

# Renewable and Nonrenewable Energy

**LEVEL:** Grades K-3

**SUBJECTS:** Science, Mathematics, Language Arts

**SKILLS:** Analyzing, applying, comparing similarities and differences, observing, understanding cause and effect, concluding

## NOTE

This is a curriculum designed for use with an interactive whiteboard. Many aspects of the curriculum can be used without an interactive whiteboard, it is not mandatory that a classroom have that technology in order to properly use this curriculum.

## MATERIALS

200 pennies, piece of coal, toy pinwheel, "Fossil Fuel Search" handout, four small plastic cups per pair of students, pinwheel pattern

## CONCEPTS

Students will understand the difference between renewable and nonrenewable energy. Students will understand how energy is generated from renewable sources such as wind, sun, water, biomass, and geothermal energy. Students will also know that the majority of the energy used in the U.S. is generated from nonrenewable energy sources such as coal, petroleum, natural gas, and uranium.

## SUPPORTING INFORMATION

Renewable and Nonrenewable Energy is a topic of interest to many people. Currently the U.S. uses 93% nonrenewable energy sources for our power. This curriculum will explain in detail what energy sources make up nonrenewable and renewable energy. Through video, activities within Smart Board, activities within the classroom, and class discussions, students will have a better understanding of the two forms of energy used today: Renewable and Nonrenewable.



## BRIEF DESCRIPTION

Students will learn that energy comes in two forms: renewable and nonrenewable. They will be able to describe the different forms of renewable and nonrenewable energy and give examples of each.

## OBJECTIVES

The students will:

- Understand the difference between renewable and nonrenewable energy;
- Know the forms of renewable energy: solar, biomass, wind, water (hydropower), and geothermal;
- Know the forms of nonrenewable energy: coal, petroleum (gasoline, diesel fuel and propane), natural gas, uranium;
- Experience how renewable energy can be used.

## ESTIMATED TEACHING TIME

There are many classroom activities that can be done with this curriculum. Teaching time could run from 30 minutes to 3 days of 45-60 minutes depending on the amount of activities chosen to supplement the teaching material.

## Session 1

# PROCEDURE

Notebook  
Page 2

Take a moment to review the different forms of energy. Pull the screen shade down to reveal the different forms of energy (light, heat (thermal), motion (mechanical), sound, growth (chemical)).


Notebook  
Page 3

Introduce and/or review the renewable energy sources such as sun (solar), water (hydropower), biomass (organic matter such as plants or garbage), wind, and geothermal (heat from earth's interior).

Notebook  
Page 4

Introduce and/or review the nonrenewable energy sources such as petroleum (gasoline, diesel fuel, and propane), coal, natural gas, and uranium (nuclear energy).

Notebook  
Page 5



Play "Fossil Fuel Search" with the students by hiding 200 pennies prior to the beginning of class. Begin class by showing a piece of coal and asking the students what it is used for. Ask if it is a renewable or nonrenewable form of energy. Now demonstrate the movement of the pinwheel. Ask the students to identify the source of energy (if they say "you" be sure to correct them by saying "wind"). In comparing the two energy sources, students should explain why they think one will likely run out and the other is not likely to run out. Ask the students if the pictures are renewable or nonrenewable forms of energy (notebook page 5). Click on the question marks to reveal the correct answer. Arrange students in pairs and give each pair the "Fossil Fuel Search" handout. Give each pair four plastic cups labeled 1, 2, 3, and 4. Tell them they are going to be searching for a nonrenewable source of energy (such as the coal) that is symbolized by pennies hidden throughout the classroom. Give students four 30 second opportunities to find pennies. After each search, have them count, record, and deposit the pennies into a cup (one labeled for each search). At the end of their four searches, they should make a

bar graph and analyze their data. Topics for discussion:

- Did each search yield less pennies?
- In which search did you find the most pennies? Why?
- What is the actual difference in the number of pennies you found from search 1 and search 4?
- Why do you think it became harder to find the pennies?
- If you were really searching for coal what did your graph data tell you?

Notebook  
Page 6

Notebook page 6 is a K-W-L chart that can be used to discuss what the students **Know** about Renewable and Nonrenewable Energy and what they **Wonder** or **Want** to know about Renewable and Nonrenewable Energy. The **Learned** column can be filled out at the end of the lesson.

The next five Notebook pages will discuss each form of Renewable Energy separately. Notebook page 7 begins with Solar Energy or energy from the sun. Explain to the students that we get most of our energy from the sun. We call this energy Solar Energy. Solar energy is free and clean. There is enough for everyone and we will never run out of it. Solar energy is renewable energy. Lots of people put **solar collectors** on their roofs. Solar collectors capture the sunlight and turn it into heat. People heat their houses and their water using the sun's energy. **Solar cells** can turn light energy into electricity. Some toys and calculators use solar cells instead of batteries. Larger solar cells can make enough electricity for a house. Scientists are looking for new ways to capture and use solar energy. Click on the video on Notebook page 7 to learn more about solar energy.

Notebook  
Page 7

Activity: Make a Pizza Box Solar Oven and/or Sun Tea and S'mores. These activities are



located in the attachments tab.

Notebook  
Page 8

Energy from water or hydropower is another form of renewable energy. Hydropower is the renewable energy source that produces the most electricity in the United States. (You may choose to do a lesson on “Understanding the Water Cycle” at this point).

Mechanical energy is harnessed from moving water. The amount of available energy in moving water is determined by its flow or fall.

Swiftly flowing water in a big river, like the Columbia River that forms the border between Oregon and Washington, carries a great deal of energy in its flow. Water descending rapidly from a very high point, like Niagara Falls in New York, also has lots of energy in its flow.

Notebook  
Page 9

Wind is moving air. We can use the energy in wind to do work. The energy in wind comes from the sun. When the sun shines, it heats the earth. Some parts of the earth get hotter than others. An area where land and water meet is a good example. Land usually absorbs and releases energy more quickly than water. The air over land gets hotter than the air over water. The warm air rises and cool air rushes in to take its place. The moving air is called WIND. As long as the sun shines we will have wind. It is a FREE renewable energy source. Today we use **wind turbines** to catch the wind. Sometimes there are hundreds of wind turbines in one place. This is called a **wind farm**. When the wind blows it pushes against the blades of the wind turbine. The blades spin around. They turn a generator to make electricity. Click on the single wind turbine picture to view a video about wind turbines. You can also click on the BrainPop link at the bottom of page 9 to view a FREE video and do activities about wind power.



A “build your own” wind turbine (pinwheel) activity is found in the attachments tab. A wind energy reader’s theater is also located in the

attachments tab.

Notebook  
Page 10

Biomass is a form of renewable energy. Biomass is organic material from plants and animals. Biomass contains stored energy from the sun. Plants absorb the sun’s energy in a process called **photosynthesis**. The chemical energy in plants gets passed on to people that eat them. Biomass is a renewable form of energy because we can always grow more trees and crops, and waste will always exist. Examples of biomass are wood, crops, manure, and some garbage. Burning biomass is one way to release its energy but it is not the only way. Biomass can be converted into other useable forms of energy such as methane gas or transportation fuels such as ethanol or biodiesel. Methane gas is the main ingredient in natural gas. Smelly stuff, like rotting garbage and agricultural waste, release methane gas. Crops such as corn and sugar cane can be fermented to produce ethanol which is a transportation fuel. Biodiesel, another fuel we use in our vehicles can be produced from leftover food products such as animal fats and vegetable oils. Click on the video to learn more about a methane digester which converts animal waste into electricity.

You can build a biomass generator using the directions located in the attachments tab.



Geothermal energy is energy produced from heat within the Earth. Geothermal energy is a renewable energy source because heat is continually produced within the Earth. We recover this heat as steam or hot water and use it to heat buildings or generate electricity. Most of the time geothermal energy is found within naturally occurring large areas of hydrothermal resources called **geothermal reservoirs**. Most geothermal reservoirs are deep underground with no

Notebook  
Page 11

Notebook  
Page 11  
cont'd

visible clues showing above ground. But geothermal energy sometimes finds its way to the surface in the form of volcanoes, hot springs, and geysers. As of 2008, the U.S. leads the world in electricity generation with geothermal power. Geothermal power plants are located in California, Nevada, Hawaii, Idaho, Montana, and Utah. Click on the video on page 11 to learn more about the process of converting geothermal energy to electricity.

Notebook  
Page 12

**Notebook Page 12** is an activity in which students can come to the Smart Board. Students will drag the pictures into the appropriate vortex to show if they are a renewable or nonrenewable energy source. The pictures are: coal, corn, garbage, sun, wind turbine, hydroelectric (water), natural gas, and propane.

Notebook  
Page 13  
and 14

**Notebook Page 13 and 14** is a review on renewable and nonrenewable energy. Go back to Notebook Page 6 to complete the K-W-L chart. Another excellent review is found at the Energy Kids website. A link is located at the bottom of Page 14 and in the attachments tab.

### REVIEW

Notebook  
Page 15

**Notebook Page 15** is a pie chart indicating the amount of renewable and nonrenewable energy sources used in the U.S. This page show what exact renewable sources make up the 7% of renewable energy used in the U.S. Use this page for discussion.

Notebook  
Page 16

Using the statistics in the pie chart ask the students “Do you think our energy sources will eventually run out?” Then ask, “why or why not?” Divide the students into groups to discuss this topic. After they have had a few minutes to discuss, ask them to present their opinions to the class.

Notebook  
Page 17

Keep the students in their groups and have them begin a discussion on Energy Conservation. Ask them what those words (Energy Con-

servation) mean? Have them spend a few minutes discussing how they can conserve energy. Then have them share their ideas with the class. For a complete Energy Conservation lesson go to [www.cceoneida.com](http://www.cceoneida.com) and click on Energy.

Notebook  
Page 17

**Notebook Page 18** is an interactive game similar to “hangman.” Click on the Clue button to have a clue given for the puzzle being solved. Then have students select letters to fill in the blanks and solve the puzzle by making goals.

Notebook  
Page 18

## ADDITIONAL RESOURCES AND CREDITS

*KidWind Wind Energy Science Education.*  
<http://www.kidwind.org/>

*Energy Kids: U.S. Energy Information Administration.* <http://www.eia.doe.gov/kids/>

*National Energy Education Project.* <http://www.need.org/>

*Energy Star Kids.* [http://www.energystar.gov/index.cfm?c=kids.kids\\_index](http://www.energystar.gov/index.cfm?c=kids.kids_index)

## NYS Learning Standards

- 4.1a Energy exists in various forms: heat, electric, sound, chemical, mechanical, light.
- 4.1b Energy can be transferred from one place to another.
- 4.1g Interactions with forms of energy can be either helpful or harmful.
- 7.1a Humans depend on their natural and constructed environments.

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- 7.1b Over time humans have changed their environment by cultivating crops and raising animals, creating shelter, using energy, manufacturing goods, developing means of transportation, changing populations, and carrying out other activities.
  - 7.1c Humans, as individuals or communities, change environments in ways that can be either helpful or harmful for themselves and other organisms.

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