

Cloverbud Investigators: Career Detectives**Alternative Powers****December****Background:**

Do you like being able to flip a switch and turn on a light? Have you ever wondered how we can turn a switch and keep your bedroom nice and toasty? This is all done by different types of power that is produced.

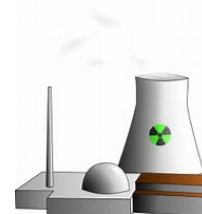
Keeping the power flowing to American homes and businesses is a necessity for everyday life. The Energy Department works hard to increase the grid efficiency and energy storage capacity as more renewable energy sources come online.

Electricity - the flow of electrical power is a secondary energy source generated by the conversion of primary sources of energy like fossil fuel, nuclear energy, wind power, water power, or solar power.

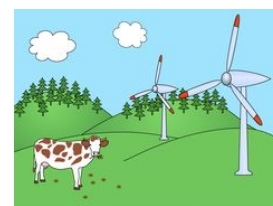
Fossil Fuel - includes oil, coal and natural gas. These are non-renewable resources that formed when prehistoric plants and animals died and were slowly buried by layers of rock. Over millions of years, different types of fossil fuels formed. The fuel type is dependent on the combination of organic matter, the length of time it was buried, as well as the temperature and pressure conditions that existed. These fossil fuels are often used as energy sources to produce electricity.



Nuclear Energy - contributes nearly 20 percent of the electricity generated in the United States. For the last 60 years, the United States has used nuclear power to produce reliable, low-carbon energy and to support national defense activities. Nuclear energy remains an important part of our nation's energy production as we strive to reduce carbon emissions.



Wind - The United States is home to one of the largest and fastest-growing wind markets in the world. The Department of Energy has invested in wind research and development projects, both on land and offshore, to advance technology innovations, create job opportunities, and boost economic growth. The U.S. wind industry remains a critical part of energy strategy to cut carbon pollution.



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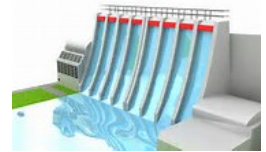
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Solar - The tremendous growth in the U.S. solar industry is helping to pave the way to a cleaner, more sustainable energy future. Over the past few years, the cost of a solar energy system has dropped significantly, helping to give more American families and business access to affordable, clean energy. The energy comes from the sun and has the ability to be stored to use as needed.



Hydropower - From 1939 to 1949, the Hoover Power plant was the world's largest hydroelectric installation. Today, it is still one of the country's largest. The Hoover Dam generates, on average, about 4 billion kilowatt-hours of hydroelectric power each year for use in Nevada, Arizona, and California - enough to serve 1.3 million people.



Local Career Connections: Careers to discuss- Careers in Renewable Electricity Generation

Geothermal – Installers, Plant Managers, Engineers.

Wind – Meteorological Technician, Assembler and Fabricator, Wind Technician, Sales, Logistician, Environmental Science Technician, Research Engineer, Research Scientist, Mechanical Engineer, Electrical Engineer, Industrial Engineer, Project Manager, Aerospace Engineer, Land Acquisition Specialist.

Water – Construction Manager, Civil Engineer, Hydropower Strategy Director, Hydroelectric Plant Operator, Engineering Analyst.

Solar – Manufacturing Technician, Quality Assurance Specialist, IT Specialist, Structural Engineer, Power Systems Engineer, Software Engineer, Solar Project Developer, Solar Utility Procurement Specialist, Solar Sales Representative, Solar Site Assessor, Solar Installer.

Other - Jobs in Manufacturing, Government Energy Management, Bioenergy, Vehicles, Hydrogen and Fuel Cells.

We have talked about lots of different sources of energy, but would you be surprised to learn that there is stored chemical energy in some everyday items we might find at the grocery store? In this investigation we are going to experiment with different vegetables and fruits to see if we can convert their stored energy in to power. We will be building a battery using potatoes and lemons.

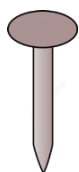




December's Mystery: Can we power a clock with no batteries or electricity?

Supplies:

- Digital clock with wires
- 2 Potatoes
- Copper wire
- Galvanized nails for Zinc
- Connecting Wire
- Alligator clips



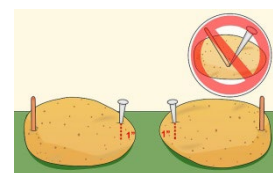
Science Behind:

In this experiment, we are making an electrochemical battery or cell. Batteries allow us the ability to make energy portable. All batteries depend on some sort of chemical reaction to generate electricity; this is called a spontaneous electron transfer. The flow of electricity from one place to another, is called a current. In order for electricity to flow we need to create a circuit, which is a path for it to follow. In this experiment we will create positive and negative terminals made from galvanized (zinc) nails and copper wire. Copper is electronegative and will attract electrons from the zinc causing the spontaneous electron transfer. To see the flow of energy, we will add a small digital clock into the circuit allowing the energy transfer to power the clock.

What to Do:

Step 1: Label your potatoes as “1” and “2”.

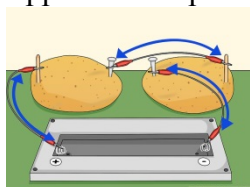
Step 2: Remove batteries from your digital clock (if needed). You will connect wires to the (-) and (+) terminals inside the clock. If needed, label the ends of your clock with positive and negative.



Step 3: Press one nail about an inch into each potato near the end of the potato.

Step 4: Once the nail is secured, press a piece of copper wire into the opposite end of the potato, as far from the nail as possible. Each potato should have one nail and one copper wire sticking out of opposite ends. The nail and wire should not touch.

Step 5: Using the alligator clips, you will connect each potato together with the clock to make a circuit. Connect the copper wire in potato 1 to the positive (+) terminal in the clock's battery compartment.



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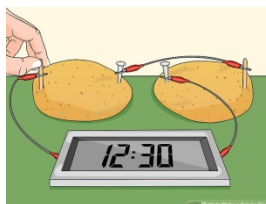
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Step 6: Connect the nail on potato 2 to the negative (-) terminal in the clock's battery compartment.

Step 7: Connect the nail on potato 1 to the copper wire on potato 2. When this connection is made you should see the clock come on. If it doesn't come on, check your wire connections.



Additional experiments

Follow the same set up using lemons or oranges or limes. Do they work?

Go Over Findings:

What are some ways to generate electricity? Solar, Wind, Water, Nuclear, and Fossil Fuels.

What is the flow of ions called? Current

What do you think is the cleanest way to provide electricity?

Investigate, Create, & Take: Investigators can take with them:

- ✓ Ideas and plans for a solar oven to try at home
 - How To Build a Solar Oven by Home Science Tools. Link to a solar oven:
<https://www.homesciencetools.com/article/how-to-build-a-solar-oven-project/>
- ✓ Make a wind mill. How much air does it take to make it move?
 - Windmills: Putting Wind Energy to Work by PBS Learning Media
https://woub.pbslearningmedia.org/resource/phy03.sci.engin.design.lp_windmill/windmills-putting-wind-energy-to-work/#.Wrkfa_nwaUk



Sources:

Department of Energy, Electric Power-<https://energy.gov/science-innovation/electric-power>

Reclamation Lower Colorado Region Hoover Dam Frequently Asked Questions and Answers
Hoover Dam-<https://www.usbr.gov/lc/hooverdam/faqs/powerfaq.html>

Additional Links:

How does hydropower work? By: ACCIONA-
<https://www.youtube.com/watch?v=uAXHHMFjpQM>

How Does Solar Energy Work? By: SolarBuddy-
<https://www.youtube.com/watch?v=HciKU63dLtA>

How does a wind turbine work? | Sustainability By: ACCIONA-
<https://www.youtube.com/watch?v=DILJJwsFl3w>

How does nuclear energy work? By: Horizon Nuclear Power-
<https://www.youtube.com/watch?v=FNNKhE1FNNM>

Fossil Fuels 101 By: Student Energy- <https://www.youtube.com/watch?v=zaXBVYr9Ij0>

Coal 101 By: Student Energy- https://www.youtube.com/watch?v=iN6LvH_4Q3g

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