Renewable vs. Non-renewable Energy Sources

Name:_____ Date:_____

Test Your Knowledge of Renewable and Nonrenewable Energy

Energy is the power we use everyday, for transportation, to heat and light our homes, and to manufacture all types of products. Energy sources are divided into two groups: renewable (an energy source that can be replenished and can be used over and over again) and nonrenewable (an energy source that we are using up and cannot be replenished).

Instructions: Below is a list of renewable and nonrenewable resources. Put ñRò in front of the renewable resources and ñNò in front of the nonrenewable resources.

_____ **OIL**
_____ **WIND**
_____ **NATURAL GAS**
_____ **COAL**
_____ **SOLAR**
_____ **BIOMASS**
_____ **NUCLEAR**
_____ **GEOTHERMAL**
_____ **WATER**

Challenge: On the back of this paper, draw one renewable energy resource and one nonrenewable energy resource.

Answer Key

N OIL
R WIND
N NATURAL GAS
N COAL
R SOLAR
R BIOMASS
N NUCLEAR
R GEOTHERMAL
R WATER

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Establish Set:

Students must understand the key difference between renewable and nonrenewable energy. Nonrenewable energy takes millions of years to regenerate. Once it is gone, it is gone for all practical purposes. Renewable energy can regenerate quickly; even slow growing trees (slow to us) are renewable as they can be planted and harvested in a few human generations. If trees are replanted as they are harvested, then the resource is sustainable.

Procedure:

Make a chart with two columns on a chalkboard, dry erase board or on chart paper. Label the column headings órenewableô and ónonrenewable.ôHave students brainstorm the various energy resources we use and place them under the correct headings. Discuss what happens when you use each of the resources (gone forever, replenished) and what they each have in common. Discuss ways to use one resource over the other and reasons to make your choices.

Ask if anyone uses any of the renewable resources, and if so, which ones and how they are used.
Ask if anyone uses any of the nonrenewable resources, and if so, which ones and how they are used.

NONRENEWABLE HARVEST ACTIVITY— Grades 1-5

Prior to the class, hide 200 pennies around the room (or 200 food stuffs outside). Make sure that some are hidden in very obscure places.

Begin this activity by showing a piece of coal and asking for student volunteers to tell what it is and what it is used for. Allow students to touch the coal so that the black left on their fingers can be a topic of discussion (dirty, pollution).

Lead the students to classify it as a source of energy that must be burned to release energy.

Arrange students in pairs and hand out the data sheet, plastic cups and markers. Have them label the cups 1 through 4. Tell them that they are going to be searching for a nonrenewable source of energy (such as the coal discussed earlier) symbolized by pennies/marbles hidden throughout the classroom or outside (use food if completed outside).

Give students four 30-second opportunities to find the hidden resource. 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. *Make a classroom graph for young students.

Materials

- 200 pennies or marbles or pieces of small food (cheerios, fruit loops, popcorn kernels)
- Chart paper
- Markers
- Pencils
- Pinwheel
- Piece of coal
- Non-renewable Resource Data Collection sheet
- 4 cups per each student group
- Energy Resources PowerPoint (or your own information)

Credits:

www.teachengineering.org

When the paired groups have completed the data sheet, ask for volunteers to share their results. Once a few pairs share similar results, lead the class in a discussion.

Through the data, students should be able to deduce that, due to a limited supply, the search yielded smaller returns each time.

Ask questions such as:

In which search did you find the most pennies?

What is the difference between the number of pennies you found in your tallest graph and your shortest graph?

Why do you think it became increasingly harder to find pennies?

If you were really searching for coal, what does your graph data tell you?

MOVING ON:

Revisit the concept of renewable versus non-renewable energy. All the energy we use comes from the earth.

The electricity we use every day doesnôt come directly from the earth, but we make electricity using the earthôs resources, such as coal or natural gas. Both coal and natural gas are called ñfossil fuelsò because they were formed deep under the earth over millions of years. The problem is that fossil fuels canôt be replaced ï once we use them up, theyôre gone forever. Renewable energy, on the other hand, is made from resources that will be naturally replaced like wind, water and sunshine. Renewable energy is sometimes called ñclean energyò or ñgreen powerò because it usually doesnôt pollute the air or the water.

Demonstrate the movement of a pinwheel by blowing toward it. Again, ask students to identify the source of the energy. (If they say ñyou,ò be sure to translate that into ñwindò or ñnature.ò) Also, ask how the pinwheel uses the wind ð how it is captured or harnessed.

Students should be able to recognize that the shape of the pinwheel creates the rotation when a current of air strikes it. Ask students to suggest which one of the energy sources is more likely to run out of its supply, the non-renewable source such as coal, or the renewable source such as 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.

Discuss the effects of using renewable and nonrenewable energy sources to fuel our lives. Ask for student input.

DID YOU KNOW?

Burning coal is a leading cause of smog, acid rain and toxin substances in the air, and one of the chief culprits of carbon dioxide emissions. In an average year, a typical coal power station generates 3,700,000 tons of carbon dioxide, and is the primary human cause of global warming - that's as much carbon dioxide as cutting down 161 million trees.

A single liter of oil spilled can contaminate a million liters of drinking water. And overall, 30% of CO2 emissions affecting the atmosphere come from cars and other petrol guzzling vehicles.

The following lessons help students develop their understanding of pollutants and harmful environmental effects that are caused by burning nonrenewable coal for other forms of energy (e.g. electricity).

One problem with traditional energy sources like coal, oil, and gas is that they produce gasses and tiny particles that can foul the air and produce smog when tiny droplets of water condense around them.

Ask students what air pollution looks like? What are some of the different sources of air pollution? (Make sure to include coal fired power plants as a pollution source.) Tell them they will learn more about what air pollution looks like, and how it occurs, in this activity.

Before the Activity: Practice the process a few times before demonstrating it to the class.

DEMONSTRATION: INCOMPLETE COMBUSTION— Grades 1-8

Light the candle.

Place the bottom of the can directly over the flame for a few seconds. The top of the flame should be almost touching the can.

Look at the bottom of the can. Ask students what they see. (Answer: Black, sooty area.) Have the students record their observations in their journals.

Ask: Do you think this is evidence of pollution? (Answer: Yes)

Clean off the bottom of the can with a paper towel. Have students also observe the pollution on the towel.

Repeat the procedure, but use the straw to gently blow air on the bottom of the can. Be careful not to blow the flame out.

Look at the bottom of the can and ask students what they see. (Answer: Nothing or perhaps some water vapor condensing on the bottom of the can.)

Ask: Do you see any pollutants? (Answer: No) Have students record their observations and responses in their journals.

Ask students how the additional air affected the combustion of the candle. (Answer: Complete combustion takes place, producing only carbon dioxide and water vapor. Other types of pollutants are avoided.) Have students record their responses.

Incomplete Combustion Demonstration Materials

- Utility candle
- 1 tin can
- Matches
- Straw
- Paper towel or rag
- Hot mitt

Credits:

GLES

One problem with traditional energy sources like coal, oil, and gas is that they produce gasses and tiny particles that can foul the air and produce smog when tiny droplets of water condense around them.

Before the Activity: Practice the process a few times before demonstrating it to the class.

SMOG IN A BOTTLE— Grades 1-8

Demonstrate smog in a bottle to show effects of burning coal for electricity.

Say: Sometimes the little drops of water the air has sucked up join bits of other stuff, like dust or smoke, that comes from chimneys and autos. Then the little drops become haze, and everything outside looks kind of fuzzy. If enough water and smoke mix, we call it a mixture of smoke and fog, or smog.

Procedure:

Any glass pitcher will do, or use a two liter soda bottle with the top cut off. Put some ice cubes in a baggie, pour an inch or two of warm water into the bottle, light a match and hold it inside the bottle for a second and then drop it into the water, close the top with the baggie, and watch the smog form inside as the warm, wet, smoky air rises up to touch the cold baggie (Smog 1). Count to 30 seconds, take the baggie off the top and watch the smog rise into the air (Smog 2). If itôs a sunny day, do all this near a window where the sun can shine in and light up the smog.
Ask students to describe what they see in the jar. How is it like real smog? How is it different? Ask students to write their responses in their journals.
Safety note: Do not breathe the "smog." Be sure to release it outdoors when you are finished with the demonstration.

Materials

- Jar or two liter bottle with top removed
- Warm water
- Baggies
- Ice
- Matches

Smog 1

Smog 2

Credits:

Funlessonplans.com

TRY THIS!

Mini Lab: Oil Spill— Grades 3-8

Make an ocean shoreline by placing rocks and gravel in one end of the pan. Add enough water to almost cover the rocks. Place several of the cotton balls on the rocks to represent birds and other animals. Add several drops of motor oil to the water to simulate an oil spill.

Construct a boom (provide definition to students) to contain the oil. First, use yarn to try to contain the spill. Next, string plastic straws together and place them around the oil.

Remove the boom and allow the oil spill to reach the shoreline. Use a clean straw to gently blow the top of the water to simulate a windy day.

Try different methods to clean up the oil spill: paper towels, plastic spoons, and cotton balls.

Explain why oil spills have such a negative effect on ecosystems.

Materials

- Disposable baking pans
- Spoons
- Yarn/string
- Straws
- Cotton balls
- Motor oil
- Eye droppers
- Paper towels
- water
- Dirt/sand/rocks/gravel
- Feathers/fake fur
- Dish soap

Extension:

Oily Ospreys and Otters

Dip feathers or small strips of fake fur into the oily water.

Using dish soap or other cleaning agents, see how long, or how many washes it takes, to remove all traces of oil from the feathers or fake fur. Discuss why this is a problem for our animal inhabitants.

Clean up help:

Since motor oil should not be poured down the drain or on the ground to contribute to run off, please make appropriate efforts to dispose of the used oil appropriately. This is a good opportunity to discuss proper disposal of household wastes with your students.

Disposal methods:

Soak up water and oil with paper towels and put in trash

Soak up water and oil with cat litter and put in trash

Credits:

GLES

Name:_____ Date:_____

Word Scramble

Try to find as many energy-related words as possible. You will find them across, down, backwards and on the diagonal. Good luck!

A	S	F	O	C	U	C	O	A	L	P	J	D
B	I	O	M	A	S	S	L	E	O	U	T	M
O	P	S	L	W	I	I	B	F	U	E	L	G
L	N	S	Y	A	H	F	N	G	E	H	D	S
H	G	I	G	T	R	Y	N	I	X	N	A	P
R	E	L	A	T	C	D	D	O	C	O	S	I
T	R	G	B	E	L	W	W	R	A	I	I	N
T	F	D	K	A	M	I	A	N	O	S	T	D
G	V	N	L	M	U	S	A	V	E	S	P	L
H	I	I	V	N	P	G	Q	M	F	I	N	E
R	O	W	E	N	E	R	G	Y	D	F	X	T
E	J	K	Z	S	A	J	U	D	R	F	Q	O
N	O	I	S	U	F	P	I	A	J	B	M	P
E	P	M	T	P	I	E	E	J	M	M	O	H
W	P	E	T	R	O	L	E	U	M	T	L	V
A	U	N	W	I	C	C	K	A	S	K	J	Z
B	J	R	I	U	L	Y	W	A	S	T	E	K
L	K	Q	N	M	A	C	G	D	F	M	N	Y
E	D	N	O	T	D	E	N	F	W	E	G	N
R	E	N	A	T	U	R	A	L	G	A	S	I
S	M	Y	P	A	R	M	W	A	T	T	N	R
Q	G	U	B	A	T	I	V	C	J	N	I	E
S	H	J	S	G	W	J	G	X	K	U	B	C
D	E	E	L	E	C	T	R	I	C	I	T	Y
F	S	R	U	C	U	L	Q	T	S	N	N	G
G	S	W	I	N	D	M	I	L	L	M	B	P

WORDS TO FIND:

coal
solar
natural gas
biomass
waste
fusion
recycle
fuel
nuclear
fission
renewable
wind
hydro
fossil
oil
saves
watt
petroleum
electricity
windmill
energy