



Oklahoma Alliance for Geographic Education

Teacher Training | Curriculum Development | Outreach Programs

Sustainable Energy Systems

Adapted from: “From Resources to Energy: the Origins of Energy”

by Louisa Torrance for the Environmental Science Institute at the University of Texas at Austin



Grace Gierach

Oklahoma Alliance for Geographic Education

100 East Boyd Street, SEC 684 | Norman, OK 73019-1018
(405) 325-5832 | <https://okageweb.org/> | okage@ou.edu

Lesson Title: Sustainable Energy Systems

Grade Level: 6th-7th grade

Purpose/Overview:

The lesson will introduce different types of sustainable energy and students will learn how these energy systems work.

National Geography Standards from *Geography for Life*

Geographic Elements & Standards:

12 The processes, patterns, and functions of human settlement

14 How human actions modify the physical environment

16 The changes that occur in the meaning, use, distribution, and importance of resources

18 How to apply geography to interpret the present and plan for the future

<https://www.nationalgeographic.org/standards/national-geography-standards/>

Oklahoma Academic Standards for the Social Studies:

6.C.2.4 Describe the distribution of natural resources found in each region, delineating between renewable and nonrenewable resources, and explaining how the relative location to such resources can influence the economic development of a region.

6.C.4.6 Describe the role of citizens as responsible stewards of natural resources and the environment (e.g., recycling campaigns, water conservation, national parks, protection of wildlife preserves).

7.C.3.3 Evaluate the effects of human modification of the natural environment through processes related to industrialization.

7.C.3.4 Describe the role of citizens as responsible stewards of natural resources and the environment, through sound resource use and conservation.

<https://oklahoma.gov/content/dam/ok/en/osde/documents/services/standards-learning/social-studies/SS%20OAS%20July%202025.pdf>

Geographic Themes:

- Human-Environment Interaction | Movement

Objectives:

1. What **key topic/issue(s)** is/are associated with this lesson/unit?
 - a. Energy sources, energy conversion, ethical/social issues surrounding Earth's natural energy resources and the advantages and disadvantages of long-term use
2. What **should students know** after this lesson/unit?
 - a. Students will understand the origins and uses of different energy

sources.

3. **How will students apply** this lesson/unit content?

- a. Students will be able to describe the many different forms of energy and how they can transform from one to another.

Materials:

- Energy strips (Attached)
- Vocabulary sheets (Attached)
- Energy source worksheets for teams: Coal, Gas, Oil, Water, Wind (Attached)
- Pen or pencil

Time Frame: Two 45-minute class periods

Procedures:

Day 1

1. The teacher will explain the following:
 - a. Fossil fuels are natural fuel sources formed by historical geological processes from the remains of living organisms. The most famous fossil fuels include coal, oil, and natural gas. These are nonrenewable, meaning these sources of energy are depleted by use and can be permanently eliminated. Alternate fuel sources include solar, wind, biomass, hydroelectric, and geothermal energy, which are renewable. These sources occur naturally by the sun, wind, or plant life.
 - b. The teacher will hand out the vocabulary sheet so that students can reference it during the activity.
2. Pre-activity discussion
 - a. The teacher will ask students the following questions:
 - How do we get our energy?
 - Why do we need energy sources?
 - Which energy sources could we use here in Oklahoma?
3. Activity
 - a. Before class, the teacher will cut the sentence strips into sets to give to each team.
 - b. At the start of the activity, the teacher will define an energy source as the resource used to create electricity, heat, or fuel.
 - c. The teacher will pass out sentence strips to each team and ask teams to begin sorting them into different energy source categories (coal, gas, oil, water, wind, etc.) and tell the students that the sentence strips describe the following categories: solar, wind, oil, water, natural gas, wood, and coal, and they should team the sentence strips accordingly. For added critical thinking, tell the students there are seven kinds of energy and they need to divide the strips into

- categories and determine the teams.
- d. Throughout this activity, the teacher should ask each team why they teamed certain strips together. Have students write down the energy sources for each of their teams (oil, wind, sun, etc.)
 4. Discussion: The teacher will ask either each team or the entire class the following questions:
 - a. Describe the perfect energy source. Do you see one in your teams?
 - b. Which energy sources did you use today (riding the bus, turning on lights, heater)?
 5. Extension question
 - a. Explain why Oklahoma is an ideal place for one or more of these sources.

Day 2

1. Activity
 - a. Before class, the teacher will print out the Energy source worksheets for each class.
 - b. At the start of class, the teacher will hand out worksheets of a given energy source to teams. Ideally, there should be five teams - one energy source per team.
 - i. Each team is responsible for a unique energy source and will be teaching their peers about how we use it.
 - c. Each team will complete the first table in the worksheet (Renewable vs. Non-renewable vs. indefinite) individually.
 - d. Afterwards, each team will be instructed to collectively work on answering the questions following the energy paragraph. The teacher should check in with the teams frequently during this step.
 - i. Guiding questions such as “Where do you find this resource? Is it easily accessible?” and “How does the electricity from the power plant get to your house?” can help teams think in a logical sequence.
 - e. Each team will present their energy source. Each student listening should answer the following questions on a piece of paper which will be turned in after class:
 - i. What is the energy source?
 - ii. Where is it found?
 - iii. How is it harnessed?
 - iv. How is it transported?

Assessment Options:

The teacher should assess each student's understanding by grading their energy source worksheet and presentation and then their answers to the provided questions about other teams' energy sources.

After this lesson, students should be able to: list important energy sources, understand the process of attaining energy from a resource and how this affects the environment, and compare and contrast the impacts of certain energy sources.

Resources:

- Fossil fuels
 - o <http://energy.gov/science-innovation/energy-sources/fossil>
- Renewable resources
 - o <https://www.energy.gov/topics/renewable-energy>
- Wind farms in desert
 - o https://www.gem.wiki/Desert_Sky_wind_farm
- Hoover dam energy production
 - o <https://www.eia.gov/kids/for-teachers/field-trips/hover-dam-hydroelectric-plan-t.php>
- Fracking
 - o <https://www.usgs.gov/mission-areas/water-resources/science/hydraulic-fracturing>
- Coal from swamps
 - o <http://www.ucmp.berkeley.edu/carboniferous/carboniferous.php>
- Oil from limestone
 - o <https://www.sciencelearn.org.nz/resources/477-limestone-as-an-oil-reservoir>

Extension and Enrichment/Simplification:

Instead of having each team teach the others about their energy source, have the teams rotate so that they each fill out all five worksheets and learn about the different energy sources themselves. Allow an extra 1-2 class periods for this.

Vocabulary

- Cap rock – a layer of hard, impervious rock overlying and often sealing in a deposit of oil, gas, or coal
- Carbon dioxide – a heat trapping gas present in the atmosphere formed when energy sources containing carbon are burned
- Coal – a fossil fuel burned as an energy source consisting of plant matter found in underground deposits
- Emission – the production and discharge of something
- Fracking – hydraulic fracturing of non-permeable rocks in order to obtain oil or gas deposits
- Generator - a machine for converting mechanical energy into electricity
- Kinetic energy - energy that a body possesses by virtue of being in motion
- Oil – a fossil fuel burned as an energy source derived from petroleum that stays as a liquid and is drilled for underground
- Shale - soft, finely stratified sedimentary rock that formed from consolidated mud or clay and can be split easily into fragile slabs
- Turbine - a machine for producing continuous power in which a wheel or rotor, typically fitted with vanes, is made to revolve by a fast-moving flow of water, steam, gas, air, or other fluid

Sentence Strips

Uses wind to spin fan blades.

Uses flowing water to spin a turbine.

Uses a turbine to create electrical energy.

Created by the remains of organic matter.

Uses a drill to cut through shale.

Cleanest burning fossil fuel.

Produces high carbon dioxide emissions.

Can be transported by pipeline or ocean tanker.

Uses a special sheet to absorb sunlight.

Can be put on your roof.

Only produces energy during the day.

Helpful fuel source in poor regions.

Contributes to deforestation.

Uses a renewable energy source.

Can destroy aquatic ecosystems.

Needs a dam to create different water heights.

Consists of a giant windmill.

Uses a gas (methane) as an energy source.

Can pollute underground water sources.

Uses a turbine to create electrical energy.

Can be built on open plains and by the ocean.

Energy Source Worksheets

Define renewable resource:

Define non-renewable resource:

Define indefinite resource:

Write the following list of fuels in the correct category in the table:

Oil	Natural Gas
Coal	Nuclear Fission
Sun rays	Wood
Ocean Tides	Compost

Renewable	Non-renewable	Indefinite

Team 1:

What is the energy resource? _____

Where is it found? _____

How is it harnessed? _____

How is it transported? _____

Team 2:

What is the energy resource? _____

Where is it found? _____

How is it harnessed? _____

How is it transported? _____

Team 3:

What is the energy resource? _____

Where is it found? _____

How is it harnessed? _____

How is it transported? _____

Team 4:

What is the energy resource? _____

Where is it found? _____

How is it harnessed? _____

How is it transported? _____