



Energy Spoons

To get power to your home

Overview: Using cards and a game of spoons students will learn about how energy gets to their home and how renewable sources of energy may provide alternatives to nonrenewable energy sources in the future.

Lesson Characteristics: Use the table below for lesson planning purposes:

Time Required	40-45 minutes
Key Concepts/Terms	Renewable, Nonrenewable, Turbine, Generator
Setting	Classroom, class divided into groups of four
Materials	Set of cards per group Set of energy spoon placemats per group Worksheet for each student Four spoons per group

Standards: HS-ESS3-4, ESS3.C

Learning Objectives: Students will...
... understand the differences between renewable and nonrenewable energy sources
... understand how resources can be depleted over time
... understand how sources of energy require an environmental impact

Preparation: Print 1 deck of cards per group, placemats, and worksheets to make a class set. Set the classroom in a way for students to sit as groups of four.

Background Information: We use electricity for a wide variety of activities in our daily lives. From our cell phones to our laundry machines they all require electricity to work. However, many people do not stop and ponder where their electricity comes from.

Electricity sources are categorized by: renewable and nonrenewable. Mostly, the electricity in the United States comes from nonrenewable sources: Natural Gas (33.8%) and Coal

(30.4%). Whereas only 14.9% of our electricity comes from renewable sources (Hydropower, Wind, Biomass, Solar, and Geothermal).¹

Nonrenewable resources are finite and cannot be replenished within a human's lifetime. These resources have taken thousands to millions of years to be produced and can be mined and burned within months. Eventually, we will run out of these resources.² Also, the environmental cost of the production and burning of these resources have caused harmful issues to our environment.

Renewable resources are infinite and use natural phenomena to produce energy. The environmental cost of the production and use of these resources is far fewer compared to the nonrenewable alternative.³

Vocabulary:

Terms	Definitions
Coal	Coal is a fossil fuel mined from the ground then burned to create steam which turns a turbine to produce electricity
Biomass	Biomass are renewable energy sources that are burned to produce heat that produces steam to turn turbines and produce electricity
Hydroelectric	Rivers and creeks are dammed, the water then flows downhill within the dam through turbines that then generate electricity
Natural Gas	Natural Gas is a fossil fuel extracted from the ground then burned to create steam which turns a turbine to produce electricity
Nonrenewable Resources	Resources that take thousands to millions of years to be replenished
Nuclear	Utilizes the heat generated from the

¹ <https://www.eia.gov/tools/faqs/faq.php?id=427&t=3>

² <https://www.cia.gov/library/publications/the-world-factbook/geos/xx.html>

³ <http://www.ucsusa.org/clean-energy/renewable-energy/environmental-impacts#.WSWR-2grK70>

	splitting uranium atoms to turn a turbine. Uranium is finite and is considered a non-renewable source.
Renewable Resource	Resources that can be naturally replenished over a human's lifespan.
Solar Power	Electricity produced by the sun's radiation exciting an electron in a silicon panel
Wind Energy	Electricity produced by wind turning a turbine

Procedure:

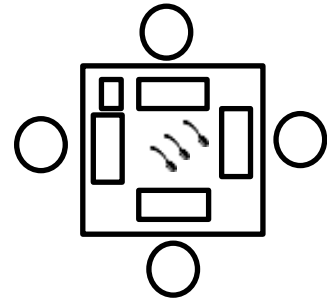
Follow the steps in the table below to conduct the activity. **Sentences in bold are suggestions for what an educator might say to students.** *Items in italics are possible student answers to questions.*

Phase	Step	Action
Engage	1	What do we use that require electricity? <i>Cell phones, computers, cars, lights, washing machines, televisions, oven, refrigerator, tablets, etc.</i>
	2	What are the sources of electricity to power the items we mentioned? <i>By burning coal or natural gas. By harnessing the power of the sun, wind, water, or nuclear.</i> Create a list with two columns with one representing renewable and the other non-renewable. Make sure to correct any misunderstandings about these sources.
	3	Pick an item that has to be plugged in and show it to the class. We know the sources of electricity and how the electricity is used. How does this source of electricity power our items? Have students pick one source of electricity then map out the way the energy goes from source to use. Make

		sure to use the terms <u>extract</u> , <u>transport</u> , <u>generate</u> , and <u>use</u> . These terms are used in the activity. Make sure to do a map for both a renewable and a non-renewable source.
	3	In this activity we are going to replicate the different electricity sources and how the sources we choose may need to change over time.
Explore/Explain	4	Divide the class into groups of four and pass out the placemats. Each person should either have a renewable or non-renewable resource (if the class does not divide evenly make sure a group has less than four students). Pass out the worksheets.
	5	One person per group read out loud the first part of the instructions for the game. While the students are reading the instructions pass out a deck of cards to each group. Once everyone has finished reading have them fill out the first part of the worksheet. Now read through what each card represents and begin the first round. Work through any questions the students may have about the game. Allow students to finish through all rounds.
	6	Fill out the rest of the worksheet.
Evaluate	7	Which energy source was able to make it through to the final round? All groups will have a renewable resource at the end of the game. Why did the renewable source of energy win out compared to the other options? <i>There were fewer extract and transport cards. The renewable resources had less cards to have to get by the end of the game.</i>

		<p><i>Nonrenewable sources had to be transported more often.</i></p> <p>What happens in real life if we were to run out of nonrenewable sources of electricity? <i>We have to rely on renewable resources.</i></p> <p>Use the worksheet to evaluate the students understanding.</p>
Elaborate	8	<p>Allow students to look at the different electricity sources that are available at home.</p> <p>Provide different resources to show the environmental impacts of fossil fuels and renewable energy.</p>
Extensions	9	<p>Have students research whether or not renewable electricity can be used on the school grounds.</p> <p>Have students research ways to reduce the amount of electricity used at home or at school.</p>

Energy Spoons Game Play



One person read aloud before playing:

The goal of this game is to get one of the spoons on the table. Only when you have all the cards needed can you reach for a spoon. Whoever is without a spoon will sit out the next round. We will play three rounds for an ultimate electricity winner.

Your teacher has given you a placemat with a spot for the four cards you need to get, and whether you are a renewable or nonrenewable source of electricity. Pick one electricity source your class brainstormed that coincides with whatever is on your placemat (ex. Renewable: Solar). Fill out the top part of your worksheet.

Energy Spoon Card Descriptions:

EXTRACT: Mining occurs to build materials for renewable power generators. Once mined the material is built into the generator. Once the generator is built they can last decades with proper upkeep and minor repairs.

Mining occurs to reach nonrenewable energy sources such as coal and natural gas. Once the material is burned to create electricity more material needs to be mined. These resources take thousands of years to replicate and once burned is gone forever.

TRANSPORT: Once mined the material to build renewable power generators is transported to wherever the generator is built then to wherever it is installed. Once installed the generator no longer needs to be transported.

The materials used for non-renewable power sources need to be transported to wherever it is burned to create electricity. In order to provide a consistent supply of electricity resources continually need to be transported. Also, once the material is transported the energy used to transport it is now lost and more energy is needed to continue the cycle.

GENERATE: Electricity from renewable resources is made by the force from phenomena generating electricity. The electricity generated goes down power lines to buildings.

Electricity from non-renewable resources such as coal and natural gas is made from the burning of these resources at a power plant. The burning heats up water which creates steam to turn a turbine attached to a generator. The electricity generated goes down power lines to buildings.

USE: The electricity generated can be used for everything from cell phones to washing machines.

Playing the game:

Round 1: Shuffle your deck of energy cards and place it next to whoever has the placemat with a star, this person is now “the dealer”, the pile of cards is the “Recycle” pile. The dealer starts by picking up a card from the pile, and placing it on the correct spot on their placemat. The dealer continues to draw cards; if they need it they place it on their mat if they don’t need it they pass it to the person on their left. Each player passes to the person on their left if they don’t need that card. The last player places their passed cards into the “recycle” pile. Once you have the four cards you need pick up a spoon. Once you have a spoon continue to pass cards until all three spoons have been picked up. The electricity source that does not have a spoon sits out the next round.

Since more materials are needed for non-renewable sources of electricity place the **EXTRACT** and **TRANSPORT** cards from those placemats into a “Burn” pile they cannot be reused.

Since the generators have already been built for the renewable sources of electricity those players can keep their **EXTRACT** and **TRANSPORT** for the next round.

All other cards are placed back into the “Recycle” pile. This includes any cards received by the player who did not get a spoon.

Round 2: *Ten years later.* Shuffle your deck of energy cards and place it next to the dealer. Take one spoon and put it off to the side. Play another round.

Since more materials are needed for non-renewable sources of electricity place the **EXTRACT** and **TRANSPORT** cards from those placemats into a “Burn” pile they cannot be reused.

Since the generators have already been built for the renewable sources of electricity those players can keep their **EXTRACT** and **TRANSPORT** for the next round.

All other cards are placed back into the “Recycle” pile. This includes any cards received by the player who did not get a spoon.

Round 3: *Ten years later.* Shuffle your deck of energy cards and place it next to the dealer. Take one spoon and put it off to the side. Play the final round.



Energy Spoons

Using cards and a game of spoons you will model how electricity gets to your home and how certain sources may not be the best method of creating electricity in the future. Your group will play 3 rounds.

Before the game:

What is your Electricity Source? _____

Is your Electricity Source Renewable or Nonrenewable? _____

How many rounds do you think your Electricity Source can last? _____

After the game:

How many rounds did your Electricity Source last? _____

What Electricity Source lasted the longest? _____

Explain in your own words why the Electricity Source that lasted the longest was able to make it to the end?

How does your answer above relate to how electricity is produced in real life?

Why was it easier or more difficult for renewable electricity resources to outlast nonrenewables?
