Energy Name Game

Get Ready

If you have 20 or more students in the group or class, separate them into groups of 10 to 12.

Get Set

- Seat the members of the group in a circle facing inward.
- Select a group leader for each group, if necessary.

Go

- The group leader should instruct the students that they will be choosing new last names. Their new last names should begin with the same letter as their first names and be energy-related—a source of energy, an energy-consuming or -producing device, or energy term. For example: Bob Biomass, Martha Microwave, Gina Generator, etc. Tell the members of the group that no relatives will be allowed in the game—there can't be both Bob and Barbara Biomass.
- Before you get started, ask if anyone in the group is having a problem thinking of an energy last name. For those who are, ask them to tell the group their first names. Then have the group brainstorm several last names for them.
- The group leader begins by saying, "Hi, my name is…" and then his/her first name, followed by his/her new energy last name. The person to the left of the leader says the first person's first and last name, and then his/her own new energy name. The third person continues by giving the first two names, then his/her own energy name. This continues until the final person, sitting to the right of the group leader, gives everyone's name and then his/her own name.
- If, during the game, someone in the group has a problem remembering a person's first or last name, have members of the group give that person a hint. For example: If the person's name is Tim Toaster, someone in the group could say, "You put your bread in it in the morning." If the person's name is Pedro Petroleum, a group member could say, "You make gasoline from it."

Energy Name Game **is a quick, easy way to introduce people to each other in a group. It requires no preparation and very little time.**

Grade Levels

- K-12

Preparation

- 5 minutes

Time

- 10 minutes for a group of 12

Energy Bingo

***Energy Bingo* is a great icebreaker for a NEED workshop or conference. As a classroom activity, it also makes a great introduction to an energy unit.**

Grade Levels

- K-12

Preparation

- 5 minutes

Time

- 45 minutes

Bingos are available on several different topics. Check out these resources for more bingo options!

- Science of Energy Bingo—*Science of Energy* guides
- Transportation Bingo —*Transportation Fuels Infobooks*
- Renewable Energy Bingo—*Energy Infobook Activities*
- Marine Renewable Energy Bingo —*Exploring Ocean Energy*
- Wind Energy Bingo—Wind guides
- Biomass Bingo— *Energy Stories and More*
- Hydrogen Bingo—*H_2 Educate*
- Solar Bingo—Solar guides
- Hydropower Bingo—Hydropower guides
- Change a Light Bingo—*Energy Conservation Contract*
- Energy Efficiency Bingo—*Monitoring and Mentoring* and *Learning and Conserving*
- Nuclear Energy Bingo—Nuclear guides
- Oil and Gas Bingo—Oil and Gas guides
- Offshore Oil and Gas Bingo —*Exploring Ocean Energy*

Get Ready

Duplicate as many *Energy Bingo* sheets on page 30 as needed for each person in your group. In addition, decide now if you want to give the winner of your game a prize and what the prize will be.

Get Set

- Pass out one *Energy Bingo* sheet to each member of the group.

Go

PART ONE: FILLING IN THE BINGO SHEETS

Give the group the following instructions to create bingo cards:

- This bingo activity is very similar to regular bingo. However, there are a few things you'll need to know to play this game. First, please take a minute to look at your bingo sheet and read the 16 statements at the top of the page. Shortly, you'll be going around the room trying to find 16 people about whom the statements are true so you can write their names in one of the 16 boxes.
- When I give you the signal, you'll get up and ask a person if a statement at the top of your bingo sheet is true for them. If the person gives what you believe is a correct response, write the person's name in the corresponding box on the lower part of the page. For example, if you ask a person question "D" and he or she gives you what you think is a correct response, then go ahead and write the person's name in box D. A correct response is important because later on, if you get bingo, that person will be asked to answer the question correctly in front of the group. If he or she can't answer the question correctly, then you lose bingo. So, if someone gives you an incorrect answer, ask someone else! Don't use your name for one of the boxes or use the same person's name twice.
- Try to fill all 16 boxes in the next 20 minutes. This will increase your chances of winning. After the 20 minutes are up, please sit down and I will begin asking players to stand up and give their names. Are there any questions? You'll now have 20 minutes. Go!
- During the next 20 minutes, move around the room to assist the players. Every five minutes or so tell the players how many minutes are remaining in the game. Give the players a warning when just a minute or two remains. When the 20 minutes are up, stop the players and ask them to be seated.

PART TWO: PLAYING BINGO

Give the class the following instructions to play the game:

- When I point to you, please stand up and in a LOUD and CLEAR voice give us your name. Now, if anyone has the name of the person I call on, put a big "X" in the box with that person's name. When you get four names in a row—across, down, or diagonally—shout "Bingo!" Then I'll ask you to come up front to verify your results.
- Let's start off with you (point to a player in the group). Please stand and give us your name. (Player gives name. Let's say the player's name was "Joe.") Okay, players, if any of you have Joe's name in one of your boxes, go ahead and put an "X" through that box.
- When the first player shouts "Bingo," ask him (or her) to come to the front of the room. Ask him to give his name. Then ask him to tell the group how his bingo run was made, e.g., down from A to M, across from E to H, and so on.
- Now you need to verify the *Energy Bingo* winner's results. Ask the bingo winner to call out the first person's name on his bingo run. That player then stands and the bingo winner asks him the question which he previously answered during the 20-minute session. For example, if the statement was "can name two renewable sources of energy," the player must now name two sources. If he can answer

the question correctly, the bingo winner calls out the next person's name on his bingo run. However, if he does not answer the question correctly, the bingo winner does not have bingo after all and must sit down with the rest of the players. You should continue to point to players until another person yells "Energy Bingo."

- In case of a tie, ask the winners to come to the front one at a time to verify their results. If time permits, you may wish to continue the game for second or third place winners. You may want to change some of the questions to fit your group. Below are eight extra statements you can use instead.
  - Knows what energy source C_3H_8 is *(propane)*
  - Knows what ethanol is made from in the U.S. *(corn)*
  - Knows which state produces the most oil *(Texas)*
  - Knows which state produces the most coal *(Wyoming)*
  - Can name two products made from petroleum *(gasoline, diesel, jet fuel, fuel oil, plastic, tires, etc.)*
  - Knows which energy source generates the most electricity *(coal)*
  - Knows the main ingredient in natural gas *(methane)*

ENERGY BINGO

ANSWERS

A Has seen a wind turbine

B Can name two fossil fuels

C Has never seen coal

D Uses a solar clothes dryer

E Has visited a power plant

F Can name two ways to save energy at home

G Uses a hand-operated can opener

H Can name two ways to increase a car's MPG

I Recycles aluminum cans

J Has seen geothermal energy

K Has seen a photovoltaic cell

L Can name two renewable energy sources

M Knows the cost of a kilowatt-hour of electricity

N Knows how natural gas is usually transported

O Knows which fuel is used in barbecue grills

P Knows how uranium atoms give off energy

A Student should share location.	**B** coal, petroleum, natural gas, propane	**C** (no answer needed)	**D** Students should be able to describe a clothes line.
E Students should describe plant or location of plant.	**F** turning off lights, insulation, saving water, etc.	**G** (no answer needed)	**H** tire pressure, maintenance, removing excess weight
I (no answer needed)	**J** Student should describe volcano, geyser, or hot spring.	**K** Student should list where: home, street light, calculator, etc.	**L** hydropower, solar, geothermal, wind, biomass
M 12 cents/kWh national average	**N** pipeline	**O** propane	**P** fission

Energy BINGO

For each letter, find one person about whom the statement is true. Write each name in one of the boxes below.

A Has seen a wind turbine

B Can name two fossil fuels

C Has never seen coal

D Uses a solar clothes dryer

E Has visited a power plant

F Can name two ways to save energy at home

G Uses a hand-operated can opener

H Can name two ways to increase a car's MPG

I Recycles aluminum cans

J Has seen geothermal energy

K Has seen a photovoltaic cell

L Can name two renewable energy sources

M Knows the cost of a kilowatt-hour of electricity

N Knows how natural gas is usually transported

O Knows which fuel is used in barbecue grills

P Knows how uranium atoms give off energy

A NAME	B NAME	C NAME	D NAME
E NAME	F NAME	G NAME	H NAME
I NAME	J NAME	K NAME	L NAME
M NAME	N NAME	O NAME	P NAME

Energy Eliminators

Get Ready

Divide the students into ten teams. For each team, make a list of five to ten words or phrases that describe the team's energy source. The number of words or phrases you use will depend on the age level and experience of the students playing the game. You may use the lists on page 34 and cross out the words and phrases that you do not want to use, leaving five to ten words or phrases for each energy source. (If you feel that the words provided are too difficult, or revealing, feel free to make up your own list of words.) Next, write the name of each energy source on the top of a blank sheet of paper. Students will use these sheets to brainstorm their own lists.

Get Set

- Give students an overview of the game. Give each team the sheet of paper with their energy source name and remind them not to reveal their energy source to the other teams.

Go

Give the students the following instructions for how to play the game:

- Each team has been given a sheet of paper with the name of an energy source. Remember, don't let the other teams see your name. You will have four minutes to brainstorm as many words or phrases as possible that relate to your energy source. For example, if your energy source is ELECTRICITY, what words might you brainstorm that relate to electricity? (List student examples on the board—words might include: kilowatt-hour, generator, megawatt, power plant, and peak demand.) You will now have four minutes to brainstorm words and phrases for your energy source. Write the words you have brainstormed on the sheet of paper that I have given you. Please do your brainstorming quietly so that the other teams will not be able to hear you.
- Now, I will give each team a list of words and phrases that I have selected for their energy source. Compare my list with the list of words you have developed. On your list, cross off all the words that match the ones on my list.
- Next, take your sheet of paper and write the numbers one through ten on the reverse side. A student from team one will now stand up and tell the class in a loud, clear voice the words and phrases that have not been crossed off their list. The other teams will write these words next to the number one on their sheet of paper. After all ten teams have given their remaining words, you will have three minutes to decide which energy source each team represents.
- One at a time, each team will stand up and tell the class the energy source they represent. On your sheet of paper, place check marks next to the teams that you guessed correctly. Do not check your own team—the most you can guess correctly is nine. You receive ten points for each correct guess.
- Starting with team one, how many teams correctly guessed the first team's identity? Team one receives five points for each team that guessed their identity. (The leader continues this process with the remaining teams.)
- Teams should now add up their scores. The group that has the most points wins.

Energy Eliminators **strengthens students' brainstorming skills while reviewing major energy topics.**

Grade Levels

- Elementary, grades 4-5
- Intermediate, grades 6-8
- Secondary, grades 9-12

Preparation

- 5-10 minutes

Time

- 45 minutes

Energy Eliminators

Word List | *RENEWABLE*

▪ BIOMASS	▪ GEOTHERMAL	▪ SOLAR	▪ HYDROPOWER	▪ WIND
organic matter	Earth	nuclear fusion	water	air
photosynthesis	electricity	radiation	water wheels	windmill
burning	hot springs	hydrogen	grind grain	rotor blades
bacterial decay	volcanoes	renewable	electricity	electricity
methane	radioactive decay	space heating	Niagara Falls	wind farms
wood	plate tectonics	collector	kinetic energy	anemometer
renewable	Ring of Fire	greenhouse effect	turbine generator	renewable
fermentation	magma	passive system	dams	Holland/Dutch
corn	heating buildings	active system	reservoir	pump water
landfills	steam	photovoltaic cells	tidal power	tower
garbage	core	silicon	Grand Coulee	kinetic energy
ethanol	renewable	electricity	renewable	turbine

Word List | *NONRENEWABLE*

▪ URANIUM	▪ COAL	▪ PETROLEUM	▪ PROPANE	▪ NATURAL GAS
nuclear	surface mines	oil	heating	heating
fission	underground mines	crude	transportation	fossil fuel
chain reaction	sulfur	imported	LPG	methane
radioactive	trains	fossil fuel	pressurized tanks	processing plant
electricity	electricity	OPEC	odorless	wells
1957	fossil fuel	refinery	portable gas	cubic feet
104 reactors	carbon	gasoline	fossil fuel	compressor stations
Fukushima	nonrenewable	heating oil	refining	pipelines
neutrons	scrubber	transportation	nonrenewable	industry
cooling towers	shaft	tankers	farms	CNG
Three Mile Island	bituminous	offshore drilling	industry	LNG
Chernobyl	anthracite	air pollution	barbecue grills	nonrenewable

Energy in the Round

***Energy in the Round* is a quick, entertaining game to reinforce information about energy sources, forms of energy, and general energy information from the *Energy Infobook*.**

Grade Levels

- Elementary, grade 5
- Intermediate, grades 6-8
- Secondary, grades 9-12

Preparation

- 5-10 minutes

Time

- 10–15 minutes

Alternative Instructions

- Give each student or pair a set of cards.
- Students will put the cards in order, taping or arranging each card so that the answer is directly under the question.
- Have students connect the cards to fit in a circle or have them arrange them in a column.

"In the Rounds" are available on several different topics. Check out these guides for more, fun "In the Round" examples!

- Hydrogen in the Round—H_2 *Educate*
- Oil and Gas Industry in the Round—*Fossil Fuels to Products*, *Exploring Oil and Gas*
- Conservation in the Round—*Monitoring and Mentoring*, *Learning and Conserving*
- Forms of Energy in the Round—Science of Energy guides
- Uranium in the Round—Nuclear guides
- Solar Energy in the Round—*Energy from the Sun*
- Transportation Fuels in the Round—*Transportation Fuels Infobooks*

Get Ready

- Copy one set of the *Energy in the Round* cards on pages 47-49 on card stock and cut into individual cards.
- Have a class set of the *Energy Infobooks* available for quick reference.

Get Set

- Distribute one card to each student. If you have cards left over, give some students two cards so that all of the cards are distributed.
- Have the students look at their bolded words at the top of the cards. Give them five minutes to review the information about their words using the *Energy Infobooks*.

Go

- Choose a student to begin Round 1 and give the following instructions:
  - Read Question 1 on your card. The student with the correct answer will stand up and read the bolded answer, "I have _____."
  - That student will then read Question 1 on his/her card, and the round will continue until the first student stands up and answers a question, signaling the end of the round.
- Continue the game with Rounds 2 and 3.
- If there is a disagreement about the correct answer, have the students listen to the question carefully, looking for key words (forms versus sources, for example), and discuss until a consensus is reached about the correct answer.

Answer Key

Round 1—Starting with Propane's clue

- Solar
- Energy Sustainability
- Natural Gas
- Biomass
- Renewable
- Coal
- Ethanol
- Thermal Energy
- Wind
- Fossil fuel
- Nuclear Fusion
- Hydropower
- Hydrogen
- Electricity
- Petroleum
- Nonrenewable
- Greenhouse
- Uranium
- Energy Sources
- Power Plant
- Geothermal
- Nuclear Fission
- Radiant Energy
- Industry
- Energy
- Photosynthesis
- Texas
- Water Cycle
- Mining
- Propane

Round 2—Starting with Propane's clue

- Industry
- Coal
- Power Plant
- Energy Sustainability
- Hydrogen
- Wind
- Mining
- Nuclear Fusion
- Renewable
- Texas
- Geothermal
- Hydropower
- Solar
- Water Cycle
- Nonrenewable
- Biomass
- Ethanol
- Energy
- Nuclear Fission
- Greenhouse
- Thermal Energy
- Photosynthesis
- Radiant Energy
- Petroleum
- Fossil Fuels
- Natural Gas
- Electricity
- Uranium
- Energy Sources
- Propane

Round 3—Starting with Propane's clue

- Mining
- Greenhouse
- Biomass
- Fossil Fuel
- Power Plant
- Thermal Energy
- Hydropower
- Solar
- Ethanol
- Nuclear Fission
- Wind
- Electricity
- Coal
- Radiant Energy
- Hydrogen
- Energy
- Petroleum
- Energy Sources
- Nonrenewable
- Energy Sustainability
- Geothermal
- Photosynthesis
- Uranium
- Natural Gas
- Texas
- Nuclear Fusion
- Water Cycle
- Industry
- Renewable
- Propane

I HAVE PROPANE.

1. Who has the energy source converted directly into electricity using PV cells?
2. Who has the sector of the economy that uses about 32 percent of the nation's energy?
3. Who has the processes of surface, deep, underground, room-and-pillar, and longwall?

I HAVE RENEWABLE.

1. Who has the energy source that generates 39 percent of the nation's electricity?
2. Who has the number one state for producing natural gas?
3. Who has the gas that becomes a liquid under moderate pressure or when cooled?

I HAVE SOLAR.

1. Who has an energy concept based on efficiency and conservation?
2. Who has the process during which precipitation replenishes oceans, rivers, and lakes?
3. Who has the alcohol made by adding yeast to biomass?

I HAVE COAL.

1. Who has a renewable fuel often made from corn that is mixed with gasoline to burn cleaner?
2. Who has the item that can use many different fuels to produce most of the electricity in the U.S.?
3. Who has the form of energy released by a compact fluorescent light bulb?

I HAVE ENERGY SUSTAINABILITY.

1. Who has the energy source transported by more than two million miles of underground pipeline?
2. Who has the resource that fuel cells use to generate electricity?
3. Who has the energy source that produces volcanoes and hot springs?

I HAVE ETHANOL.

1. Who has the internal energy of atoms and molecules?
2. Who has something can be changed into other forms, but cannot be created or destroyed?
3. Who has the process in which atoms are split apart, releasing thermal energy as radiation?

I HAVE NATURAL GAS.

1. Who has the energy source that makes renewable methane gas?
2. Who has a secondary source of energy defined as moving electrons?
3. Who has the state that generates the most electricity from wind?

I HAVE THERMAL ENERGY.

1. Who has the energy source caused by uneven heating of the Earth's surface?
2. Who has the process in which water, carbon dioxide, and sunlight are turned into glucose and oxygen?
3. Who has the energy source that requires the Earth's gravity to work?

I HAVE BIOMASS.

1. Who has the energy sources that are replenished in a short time?
2. Who has a transportation fuel that can be made from biomass?
3. Who has the group of nonrenewable energy sources used most in the U.S.?

I HAVE WIND.

1. Who has a term that describes petroleum, coal, natural gas, and propane?
2. Who has the process in which uranium and coal are brought to the Earth's surface?
3. Who has the item that is generated when a magnet is spun in a coil of copper wire?

I HAVE FOSSIL FUEL.

1. Who has the process in which the sun's extremely high pressure and hot temperature cause hydrogen atoms to combine?
2. Who has a clean burning fossil fuel used to heat many homes in the U.S.?
3. Who has something that uses a generator, turbine, and transformer?

I HAVE PETROLEUM.

1. Who has the type of energy source we can't make more of in a short time?
2. Who has the group of sources that were formed from plant and animal remains long ago?
3. Who has resources that are used specifically to meet energy needs?

I HAVE NUCLEAR FUSION.

1. Who has the energy source that depends on the amount of rainfall?
2. Who has energy sources whose supplies are readily replenished?
3. Who has the process in which water changes from liquid to vapor and back?

I HAVE NONRENEWABLE.

1. Who has the gases that make up one percent of the atmosphere?
2. Who has the energy source that uses sunlight in photosynthesis to store radiant energy?
3. Who has a long-term energy plan that meets the needs of today as well as tomorrow?

I HAVE HYDROPOWER.

1. Who has the smallest element, which is only found on Earth combined with other elements?
2. Who has the energy source that takes eight minutes to reach the Earth?
3. Who has the source of energy that can be concentrated on a dish, trough, or tower to create electricity?

I HAVE GREENHOUSE.

1. Who has the radioactive mineral used to produce electricity in 100 reactors in the U.S.?
2. Who has the form of energy released deep within the Earth by the slow decay of radioactive particles?
3. Who has a renewable source of energy from wood, garbage, and agricultural waste?

I HAVE HYDROGEN.

1. Who has the secondary energy source generated by a waste-to-energy plant?
2. Who has the energy source that produces noise pollution but no air pollution?
3. Who has the item that makes light, heat, motion, growth, and powering technology possible?

I HAVE URANIUM.

1. Who has the resources that can be categorized as either renewable or nonrenewable?
2. Who has natural resources that are used to do work?
3. Who has the energy source that consists mostly of methane?

I HAVE ELECTRICITY.

1. Who has the energy source whose major use is for transportation?
2. Who has the energy source that is the nation's third leading producer of electricity?
3. Who has the energy source that can produce acid rain when it is burned?

I HAVE ENERGY SOURCES.

1. Who has the production facility where electricity is generated?
2. Who has the portable energy source used in barbecue grills and hot air balloons?
3. Who has the energy sources whose supplies are limited?

I HAVE POWER PLANT.

1. Who has the energy source that comes from the Earth's core?
2. Who has the belief that every generation should meet their energy needs without compromising the energy needs of future generations?
3. Who has the form of energy commonly called "heat"?

I HAVE ENERGY.

1. Who has the process green plants use to change radiant energy into chemical energy?
2. Who has the process nuclear power plants use to produce electricity?
3. Who has the energy source of which most is refined into gasoline?

I HAVE GEOTHERMAL.

1. Who has the process in which an atom of uranium is split by a neutron?
2. Who has the energy source that might disrupt fish and wildlife when its production facility is built?
3. Who has the process used by green plants to store the sun's energy?

I HAVE PHOTOSYNTHESIS.

1. Who has the number one petroleum producing state?
2. Who has the form of energy transformed by plants into energy stored in its roots and leaves?
3. Who has the energy source whose waste products can be stored in spent fuel pools?

I HAVE NUCLEAR FISSION.

1. Who has the form of energy that comes from the sun?
2. Who has the effect that traps heat in the atmosphere?
3. Who has the renewable energy source that produces most of its electricity in Texas, Iowa, and California?

I HAVE TEXAS.

1. Who has the process of evaporation, condensation, and precipitation?
2. Who has the energy source that is abundant in the Ring of Fire in the Pacific Ocean?
3. Who has the nuclear combining process that gives off radiant energy?

I HAVE RADIANT ENERGY.

1. Who has the sector of the economy that makes the goods and materials we use every day?
2. Who has the energy source that the U.S. must import from other countries like Canada and Saudi Arabia?
3. Who has the energy carrier that may become a significant transportation fuel in the future?

I HAVE THE WATER CYCLE.

1. Who has the continuous process used to reach energy sources buried underground?
2. Who has the type of energy sources in which fossil fuels are grouped?
3. Who has the sector of the economy that uses natural gas and propane the most?

I HAVE INDUSTRY.

1. Who has the ability to do work or make a change?
2. Who has the energy source that is transported chiefly by train?
3. Who has the type of energy source that includes biomass, solar, geothermal, hydropower, and wind?

I HAVE MINING.

1. Who has the energy source Dr. Walter Snelling discovered in 1911?
2. Who has the process in which larger atoms are made by combining smaller atoms?
3. Who has the gases that include CO_2, methane, and water vapor?

Energy Pantomime

***Energy Pantomime* is a quick and easy way to break a group into several smaller groups. It gets the participants moving, looking, thinking, and acting. *Energy Pantomime* will produce a random mix of groups or a mix of groups by age depending on how the slips are handed out. It is short, easy to prepare, and fun for your audience. It requires only one adult to run, although many can be involved. This activity is suited for most ages.**

Grade Levels

- Primary, grade 2
- Elementary, grades 3-5
- Intermediate, grades 6-8
- Secondary, grades 9-12

Preparation

- 5-10 minutes

Time

- 5 minutes

Get Ready

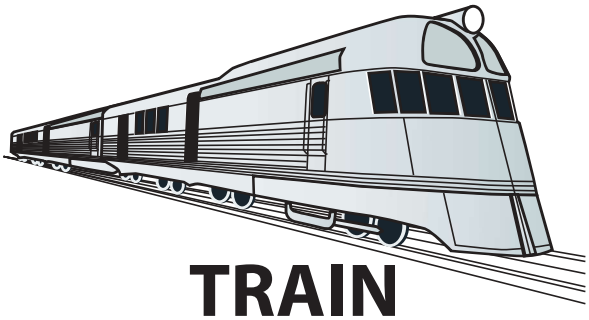
Duplicate the sheet of ten pantomimes on page 11, according to the number of people you want to have in each group. Feel free to use this sheet, or to make up your own. You will need enough slips to hand out to everyone. If you have a small group, you may want to use less than ten pantomimes.

Get Set

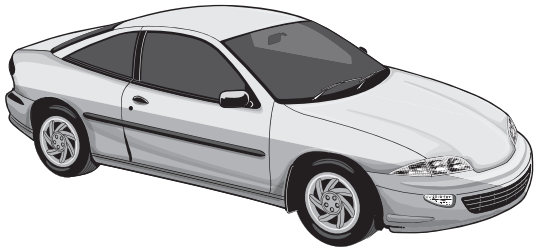
- Cut the pantomime sheets into separate pantomime slips.
- If you want your groups to contain a random mixture of people, hand out the slips randomly. If you want to divide the groups by age level, or by students' strengths and personalities, fold the pantomime slips in half, write a student's name on each slip, and distribute the slips.

Go

- Explain to the students that they are going to be broken into smaller groups using this activity.
- Explain that each of them will be handed a slip of paper with an energy source or user on it. They must not say the name of their source or energy-producing or energy-consuming device aloud—just read it and put it in their pockets.
- Hand out the pantomimes. Once all the slips have been handed out, tell the students to begin to pantomime their energy source or user. They may make sound effects and hand motions, but no talking, whispering, or reading lips.
- The students should walk around the room searching for others pantomiming the same source or object. Once all the members of the groups have found each other, the students will be neatly divided into groups that can be used for other activities.



TRAIN



CAR

AIRPLANE

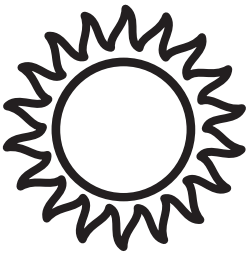
WIND TURBINE

TELEVISION

LIGHT BULB

TREE

TELEPHONE



SUN

BICYCLE

Energy Source Relay Race

Get Ready

- Gather together six pieces of paper and two pencils for each group of five students.
- Determine five energy terms to use during the game. For elementary level students you might choose simpler terms like: light bulb, solar, wind, television, and petroleum. For middle school students, coal, insulation, natural gas, biomass, and thermostat would be good choices. High school level terms might include more complex terms like: propane, nuclear fission, geothermal, hydropower, and photosynthesis.

Get Set

- Assign one student to be the game leader.
- Divide the remaining students into groups of about five. Arrange the groups of students in circles on the floor or around a table.
- On five of the six pieces of paper, instruct the students to write the name of their group in small print on the bottom and number the pages one through five. They should fold and tear the sixth sheet into eight equal pieces.
- Inform the students that there must be no talking at all during the game, and they must walk to the game leader and back to their groups. If they run, they will be asked to return and walk. If they talk, they will automatically be disqualified.

Go

- One student from each group is chosen as the opening artist. He/she will approach the game leader and receive the first energy term as soon as the starting signal is given. All artists are given the first term at the same time. The artists return to their groups and draw representations of the term. Tell the students that writing words or letters, pointing, or using numbers are forbidden.
- When someone in the group thinks he/she knows the answer, he/she should take the second pencil and write his/her guess on one of the eight small pieces of paper. Remind the students that they are allowed eight guesses for five terms, so they can only afford three mistakes. The artist nods to inform whether or not the guesser is correct. If not, guessing continues.
- If the person is correct, he/she takes the drawing and slip of paper with the correct term and gives them to the game leader. The game leader whispers or shows the next term to the student. The student then returns to the group and the game continues with that person as the new artist. The person who correctly guesses the term is always the one who draws next. The game leader should move around the room to avoid being closer to one group than another.
- The first group to correctly guess all five terms wins. Follow up with a discussion of the energy terms and display various drawings from the individual groups.

Energy Source Relay Race **tests students' ability to recognize important pictorial representations of energy sources or energy producing, consuming, or conserving devices and materials. It is based on the game show "Win, Lose, or Draw."**

Grade Levels

- Elementary, grades 3-5
- Intermediate, grades 6-8
- Secondary, grades 9-12

Preparation

- 5-10 minutes

Time

- 20 minutes

Energy Squares

Get Ready

Before class, make nine nametags for the celebrity energy guests. Next, make a copy of the game board found on page 40 to project for the class. Cut out X and O shapes from black construction paper or make sure interactive board markers are available. There are five questions provided for each guest. Most likely, only three or four questions will be needed, so choose the ones you feel are most important. You can also come up with alternative questions appropriate to the grade level of the students playing the game.

ENERGY NAMES

Peter Petroleum	Natalie Natural Gas	Colin Coal
Reba Renewable	Ursula Uranium	Christy Conserve
Paul Propane	Eli Electricity	Herman History

Get Set

- Choose nine students to act as energy guests for the game. Provide each guest with a nametag and stand them in front of the room. Another student acts as the game show host. Props and costumes may be used.
- Divide the remaining students into four teams. Each team must choose one spokesperson.
- Only two teams can participate at one time—decide which two teams will play in the first round and which two will play in the second round.
- Flip a coin to determine which first round team begins the game. The winner of the coin toss decides who goes first, and the losing team chooses either X or O as their symbol. Repeat this procedure with the second round teams.

Go

Give the students the following instructions for how to play the game:

- This game is similar to tic-tac-toe. The goal is to get three X's or O's in a row on the game board. The first two teams will play each other and then the remaining two teams will play. The winners will face off in the final championship round.
- The first team chooses a guest and his or her accompanying square on the game sheet. The guests' names correspond to the topic of the question they will be asked. The host asks the guest a question and the guest answers to the best of his knowledge and ability. It is now the team's responsibility to decide whether or not they agree with the answer given by the energy guest. If they answer correctly, the team's symbol is placed in the square. However, if they answer incorrectly, the other team's symbol is placed in the square. After each question, it is the other team's turn to choose a guest.
- When choosing guests, keep in mind that this game is played like tic-tac-toe. You are trying to get three of your symbols in a row while blocking your opponents from doing the same thing. Play continues in this manner until a team succeeds in getting three in a row or all squares are filled with either X's or O's. One final rule—when a team is going for the winning square to get three in a row, the team members must answer the question correctly. If the question is answered incorrectly, the other team does not place its symbol in that square. Again, this is only applicable when one of the teams is going for the winning square. In case neither team succeeds in getting three in a row, the team with the most symbols on the board wins.

Based on tic-tac-toe, *Energy Squares* reinforces students' knowledge of energy sources and energy-related topics.

Grade Levels

- Elementary, grades 3-5
- Intermediate, grades 6-8
- Secondary, grades 9-12

Preparation

- 10-15 minutes

Time

- 30 minutes

Energy Squares

QUESTIONS AND ANSWERS FOR PETROLEUM

1. What is the major use of petroleum in the U.S.? (*Transportation)*
2. What is the major product produced during petroleum refining? (*Gasoline)*
3. How many gallons of oil are in one barrel? (*42)*
4. True or false? Alaska is the nation's top oil producing state. (*False, Texas is)*
5. What percentage of U.S. petroleum supply is imported—21%, 41%, 51%, or 71%? (*41%)*

QUESTIONS AND ANSWERS FOR NATURAL GAS

1. How is natural gas usually transported? (*By pipeline)*
2. True or false? Natural gas is a light yellow color. (*False, it's colorless)*
3. What is the major use of natural gas by a family? (*Home heating)*
4. What is the chemical name for natural gas? (*Methane)*
5. True or false? Natural gas is measured in, and sold by, gallons? (*False, by cubic feet)*

QUESTIONS AND ANSWERS FOR COAL

1. What is the major use of coal? (*Producing electricity)*
2. True or false? Canada is the world leader of known reserves of coal. (*False, the United States is*)
3. How is coal mainly transported? (*By railroad)*
4. Is coal the youngest or the oldest fossil fuel? (*The youngest)*
5. Most U.S. coal is produced from which type of mining, surface or underground? (*Underground)*

QUESTIONS AND ANSWERS FOR RENEWABLES

1. What type of solar cell produces electricity directly from sunlight? (*Photovoltaic cell)*
2. Renewables make up approximately what percentage of total U.S. energy demand—1%, 9%, 19%, or 21%? *(9%)*
3. Which renewable source of energy is NOT a result of the sun's energy striking the Earth? (*Geothermal)*
4. True or false? Wind is the result of uneven heating of the Earth's mantle. (*False, uneven heating of the Earth's surface)*
5. Which energy source gets its energy from garbage and agricultural wastes? (*Biomass)*

QUESTIONS AND ANSWERS FOR URANIUM

1. Where is nuclear waste stored? (*On-site in spent fuel pools and dry casks/vaults)*
2. True or false? The isotope of uranium that splits in nuclear reactors is U-238. *(False, it's U-235)*
3. What is the name of the subatomic particle that causes nuclear fission when it strikes U-235—an electron, a neutron, or a proton? (*A neutron)*
4. Plus or minus ten years, in what year did America's first nuclear power plant go into operation? (*1957 (accept 1947-1967))*
5. In what part of a nuclear power plant does nuclear fission take place? (*The reactor)*

QUESTIONS AND ANSWERS FOR CONSERVATION

1. Which letter of the alphabet is used to measure the value of insulation? (*R value)*
2. True or false? Incandescent light bulbs provide the same amount of light that fluorescent bulbs do for one-fourth the energy. *(False, it's exactly the opposite)*
3. After home heating and cooling, what is the most energy-consuming job in the home? (*Water heating)*
4. What two items are used to seal cracks around windows and doors? (*Caulking and weatherstripping)*
5. As the energy efficiency rating of an appliance increases, the amount of energy it requires to operate: increases, decreases, or remains the same? (*Decreases)*

QUESTIONS AND ANSWERS FOR PROPANE

1. Is propane used mostly in metropolitan or rural areas? (*Rural)*
2. By what quantity is propane sold? (*By the gallon)*
3. What physical state does propane turn into when it's stored under moderate pressure or cooled to -45° Fahrenheit? (*A liquid)*
4. Propane comes from processing which fossil fuels? (*Natural gas and petroleum)*
5. Is the weight of propane lighter than, heavier than, or equal to the weight of air? (*Heavier than)*

QUESTIONS AND ANSWER FOR ELECTRICITY

1. How is electricity used, measured, and sold? (*By the kilowatt-hour)*
2. What is the average cost of a kilowatt-hour of electricity for consumers? (*12 cents (accept 10 to 14 cents))*
3. Is electricity produced by rotating wires in a magnetic field in a turbine or a generator? (*A generator)*
4. In the summer, during what time period does the demand for electricity peak—6:00 a.m. to noon, noon to 6:00 p.m., or 6:00 p.m. to midnight? (*Noon to 6:00 p.m.)*
5. What is the leading energy source used to generate electricity? (*Coal)*

QUESTIONS AND ANSWERS FOR HISTORY

1. Whose motorized vehicle created a great demand for gasoline? (*Henry Ford)*
2. Where was the world's first hydroelectric power plant built in 1882? (*Appleton, Wisconsin on the Fox River)*
3. Who invented the steamboat, Robert Fulton or Edwin Drake? (*Robert Fulton)*
4. Who invented the light bulb and other electrical devices? *(Thomas Edison)*
5. After World War II, this energy source replaced coal as the number one energy source consumed. *(Petroleum)*

Energy Squares

Peter Petroleum	**Natalie Natural Gas**	**Colin Coal**
Reba Renewable	**Ursula Uranium**	**Christy Conserve**
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SOLAR OVEN CHALLENGE

Long before we were using photovoltaic cells to generate electricity from the sun, we were using the sun to dry our crops and clothes, warm up our buildings, and heat water. Students likely know the phrase "it was so hot outside, you could fry an egg." They've also probably left candy in a hot car and experienced the melting effect from that solar collector. This challenge asks students to use solar energy and create the best solar collector to heat or cook some food.

This activity is based on *Solar Oven Challenge*, an activity found within NEED's solar curriculum guides. You can construct the ovens based on this design, using a pre-fabricated pizza box, or you can have students come up with their own design completely from scratch. Essential materials include, cardboard chip tubes or other cardboard, plastic wrap, food, and a thermometer. Additional materials can be provided based on what is available. A list on page 3 provides some inspiration for necessary and suggested materials. It is often fun to provide detractor materials, or materials that may not appear to be useful, as students can work through that challenge to refine their design.

Design Parameters

- Given a chip canister and/or additional teacher approved items, construct an oven to cook or heat food.
- Students opting to use alternative materials must standardize their oven to equal a similar volume of those using chip canisters.
- Construction design must include a flap that opens to allow sunlight to enter.
- Insulation may be used, but insulation must be kept to one single layer.
- Include space to allow for thermometers to be inserted.

Testing Parameters

1. Select the food that will be utilized and provide each team with the same amount of food items. Determine the oven temperature you wish for students to achieve. Share this information with students.
2. Place ovens into the open, sunny area of students' choosing, and on your cue, ask students to place food and thermometers inside to begin cooking.
3. Keep track of the time and students keep track of their temperature to determine which design reaches the temperature in the shortest amount of time, and has cooked the food to the desired doneness.

Teachers' Cheats

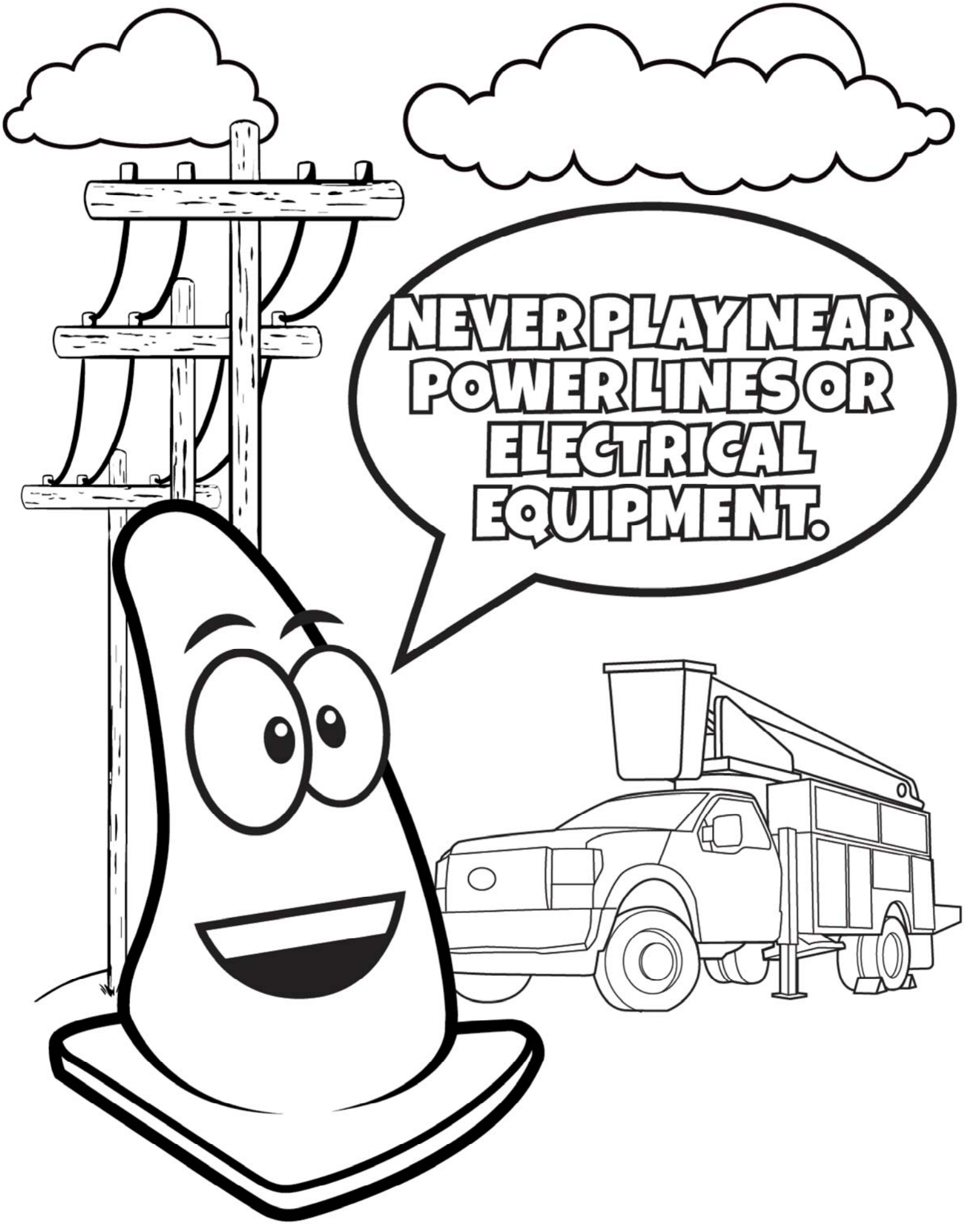
- Skewers can be used to prop open an angled awning or flap. Skewers can also be used as a rotisserie mechanism to prop up food.
- Make sure to set parameters on oven size that allows for the thermometers to fit inside.
- Digital thermometers, while helpful for quick readings, may not work well if the oven needs to be outside for extended periods of time. Often, digital thermometers have automatic shut-off to conserve battery power.
- Select food items that are student-friendly and cook easily based on your climate and the time of year. Food can also be skipped altogether and simply measure temperature.
- Sealing air leaks will be important in cooler climates. Make sure tape is available for students to use.
- Insulation can be effective for cooking in cooler climates.

Extensions and Enrichment

- Have a contest to see which design can cook a hot dog to the highest temperature. Provide digital thermometers after allowing ovens to sit for a prescribed amount of time. Spear the hot dogs to determine internal temperature.
- Limit the number of materials students may use for construction, *i.e.* only 6 inches of tape, 1 square foot of foil, etc.
- Incorporate budgeting by attributing cost to each material. Add lowest cost to the challenge parameters.
- Allow student ovens to be pulled into the shade or a cooler location to determine which design holds its temperature the longest.


UNPLUG COMPUTERS AND PHONES WHEN YOU'RE NOT USING THEM.

Las tabletas, las laptop y los teléfonos siguen usando electricidad mientras estén enchufados, incluso después que se terminen de cargar: desconéctalos cuando estén encendidos.


NEVER PLAY NEAR POWER LINES OR ELECTRICAL EQUIPMENT.


NUNCA JUEGUES CERCA DE LÍNEAS ELÉCTRICAS O EQUIPOS ELÉCTRICOS.

TURN OFF THE LIGHTS WHEN YOU LEAVE THE ROOM!

APAGA LAS LUCES CUANDO SALGAS DE LA HABITACIÓN.