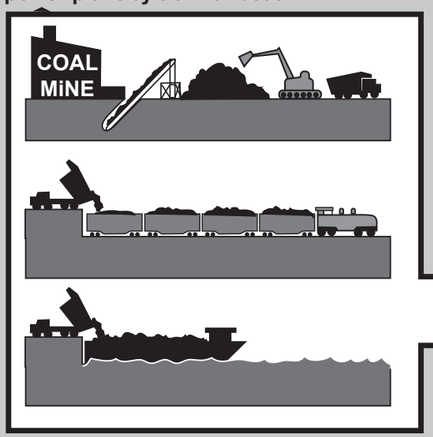
- Find a place outdoors to bury the banana peel, plastic bottle, and newspaper.
- Bury each item in a separate hole in the same area.
- Place a marker over each item so you will know where to find it.
- Wait a few weeks and dig up the items. What happened?

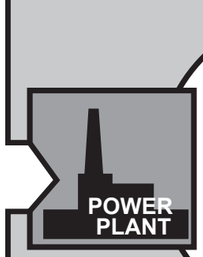
See if you can match each item below with the time it takes for it to decompose.

Banana Peel	2-5 months
Plastic Bottle	Never
Styrofoam	80 years
Plywood	1-2 months
Cotton Rag	3-4 weeks
Aluminum Can	400 years
Newspaper	1-3 years

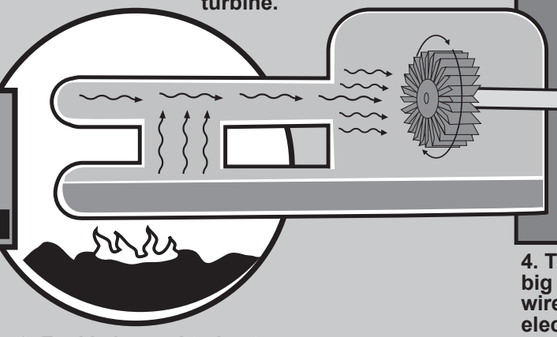
Where does electricity come from?

1. Coal is dug up in a mine and sent to a power plant by train or boat.

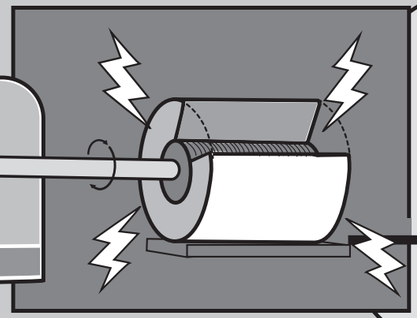




2. Fuel is burned to heat water to make steam.

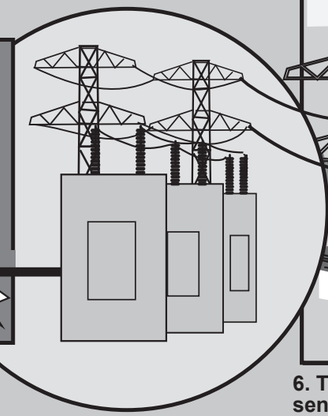


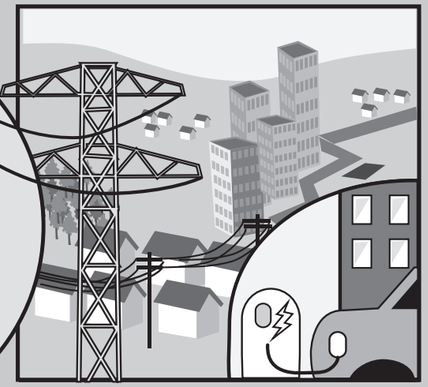
3. Inside a generator, the steam spins a big fan called a turbine.



4. The spinning turbine rotates a big magnet around a length of wire, creating a magnetic field that electrifies the wire.

5. The electric current flows through the wire and is pushed out of the power plant through high-voltage transformers.





6. Transmission lines and distribution lines send electricity across the country to homes, businesses and charging stations where electric vehicles are plugged in to recharge their batteries.

How does using electricity impact the environment?

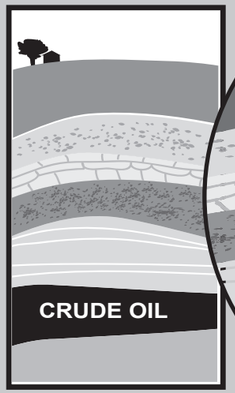
Electric vehicles do not have any emissions at all, so they are a much cleaner option for the environment than internal combustion engines. Burning fuel at power plants releases air pollutants and carbon dioxide, contributing to the greenhouse effect which causes climate change. Techniques for storage and re-use of carbon dioxide are being tested to find an effective way to reduce this impact.

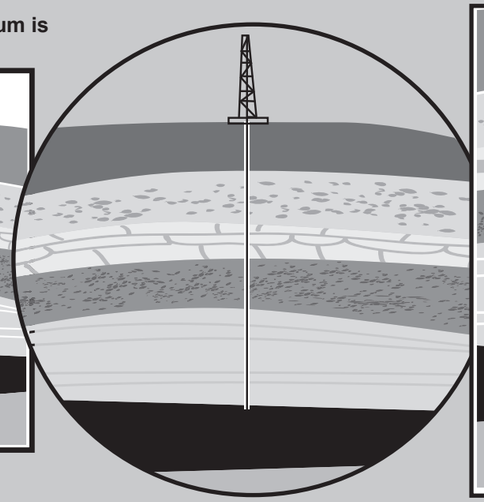
How can we produce electricity if we run out of coal?

We are already using natural gas, nuclear power, and energy from wind, water, and the sun to produce electricity.

Where does gasoline come from?

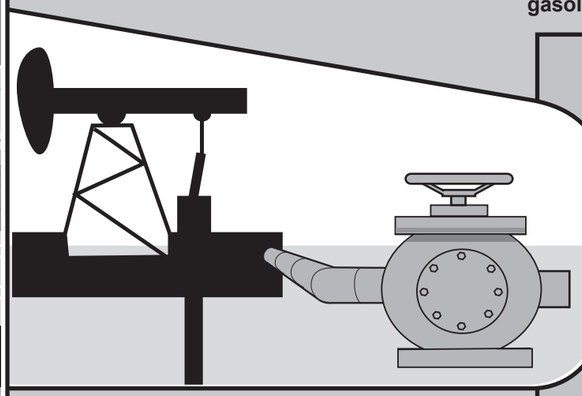
1. Crude oil or petroleum is found in porous rock.





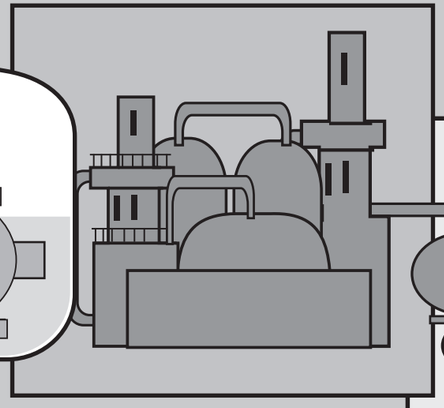
2. When a possible crude oil reservoir is found, the area is test drilled to see if there is enough usable oil to set up a well there.

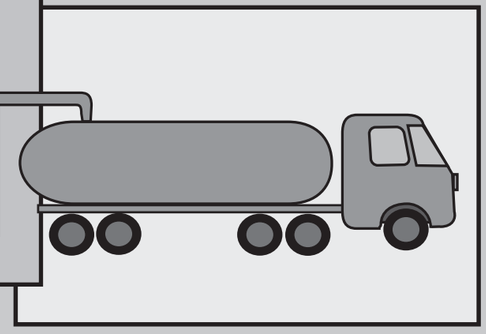
3. Wells are drilled 1,000 feet deep into the rock.



4. Pipes and valves are installed to remove the oil using the natural pressure inside the well.

5. Crude oil is sent to a refinery where its long chains of molecules are separated from the smaller chains of refined fuels including gasoline.





6. Trucks are used to transport gasoline to gas stations where vehicles with internal combustion engines get their fuel.

How does using gasoline impact the environment?

Burning gasoline in internal combustion engine vehicles releases air pollutants and carbon dioxide, contributing to the greenhouse effect which causes climate change.

How can we make gasoline if we run out of petroleum?

We can't. That's one of the reasons switching to electric vehicles makes sense. Scientists are experimenting with biofuels made from soybeans, oils and algae as alternatives to gasoline.