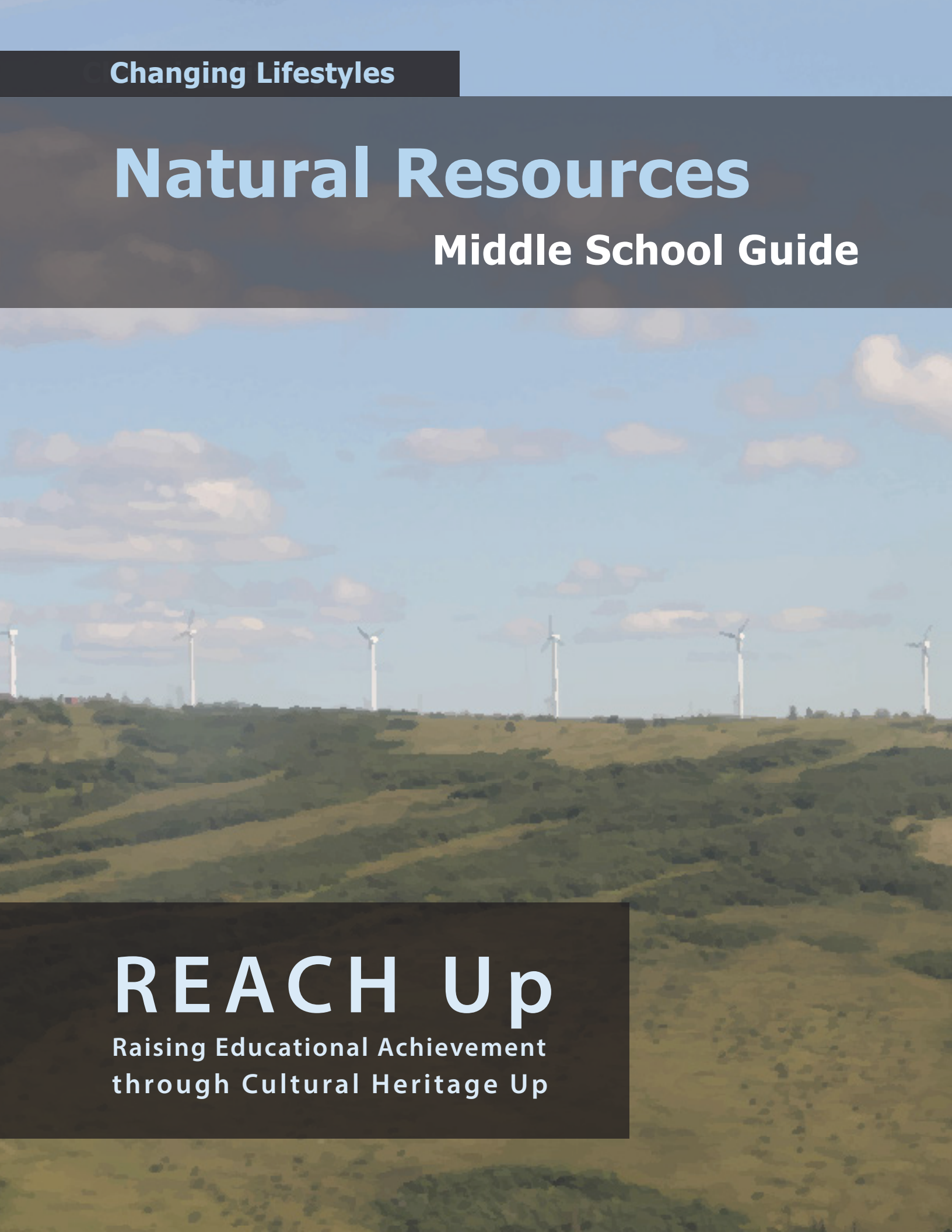
Changing Lifestyles

Natural Resources

Middle School Guide



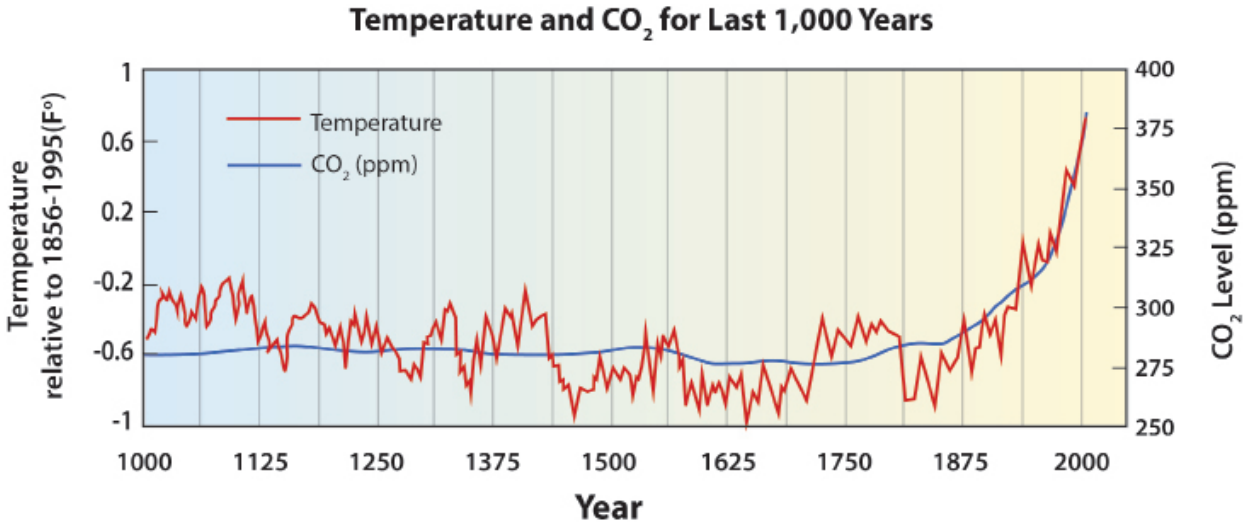
REACH Up

Raising Educational Achievement through Cultural Heritage Up

Climate Change and Carbon Dioxide

Carbon dioxide (CO_2), like water vapor and methane, is a greenhouse gas that contributes to the warming of our global climate. It is naturally produced by volcanic eruptions and forest fires, as well as by the breathing of people and animals. It is also produced by burning any type of fuel. During the last two centuries, global carbon dioxide levels have increased.

The graph below shows that carbon dioxide in the atmosphere increased significantly starting in the 1800s. This coincides with the Industrial Revolution, when people began making things in factories. The factories burned coal and wood to run their machines, and contributed carbon dioxide to the atmosphere from their smokestacks.



Graph showing increasing temperatures and CO_2 levels, modified from an article by Bill Chameides, PhD., Duke University. Data sources for CO_2: Law Dome ice core and Mauna Loa air samples. Data source for temperature: NOAA. *Source: Environmental Defense Fund, 2007.*

Today we contribute carbon dioxide in many ways. The factories that make the products we use, the airplanes that transport us and deliver our packages, the furnaces and woodstoves that heat our homes, and the vehicles we drive all produce carbon dioxide.

Changing Lifestyles

The landscapes in the northern part of the world are changing as a result of the warmer climate. People in the Bering Strait region are adapting their lifestyles to adjust to these changes. Some are also making lifestyle changes to reduce the amount of carbon dioxide and other pollution they create, so that they do not further contribute to the greenhouse effect and warming of the climate. How does the warming climate impact lifestyles in your community?

What are Renewable and Nonrenewable Resources?

Natural resources are anything in the environment that humans use to meet their needs and wants. Natural resources can be either renewable or nonrenewable. A renewable resource is something that is always available or can be replaced quickly and easily. Wind is an example of something that is always available. A nonrenewable resource is something that cannot be replaced or is being used up faster than it can be replaced by natural processes. For example, oil was produced by natural processes, but these processes took millions of years.

We use resources for many things including producing the energy to heat homes, run vehicles, and produce electricity. Utilizing energy from resources can increase the amount of carbon dioxide produced.

Thinking about your Carbon Footprint

How much carbon dioxide does your lifestyle produce?

By calculating your Carbon Footprint, you can get some idea of how much your lifestyle affects the environment. There are many Carbon Footprint Calculators on the Internet. The website activity will ask you questions such as how big your house is, the type of vehicles your family uses, how often you travel by airplane, the number of electronic devices you own, the food you eat, and how much new clothing you buy each year.

Heating our Homes

In Alaska's cold climate, people use a lot of fuel to heat their homes. Homes heating methods include wood, fuel oil, and electricity. Trees are abundant in many parts of Alaska; wood is a renewable resource. Fuel oil comes from petroleum, which is nonrenewable. Electricity is produced in a power plant and most power plants are fueled by coal, which is nonrenewable.

Wood, fuel oil, and coal all produce carbon dioxide when burned and contribute to air pollution. You can reduce your carbon footprint by reducing the amount of energy used to heat your home. Turn the thermostat down to use less energy. Wear extra clothing and use an extra blanket if you feel chilly. A valuable tip for woodstoves is to plan ahead and burn dry wood. Dry or seasoned wood burns more efficiently and produces more heat than the same amount of green wood. Burning less wood creates less air pollution.

The good news is that Alaska ranks first in the nation in per capita spending on renewable energy. Renewable energy resources in Alaska include solar, wind, geothermal, hydropower, and biomass. These resources are abundant and always available. With the execption of biomass, they generate less air pollution than nonrenewable resources such as fuel oil and coal.

Ask an Expert

1. Watch the video *Impact on Energy* available at www.k12reach.org/videos.php.

2. Interview an elder or cultural knowledge bearer in your community. Some questions you may want to ask:
    - How did people heat their homes in the past compared to today?
    - What kind of food did people eat in the past and where did it come from?
    - What types of clothing did people wear in the past compared to today? Where did the materials come from?
    - How did people reuse materials in the past compared to today?
    - What natural resources did people in our community use in the past? What natural resources do people in our community use today?
    - How did people travel in the past compared to today? How often did barges and airplanes come to the village in the past compared to today?

3. If the person you interview speaks an Alaska Native language, ask them what language and dialect they are familiar with. Ask them to please translate the following words:
    - coal
    - fuel oil
    - gasoline
    - nonrenewable resource
    - renewable resource
    - water
    - wind
    - wood
    - woodstove

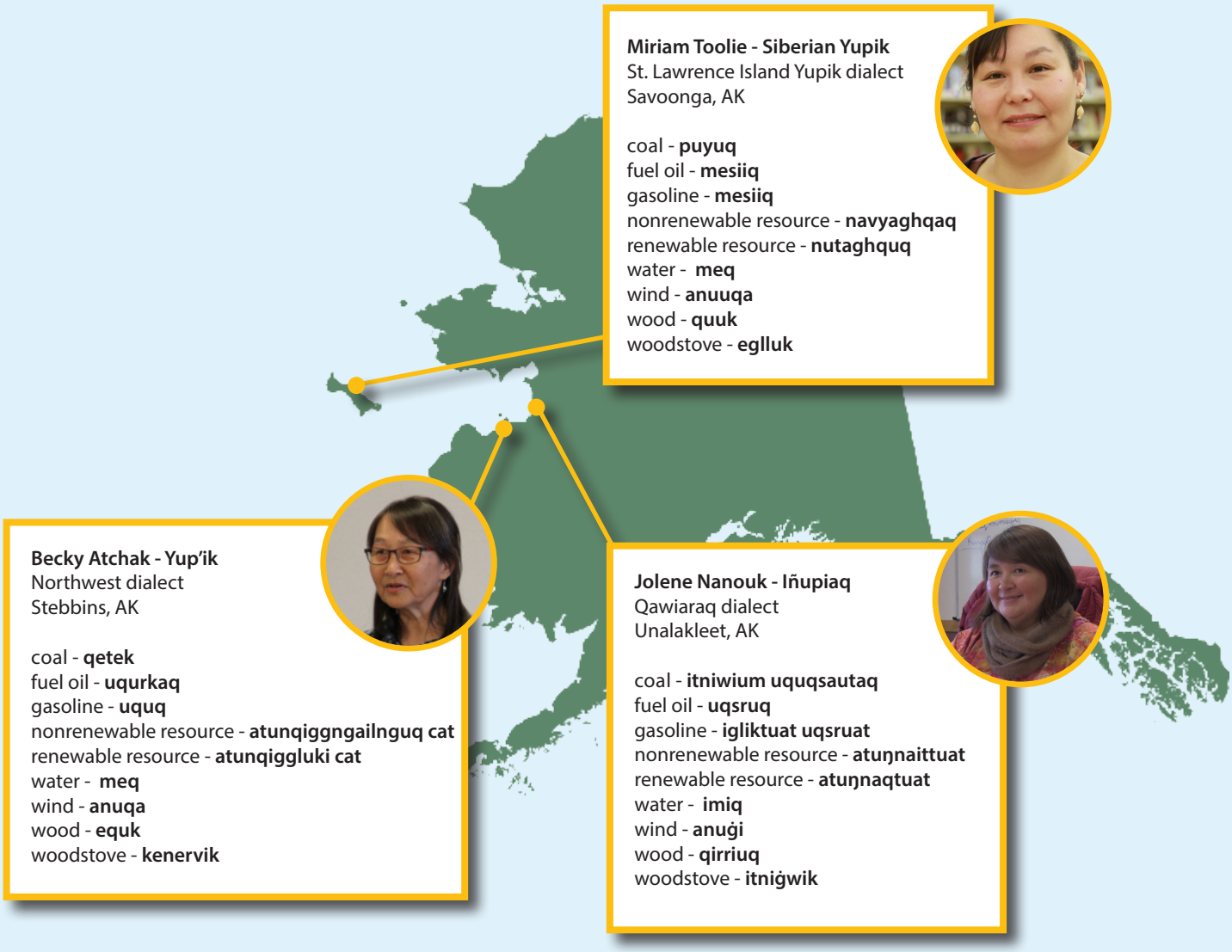
    Compare your words with the translations on the Natural Resources Vocabulary page in this guide. Are any of the terms the same or similar?

Sheldon Katchatag of Unalakleet, speaks about our dependency on fossil fuels and how challenging it is to not use them. *Photo: Qian Li, REACH Up.*

Natural Resources Vocabulary

Would you like to know Alaska Native language terms related to natural resources?

Work with your classmates to practice natural resources vocabulary words in English and the indigenous language of your community. Your teacher will give you vocabulary cards with the English word and an illustration on one side. Write the corresponding indigenous term on the blank line on the back of each card. Use the words that you learned from a local elder or cultural knowledge bearer, or choose the translation below that is closest to your community.



Miriam Toolie - Siberian Yupik
St. Lawrence Island Yupik dialect
Savoonga, AK

coal - **puyuq**
fuel oil - **mesiiq**
gasoline - **mesiiq**
nonrenewable resource - **navyaghqaq**
renewable resource - **nutaghquq**
water - **meq**
wind - **anuuqa**
wood - **quuk**
woodstove - **eglluk**

Becky Atchak - Yup'ik
Northwest dialect
Stebbins, AK

coal - **qetek**
fuel oil - **uqurkaq**
gasoline - **uquq**
nonrenewable resource - **atunqiggngailnguq cat**
renewable resource - **atunqiggluki cat**
water - **meq**
wind - **anuqa**
wood - **equk**
woodstove - **kenervik**

Jolene Nanouk - Iñupiaq
Qawiaraq dialect
Unalakleet, AK

coal - **itniwium uquqsautaq**
fuel oil - **uqsruq**
gasoline - **igliktuat uqsruat**
nonrenewable resource - **atuŋnaittuat**
renewable resource - **atuŋnaqtuat**
water - **imiq**
wind - **anuġi**
wood - **qirriuq**
woodstove - **itniġwik**

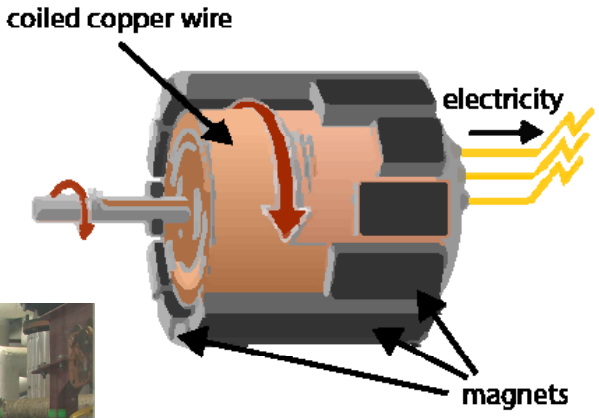
Understanding Electricity

Light bulbs are powered by electricity. Your school is likely connected to power lines. When you flip a switch and the lights come on, where does that energy come from?

Power plants convert mechanical energy into electrical energy. In larger communities, power plants may use coal, natural gas, oil, or nuclear power to boil water and create steam. The heat energy is transferred to mechanical energy. The steam spins a turbine, moving an electromagnet past copper wire coils, which generates a flow of electricity. Power lines transmit the resulting electricity to homes, schools, and businesses. Main transmission lines connect the power plant to other communities many miles away.

In rural communities not connected to a major transmission line, electricity is produced locally in a small-scale power plant that contains diesel generators. The diesel fuel is combusted, which creates gases.

Diesel generators operating inside the Unalakleet Valley Electric Cooperative. *Photo: Putt Clark, REACH Up.*

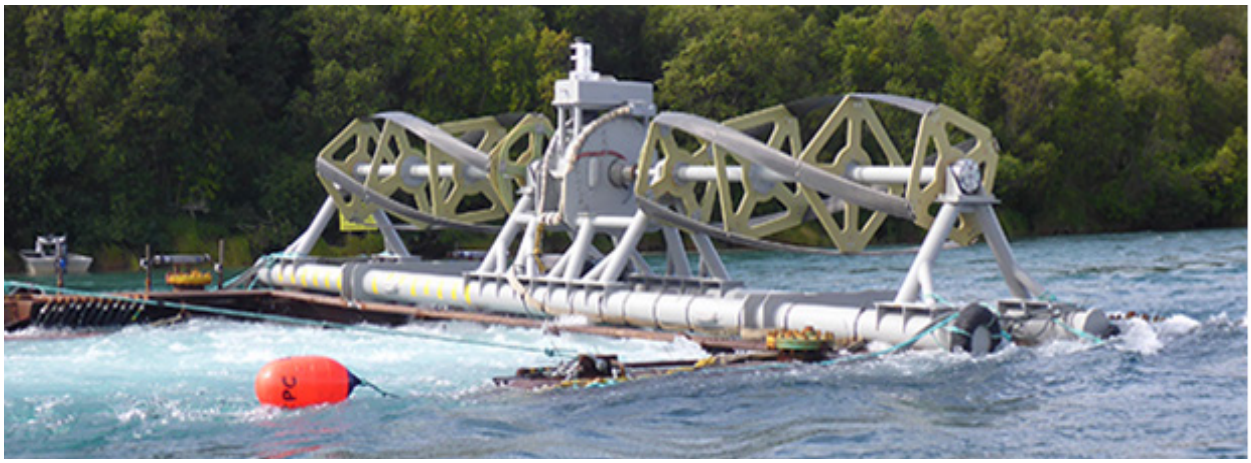


The gases expand and push the machinery into motion. Pistons spin a crankshaft, which spins a magnetic alternator to generate electricity.

What about the light bulb inside a flashlight? Batteries store chemical energy. When you press the button, you connect the circuit and the chemical energy is converted to electrical energy.

Renewable Energy

Electricity can also be produced using renewable energy sources such as solar, geothermal, biomass, wind, and hydropower.



The hydrokinetic project operating in the village of Igiugig. *Photo: Alaska Center for Energy and Power.*

Energy from the sun can be stored in photovoltaic cells. With geothermal and biomass energy, renewable resources are use used as the heat source for the equipment in a power plant. When wind and hydropower are used to generate electricity, the wind and water do the work of spinning the generators!

Solar panels adorn the newer housing in Brevig Mission. Solar energy, a renewable resource, can be stored in large batteries for later use. *Photo: Putt Clark, REACH Up.*

Build a Generator

A generator is a device that turns mechanical energy into electrical energy. Many power plants have a turbine generator that turns motion into electricity. Power plants burn fuel to produce steam, the steam spins the turbine, and the turbine generator turns the mechanical energy of spinning into electrical energy.

For this project, the generator is a hobby motor running in reverse. By attaching fan blades to the motor, you can spin it and turn wind energy into electricity. You are building a tiny power plant! Your project turns the mechanical energy of the spinning blades into electrical energy.

This project was originally published by The Exploratorium at https://www.exploratorium.edu/snacks/light-wind.

Materials

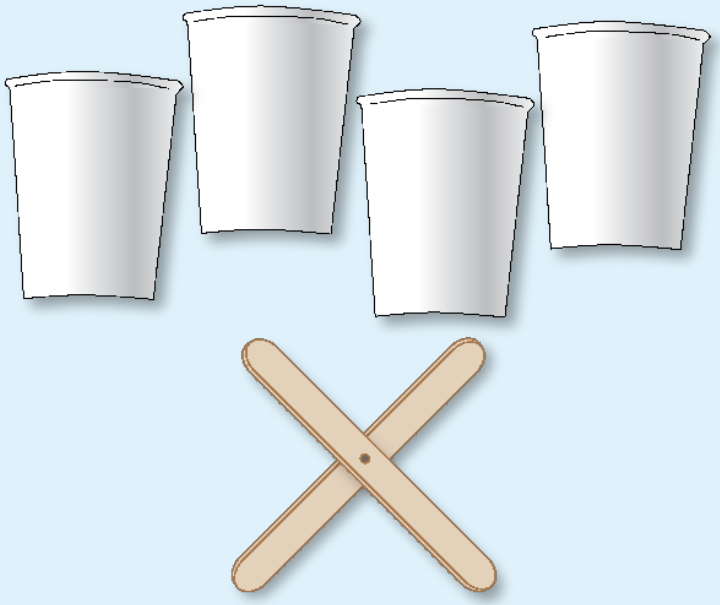
- Small hobby motor, 6+ volts
- High-intensity LED
- Alligator clips (optional)
- Craft sticks
- Paper cups of various sizes
- Large plastic cup
- Hot-glue gun and glue
- Scissors
- Fan
- Drill and 5/64 drill bit

Preparation

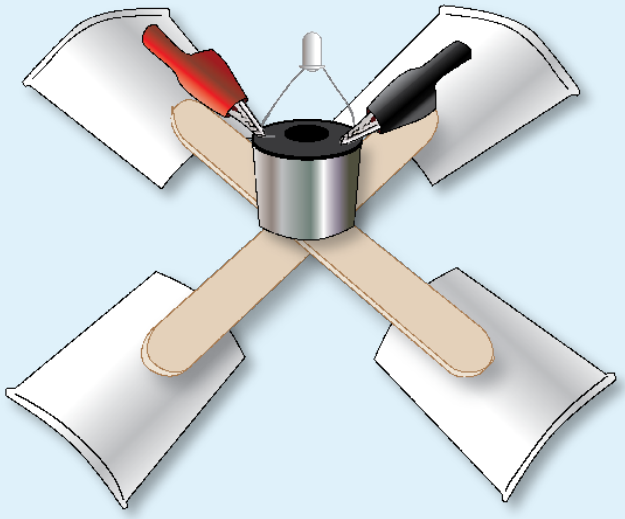
1. Use hot glue to attach two craft sticks together at the middle so they make a plus sign.
2. Once the glue is dry, drill a small hole in the center of the craft sticks. Use a drill bit that is the same size of the motor shaft. This will serve as the frame for your blades.

Model It

1. Think about how you will design your fan. Choose a paper cup for the blades. Cut the sides of the cup into four equal parts and cut away the bottom. If desired, you can use the scissors to further shape the blades.
2. Glue a blade to the end of each craft stick.

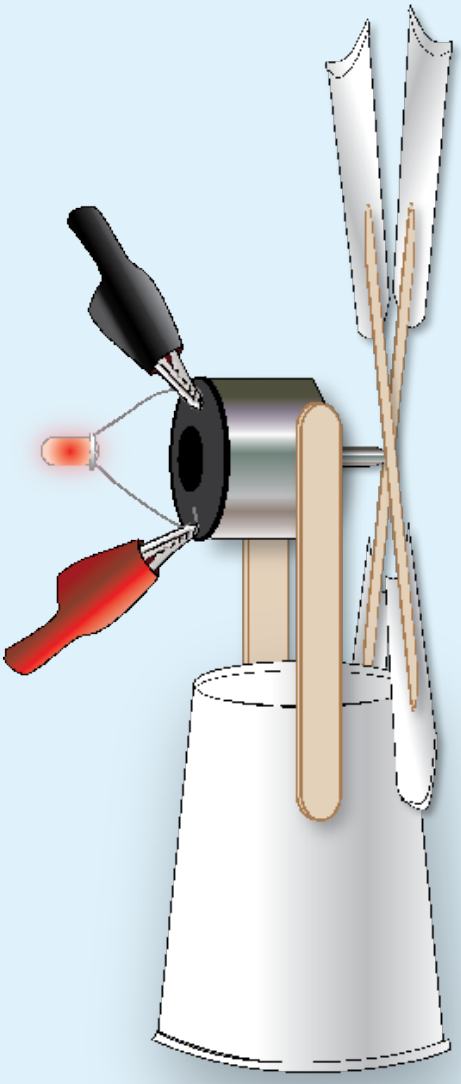


3. Attach an LED to the hobby motor using the alligator clips. Connect one leg of the LED to each prong on the back of the motor. (Or twist one leg of the LED through the hole in each prong.)



4. Slide your blade frame onto the shaft of the motor.
5. Turn the large plastic cup upside down. Make a stand by gluing two craft sticks on opposite sides of the cup. These sticks will hold the motor above the stand, so make sure they are long enough to let the blades turn freely. Glue the motor between the two craft sticks.
6. Test your wind turbine. You could try turning the fan by hand, or put it in front of a fan, or take it outside on a windy day!

   NOTE: The correct orientation of the LED will depend on whether the blades spin clockwise or counterclockwise. If the LED does not light up, try switching the legs of the LED to the opposite prongs on the motor.



Discuss

- Can you generate enough energy to light up the LED?
- Who of your classmates had the fastest spinning fan? What do you observe about their design?
- What are some sources of nonrenewable energy you can use to spin a generator?
- What are some sources of renewable energy you can use to spin a generator?

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