

GOAL:

Visitors will discover that we can find power in many different sources, including both common and uncommon materials.

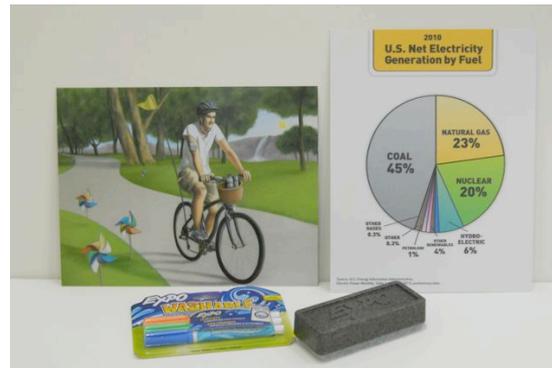
MATERIALS:

- Cyclist scene graphic
- Washable dry erase markers
- Eraser
- Sources of Power pie chart graphic

PROCEDURE:

Set-up:

1. Lay out all materials. Make sure any previous marks on the cyclist scene graphic have been erased.



Doing the demonstration:

1. Ask visitors to think of all the things in their daily lives that use electricity. Ask visitors what they think electricity is. Explain that electricity is a form of energy created by the motion of charged particles, such as electrons.
2. Explain that we can create electricity in many different ways by converting other types of energy (or power) into electricity. Show them the unlabeled side of the cyclist scene graphic and ask a visitor to use the dry erase marker to circle things in the picture that represent sources of power. There are eight sources of power in the picture; a possible approach is to challenge the visitor to identify three.
3. Once the visitor has circled their guesses, explain that there are many different ways to make electricity. Flip the graphic to the labeled side, and first explain the sources that the visitor has identified.
4. Identify and explain the other sources of power.
5. Explain that in addition to making electricity, we can also “find” more power by developing technologies and products that use less electricity to begin with, or at least use it more efficiently. Identify the light bulb as an example.
6. Tell visitors that 23% of all electricity is consumed inside the home. Ask visitors to share the kinds of things they do to try to use electricity more efficiently and not be wasteful.



7. Show visitors the Sources of Power pie chart graphic. Ask them what they notice about the percentages. Which is the greatest/least? Which sources represent clean energy? Renewable energy? Do they think these percentages need to change in the future, and if so, why? How? (Note: Do not provide an answer or opinion about the last questions. These are asked simply for visitors to consider.
8. Conclude by acknowledging that these are difficult questions and that finding energy sources for the future is a big challenge – it's important for everyone to learn more about where power is hiding so we can be smarter about how we use it.

Clean-up:

1. Erase marks, gather all materials and return to storage.

EXPLANATION:

There are eight sources of power in the picture:

- **Fuel-powered turbines** use the energy from a variety of fuels (including coal, natural gas, nuclear, biomass, and geothermal) to spin a turbine and produce electricity. This principle is illustrated in the picture by the cyclist using his energy to create mechanical motion, similar to what burning fuels are used for.
- **Wind turbines** are represented by the pinwheel. Wind spins turbines directly without the need for a separate fuel.
- **Hydropower** is represented by the waterfall. Water can also spin turbines directly without the need for a separate fuel. Hydropower, wind turbines, and fuel-powered turbines all represent converting mechanical power to electricity.
- **Solar power**, represented by the sun, converts energy from the sun into electricity.
- **Batteries**, represented by a portable music player that runs on battery power, transform chemical energy into electricity.
- **Thermoelectricity**, represented by the thermos and the water bottle, converts temperature differences into electricity.
- **Piezoelectricity**, represented by the moving flag on the back of the bike, uses changes in the shape of materials (such as special fabrics) to produce electricity.
- Finally, the eighth "source" of power is **efficiency** (including conservation), or finding more power by reducing our energy use and increasing the efficiency of technology. This is represented in the picture by the bike light; many bike lights use energy-efficient LEDs.

The vast majority of electricity generation in the United States comes from fuel-powered turbines (in 2010: 45% coal, 23% natural gas, 20% nuclear, <1% biomass, <1% geothermal). Hydropower is the largest source of renewable energy, producing 6% of the country's electricity. Wind power and solar power are each responsible for <1% of U.S. electricity generation. As residential energy use makes up 23% of the country's total energy consumption, our personal decisions about conservation and efficiency can have a significant impact.

Batteries, thermoelectricity, and piezoelectricity do not significantly contribute to electricity generation through the power grid, but they each have very important applications. Batteries are found in anything that requires stored energy, from portable electronics to cars. Thermoelectric materials are used to convert waste heat into electricity, for example at power plants. Piezoelectric materials are used in many sensors and are being researched for ways to create electricity by harvesting the energy from human movement.

WHAT COULD GO WRONG?

Make sure you use **washable** dry-erase markers to avoid making permanent marks on the graphic.