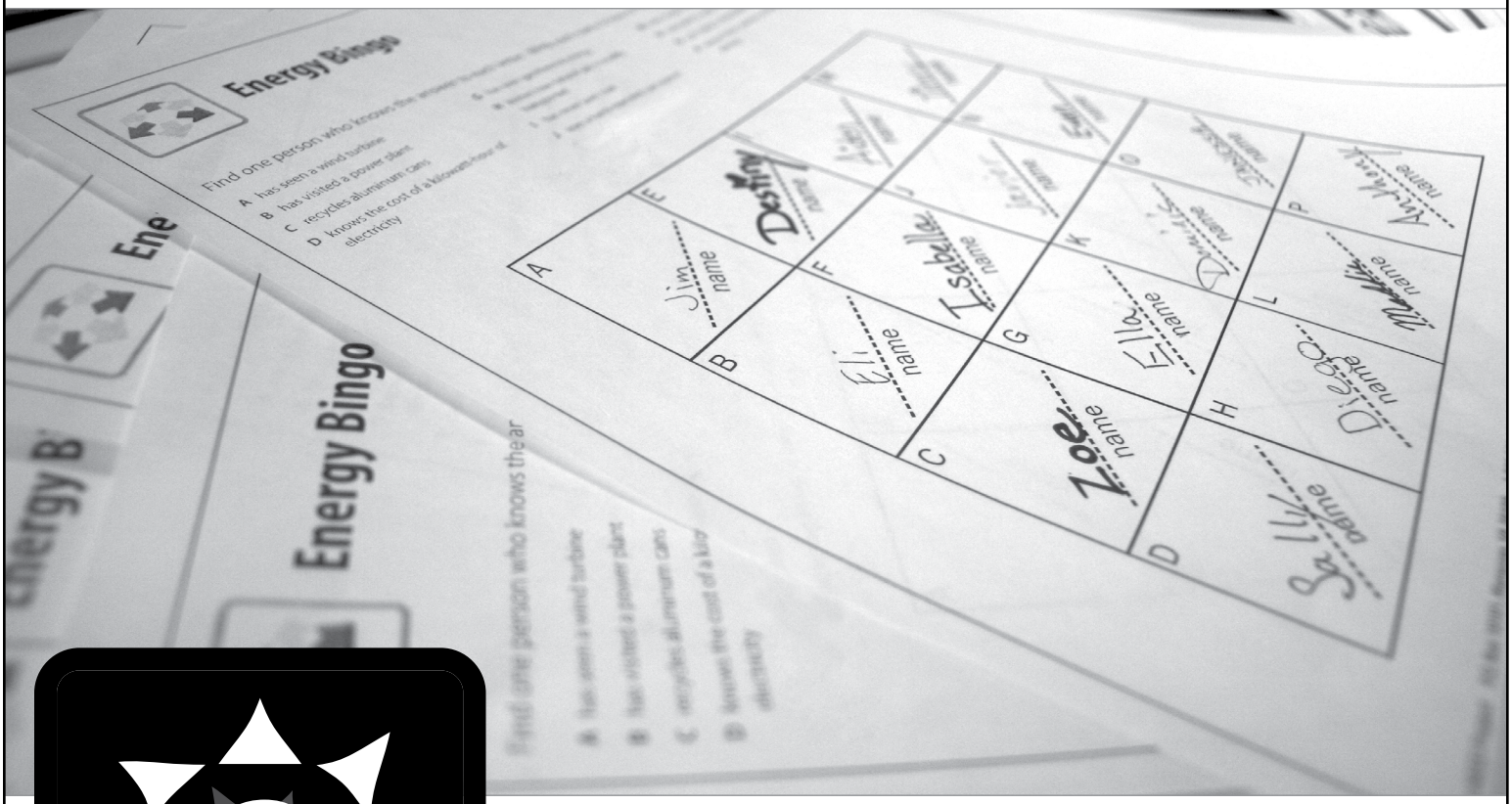
2024-2025

# Energy Games and Icebreakers

This guide offers entertaining activities to introduce energy, efficiency, and conservation to students, as well as reinforce the information that has already been presented.




**Grade Levels:**

K-12 All Levels

**Subject Areas:**

- Science
- Social Studies
- Language Arts
- Creative Arts
- Math
- Public Speaking

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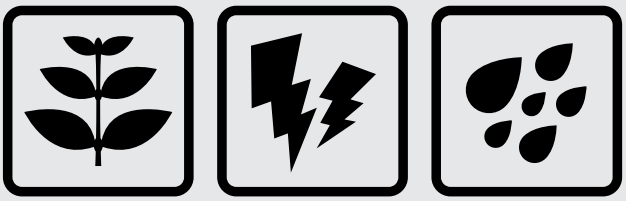

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The mission of The NEED Project is to promote an energy conscious and educated society by creating effective networks of students, educators, business, government and community leaders to design and deliver objective, multi-sided energy education programs.

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In support of NEED, the national Teacher Advisory Board (TAB) is dedicated to developing and promoting standards-based energy curriculum and training.

## Energy Data Used in NEED Materials

NEED believes in providing teachers and students with the most recently reported, available, and accurate energy data. Most statistics and data contained within this guide are derived from the U.S. Energy Information Administration. Data is compiled and updated annually where available. Where annual updates are not available, the most current, complete data year available at the time of updates is accessed and printed in NEED materials. To further research energy data, visit the EIA website at **www.eia.gov**.


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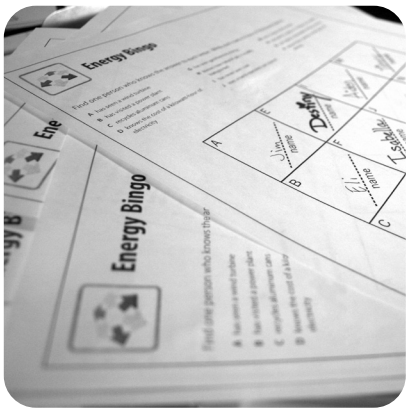



# Energy Games and Icebreakers

## Table of Contents

# Standards Correlation Information

**www.NEED.org/educators/curriculum-correlations/**

## Next Generation Science Standards

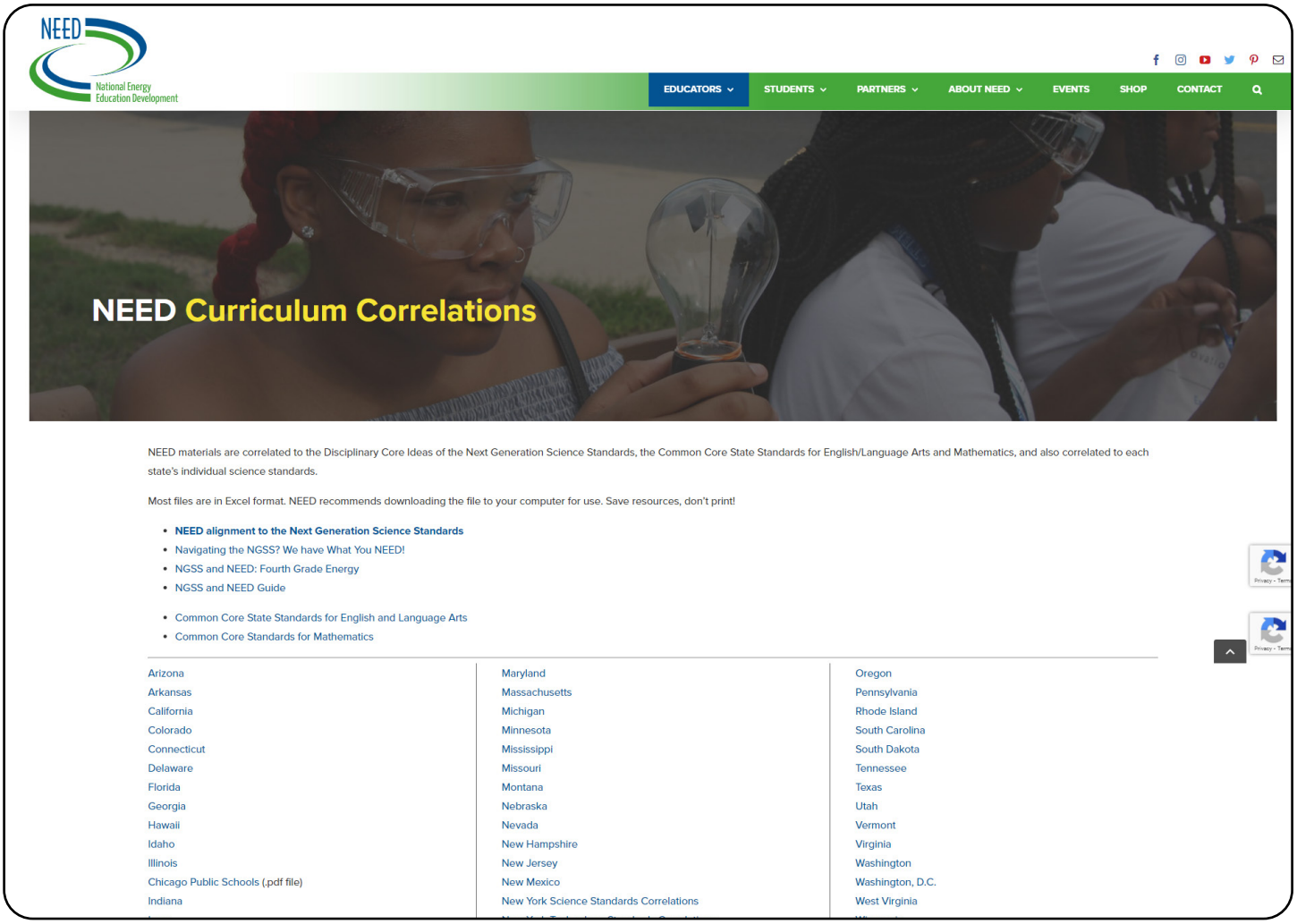
- This guide effectively supports many Next Generation Science Standards. This material can satisfy performance expectations, science and engineering practices, disciplinary core ideas, and cross-cutting concepts within your required curriculum. For more details on these correlations, please visit NEED's curriculum correlations website.

## Common Core State Standards

- This guide has been correlated to the Common Core State Standards in both language arts and mathematics. These correlations are broken down by grade level and guide title, and can be downloaded as a spreadsheet from the NEED curriculum correlations website.

## Individual State Science Standards

- This guide has been correlated to each state's individual science standards. These correlations are broken down by grade level and guide title, and can be downloaded as a spreadsheet from the NEED website.





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# 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 their first name, followed by their new energy last name. The person to the left of the leader says the first person's first and last name, and then their own new energy name. The third person continues by giving the first two names, then their own energy name. This continues until the final person, sitting to the right of the group leader, gives everyone's name and then their 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

### Extension

- Have students find one person they can "link" to by describing how their words are related. Once in pairs, have each share one question they have about energy. Have students show their links in a graphic organizer.

# Electric Connections

***Electric Connections*** **teaches students how different energy sources contribute to the generation of electricity. This activity demonstrates the advantages of working together in a group and reinforces the ideas of group sharing and cooperative learning.**

## Grade Levels

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

## Preparation

- 5-10 minutes

## Time

- 40 minutes

## Extension

- Look up the electricity generation data for your state. Have students rank the sources for their state and compare the ranking to the U.S. rankings and discuss similarities and differences. Download state data by visiting **www.eia.gov/state**.

# Get Ready

Make an appropriate number of copies of the *Game Instructions* and the *U.S. Electric Power Generation Sources* worksheets found on pages 7 and 8.

# Get Set

- Divide the class into groups of three to five students.

# Go

- Give each student a copy of the *Game Instructions*. Review the instructions with the students.
- Have the students individually rank the ten sources of energy in order of their contribution to U.S. electricity production. Give them two minutes to complete this task.
- As a group, give the students five to six minutes to rank the ten sources of energy a second time. When they are finished, give each student a copy of the *U.S. Electric Power Generation Sources* sheet. Have students transfer their individual and group rankings to the appropriate columns.
- Provide the students with the rankings for column one, or have them research the rankings independently using NEED's *Energy Infobook*s or an online resource.

(Alphabetical Order)
Biomass–7
Coal–2
Geothermal–9
Hydropower–5
Natural Gas–1
Petroleum–8
Propane–10
Solar–6
Uranium–3
Wind–4

(Numerical Order)
Natural Gas–1
Coal–2
Uranium–3
Wind–4
Hydropower–5
Solar–6
Biomass–7
Petroleum–8
Geothermal–9
Propane–10

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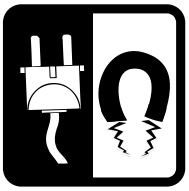

# Electric Connections
## GAME INSTRUCTIONS

About 35 percent of the nation's energy is consumed by the electric power sector to generate electricity for homes, commercial businesses, and industry. We use a variety of nonrenewable and renewable energy resources to make electricity. Some energy sources produce a substantial amount of the electricity we consume, while others produce very little.

## Individual Instructions

Your task is to rank the ten sources of energy in order of their contribution to U.S. electricity production. Place a number **one** by the source that provides the **largest amount** of electricity, a number two by the source that provides the second largest, down to a number ten by the one that provides the least amount of electricity. Use critical reasoning skills to determine the order.

## Group Instructions

Starting at the top of the list, ask members to contribute any knowledge they have about each energy source. Brainstorm by asking group members questions such as:

- Is this source limited to a certain area of the country?
- Are there any problems or limitations associated with this source?
- Have you ever seen a power plant that uses this particular source of energy?

One person in the group should take notes. Once the group has gone through the list, it should divide the ten energy sources into three levels of importance: the top three most significant energy sources, the middle four moderately significant energy sources, and the bottom three least significant energy sources. The group should then rank the ten sources of energy in order of their contribution to U.S. electricity production.

### SOURCES USED TO GENERATE ELECTRICITY

| SOURCE | YOUR RANK | GROUP RANK |
|---|---|---|
| BIOMASS | | |
| COAL | | |
| GEOTHERMAL | | |
| HYDROPOWER | | |
| NATURAL GAS | | |
| PETROLEUM | | |
| PROPANE | | |
| SOLAR | | |
| URANIUM | | |
| WIND | | |

*CONTINUED ON NEXT PAGE*

# Electric Connections
## U.S. ELECTRIC POWER GENERATION SOURCES

### SOURCES USED TO GENERATE ELECTRICITY

| SOURCE | STATISTICS | RANK | YOUR RANK | ERROR POINTS | GROUP RANK | ERROR POINTS |
|---|---|---|---|---|---|---|
| **BIOMASS** | In 2022, biomass produced 53.5 billion kilowatt-hours of electricity, 1.26 percent of the nation's total. Biomass electricity is usually the result of burning wood waste, landfill gas, and solid waste. | | | | | |
| **COAL** | 90 percent of the nation's coal is consumed by electric utility companies to produce electricity. In 2022, coal produced 829.0 billion kilowatt-hours of electricity, which represented 19.54 percent of the nation's electricity. | | | | | |
| **GEOTHERMAL** | In 2022, geothermal power plants produced 17.0 billion kilowatt-hours of electricity, mostly from facilities in the western U.S. Geothermal energy produced 0.40 percent of the nation's electricity. | | | | | |
| **HYDROPOWER** | 6.03 percent of U.S. electricity is generated by more than 2,500 hydro plants nationwide. Hydro plants produced 256.0 billion kilowatt-hours of electricity in 2022. | | | | | |
| **NATURAL GAS** | Natural gas produced 1,689.5 billion kilowatt-hours of electricity in 2022, generating 39.82 percent of the nation's electricity. Natural gas is used by turbines to provide electricity during peak hours of demand. | | | | | |
| **PETROLEUM** | Petroleum provided 0.55 percent of U.S. electricity, generating 23.4 billion kilowatt-hours of electric power in 2022. | | | | | |
| **PROPANE** | There are no statistics available for propane's contribution to electricity generation. Very little propane is used to produce electricity. | | | | | |
| **SOLAR** | Solar energy provided about 3.43 percent of U.S. electricity in 2022, amounting to 145.6 billion kilowatt-hours of electricity. Electricity was generated by solar thermal systems or photovoltaic arrays. | | | | | |
| **URANIUM** | 92 nuclear reactors provided the nation with 18.18 percent of its electrical energy needs in 2022. Nuclear energy produced 771.5 billion kilowatt-hours of electricity. | | | | | |
| **WIND** | Wind energy produced 434.8 billion kilowatt-hours of electricity in 2022, providing 10.25 percent of the nation's electricity. Most of the wind-generated electricity is produced in Texas, Iowa, and Oklahoma. | | | | | |
| | | | **ERROR POINTS TOTALS** | _____ | | _____ |

Error points are the absolute difference between your ranks and EIA's (disregard plus or minus signs).

Data: Energy Information Administration, Monthly Energy Review

**SCORING:**

**0-12** Excellent
**13-18** Good
**19-24** Average
**25-30** Fair
**31-36** Poor
**37-42** Very Poor


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# 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. At the high school level, you might include more complex terms such as 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. They 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, and using numbers is forbidden.
- When someone in the group thinks they knows the answer, they should take the second pencil and write their 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 afford only three mistakes. The artist nods to inform whether or not the guesser is correct. If not, guessing continues.
- If the person is correct, they take the drawing and slip of paper with the correct term and give it 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 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. The game 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 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 fewer 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 each pantomime slip 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 pocket.
- 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 may not talk, whisper, or read 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.

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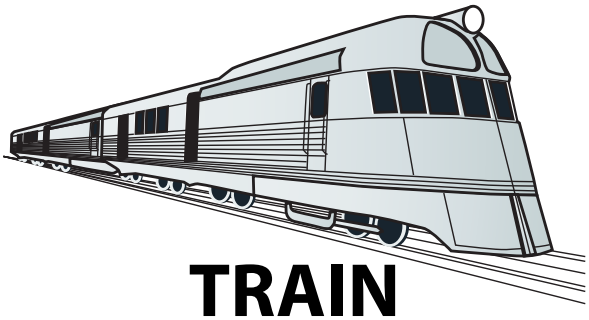
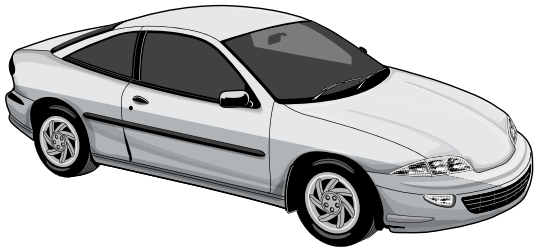


TRAIN



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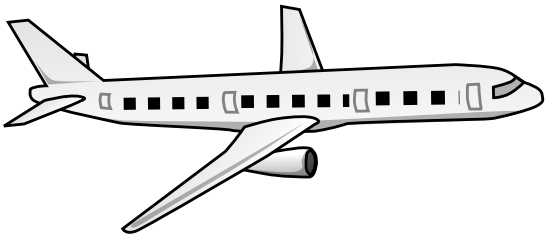
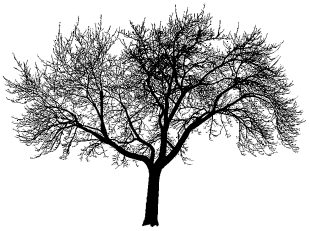


AIRPLANE

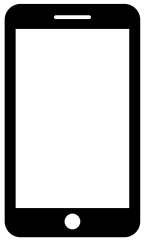
WIND TURBINE

TELEVISION

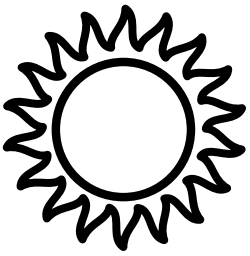
LIGHT BULB



TREE



TELEPHONE



SUN

BICYCLE

# Energy Chants

***Energy Chants* introduces the ten leading energy sources in an entertaining manner. This activity also divides a large group into ten or fewer small groups. This activity is most effective with elementary students but can be enjoyable for all.**

## Grade Levels

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

## Preparation

- 10 minutes

## Time

- 30 minutes

## Technology Integration

Check out the video of our NEED *Energy Chants* by visiting NEED's YouTube Channel, **youtu.be/8XUlaU8lKP8**.

## Get Ready

For each student playing the game, make one copy of the *Energy Chants* sheet found on page 14. Then, depending on the number of small groups you need and the number of students in each group, make the appropriate number of copies of the energy symbols found on page 15. Cut out the energy symbols and have masking tape ready.

## Get Set

- Hand out one *Energy Chants* sheet to each student and tape an energy source symbol to their back. Inform the students that they are not to look at their symbols or ask friends what energy sources they are.

## Go

- Introduce the energy sources to the students. Go through each source and reinforce one or two of the facts found on the chant sheet. Tell whether the source is renewable or nonrenewable, and add some of your own information about each source. Usually, three or four facts are enough—the students can read the others on their own.

  ***OPTIONAL:*** *You may wish to add visual aids to your presentation. Make posters or project visuals that relate to each energy source.*

- After you introduce a source, demonstrate its chant. The words are on the top of the chant sheet. Hand motions are printed on page 13 to go with each chant.
- Tell the students they have an energy source symbol taped onto their backs. Their job is to discover what source it is. Using their energy chant sheets, they should go around to other students asking yes or no questions, asking each person no more than one question. Naturally, the first question should be, "Am I (non)renewable?"
- Once the student has discovered their source, they should start to do the energy chant for that source, to find others who are the same source.
- After about two minutes of questions and searching, have everyone stop. To help the students who have not yet found their group, give three clues about one group's source and tell that group to do their chant once.
- Go through this process with each group, and the large group will be successfully divided into smaller groups by energy source.

***CONTINUED ON NEXT PAGE***



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# Hand Motions for the Energy Chants

**PETROLEUM: Blup, blup, petroleum!**

Begin with your hands below your waist in a cup shape facing down. As you say "Blup" move your hands upward like oil coming from the ground. When you reach "petroleum!" throw your hands up in the air like an old-fashioned oil well that just struck oil.

**COAL: Working in a coal mine (grunt)—hard hat!**

While chanting, "Working in a coal mine," pretend that you are shoveling coal. At "grunt—hard hat!" throw the coal over your shoulder.

**NATURAL GAS: Natural gas, gas (snap, snap)...a real gas!**

After chanting, "Natural gas, gas," snap once with your right hand, once with your left, and follow with "a real gas!"

**URANIUM: Uranium, uranium, split goes the atom!**

Begin by clenching your hands in fists. While chanting "Uranium, uranium" hit your fists together. As you say "split goes the atom" take your hands and pull them apart with your fingers spread like atoms splitting.

**PROPANE: Compress, compress, compress...pro-pane!**

During the "Compress" sequence, start with your hands apart facing each other and move them closer together. When you clasp your hands together, say "pro-pane" and begin a wave motion (like a liquid).

**HYDROPOWER: Falling water, hydropower, hydropower!**

With your fingertips touching, hold your hands under your chin and glide your hands down like a waterfall during "Falling water." For "hydropower, hydropower," spin your hands like a turbine.

**BIOMASS: Garbage, wood, landfill gas...it's all biomass!**

Hold your nose while chanting, "Garbage, wood, landfill gas." During "it's all biomass!" shake your hands near your shoulders.

**GEOTHERMAL: Shhhhh...ge-o-ther-mal!**

Place your hands together flat (without interlocking fingers) below your waist. As you say "Shhhhh," slowly move your hands upward, and on "geothermal," separate your hands to act like a geyser.

**WIND: Wind is moving air; energy is there!**

Throughout the chant, spin one arm like a wind turbine.

**SOLAR: Sun shine bright, give us light!**

Make a circle with your arms over your head as you say "Sun shine bright," then throw your hands out like rays of the sun as you say "give us light!"

*CONTINUED ON NEXT PAGE*

# Energy Chants

**Petroleum:** Blup, blup, petroleum!
**Coal:** Working in a coal mine (grunt)—hard hat!
**Natural Gas:** Natural gas, gas, (snap, snap) . . . a real gas!
**Uranium:** Uranium, uranium, split goes the atom!
**Propane:** Compress, compress, compress . . . pro–pane!
**Hydropower:** Falling water, hydropower, hydropower!
**Biomass:** Garbage, wood, landfill gas...it's all biomass!
**Geothermal:** Shhhhhhhh, ge-o-ther-mal!
**Wind:** Wind is moving air; energy is there!
**Solar:** Sun shine bright, give us light!

## Nonrenewable Energy Sources

### PETROLEUM

1. My major use is for transportation.
2. Burning me contributes to air pollution.
3. Most of me is refined into gasoline.
4. I'm the most consumed source of energy in the U.S.
5. Texas, New Mexico, and North Dakota are the leading states that produce me.
6. The United States is the world's top producer of me.

### COAL

1. I generate 19.5 percent of the nation's electricity.
2. I'm transported mostly by trains.
3. Efforts must be made to remove sulfur from me.
4. I'm America's most abundant fossil fuel.
5. I'm removed from the ground by surface mining or deep mining.
6. Wyoming, West Virginia, and Pennsylvania are states that produce me.

### NATURAL GAS

1. I heat almost half of the nation's homes.
2. I'm colorless and odorless.
3. My chemical name is methane.
4. I supply 39.8 percent of the nation's electricity–more than any other energy source.
5. I burn more cleanly than other fossil fuels.
6. I'm transported mostly by pipeline.

### URANIUM

1. My major use is generating electricity.
2. I'm presently being used in 92 reactors in the U.S.
3. I was first used in 1957 to make electricity.
4. My energy is released during nuclear fission.
5. The U.S. leads the world in production of electricity from me.
6. My power plants store my spent fuel waste products on site.

### PROPANE

1. I'm colorless and odorless.
2. My supply comes from processing natural gas and petroleum.
3. I'm often used in rural areas and on farms.
4. I'm a portable source of heat energy.
5. I'm used as a feedstock in the petrochemical industry.
6. I'm normally stored under pressure.

## Renewable Energy Sources

### HYDROPOWER

1. I supply 6.0 percent of U.S. electricity, which varies, depending on the amount of rainfall.
2. I'm limited to certain geographic areas.
3. I provide between 15-20 percent of the world's electricity.
4. I'm being used in over 2,500 locations in the U.S.
5. My facilities can disrupt wildlife and fish populations.
6. I require the Earth's gravity to work.

### BIOMASS

1. Methane gas can be made from me.
2. Photosynthesis stores radiant energy in me.
3. I get my energy from wood, garbage, and agricultural waste.
4. I can be used to generate electricity.
5. Ethanol can be made from me and used as a transportation fuel.
6. Burning me can produce air pollution.

### GEOTHERMAL

1. I produce less than one percent of U.S. energy.
2. I'm used mainly in western states.
3. I can be used for home heating and cooling.
4. My energy comes from the Earth's core.
5. My major use is the production of electricity.
6. I get my energy as a result of radioactive decay.

### WIND

1. Most of my electricity is made in Texas, Iowa, and Oklahoma.
2. I convert my motion energy directly into electrical energy with no cost for the fuel.
3. I produce no air pollution.
4. My turbines operate both on land and offshore.
5. I produce about 10.2 percent of U.S. electricity.
6. I'm caused by uneven heating of the Earth's surface.

### SOLAR

1. I'm not available at all hours of the day.
2. I can be converted directly into electricity using photovoltaic cells.
3. I'm great for water and home heating.
4. I work better in some parts of the country.
5. I supply about 3.4 percent of the nation's electricity.
6. I'm free to use, but you have to purchase and maintain my equipment.


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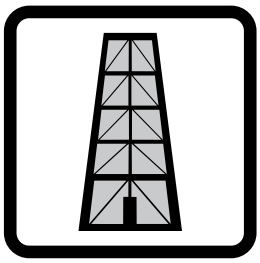
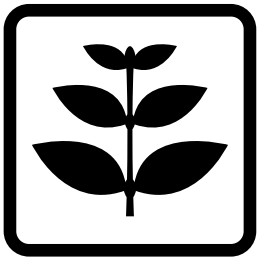
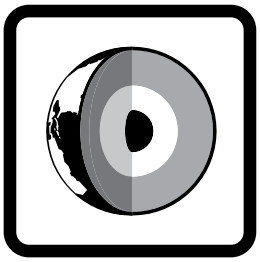
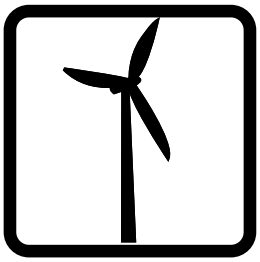
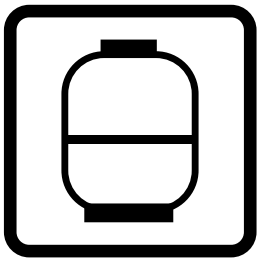
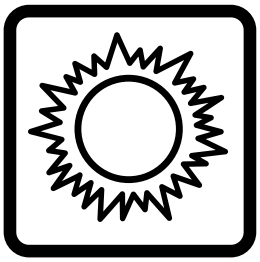
|  PETROLEUM |  HYDROPOWER |
|  COAL |  BIOMASS |
|  NATURAL GAS |  GEOTHERMAL |
|   URANIUM |  WIND |
|  PROPANE |  SOLAR |

# Primary Energy Chants

***Primary Energy Chants*** **introduces the ten leading sources of energy to primary students.**

## Grade Levels

- Primary, grades K-2

## Preparation

- 10 minutes

## Time

- Two 30 minute periods

## Get Ready

For each student playing the game, make one two-sided copy of the *Energy Chants* sheets found on pages 18 and 19. Make enough copies of the energy symbols found on page 15 so that you will have one renewable energy symbol and one nonrenewable energy symbol for each student. Cut out energy symbols and divide into renewable and nonrenewable sources. You will need a roll of masking tape, ten large sheets of drawing paper, and crayons or markers.

## Get Set

- Hand out one *Energy Chants* sheet to each student and tape a renewable symbol to their back. Tell students not to look at their symbols or ask their friends for help.

## Go

- Ask students to look at the renewable energy side of their chant sheets. Explain what renewable means. Read over the chant sheets with the students, emphasizing the essential facts about each energy source. For the youngest students, you may want to use only the first two or three facts listed. As you introduce each source, demonstrate the energy chant for that source. You can create your own hand motions or use the sample hand motions listed on page 17.
- After you have practiced each chant with the students, review by reading the first fact on each source and having the students act out the chant once they identify the source. For older students, begin at the bottom of the list to see how many facts it takes before the students figure out which energy source you are describing.
- When you are sure all students know the chants, explain that each student has an energy symbol on their back and their mission is to discover which energy source they represent. Using the chant sheets, they must ask fellow students questions that require a yes or no answer. Give examples of acceptable questions. They may not ask, "Am I biomass?" Explain to them that once they figure out which energy source they represent, they should begin performing the chant and seek out their fellow source members. Once all students are in groups, have them design and draw a poster about their energy source.
- Repeat the activity for nonrenewable energy sources.

***CONTINUED ON NEXT PAGE***



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# Hand Motions for the Primary Energy Chants

## Renewable Chants and Hand Motions

**BIOMASS: Garbage, wood, landfill gas...it's all BIOMASS!**

Hold your nose while chanting, "Garbage, wood, landfill gas." During "it's all BIOMASS," shake your hands near your shoulders.

**GEOTHERMAL: Geo-Earth, Thermal-heat—GEOTHERMAL—Earth-heat!**

Hold arms in a circle in front of you during "Geo-Earth." Cross arms and hug yourself for "Thermal-heat." Shout "GEOTHERMAL," then repeat the motions quickly for "Earth-heat."

**HYDROPOWER: Falling water, HYDROPOWER, HYDROPOWER!**

With your fingertips touching, hold your hands under your chin and glide your hands down like a waterfall during "Falling water." For "HYDROPOWER, HYDROPOWER," spin your hands like a turbine.

**SOLAR: SOLAR ENERGY—sun shine bright, SOLAR ENERGY—give me light!**

Begin with arms over head in a big circle, swaying from side to side during "SOLAR ENERGY." Spread arms out wide during "sun shine bright." Repeat motions for second part of the chant.

**WIND: Energy is flowin' in the WIND!**

Make big arm circles, mimicking a wind turbine, as you say this chant.

## Nonrenewable Chants and Hand Motions

**COAL: COAL in the hole—makes light in the night!**

During "COAL in the hole," point down with thumbs, hands in fists. During "makes light in the night," point thumbs upward in rhythm with the cadence of the chant.

**NATURAL GAS: Burn clean, burn fast—NATURAL GAS!**

During "Burn clean," bring one hand up in front of you, palm facing inward. During "burn fast," bring the other hand up to the first hand. During "NATURAL GAS," move hands upward together to make the shape of a flame.

**PETROLEUM: Pump, pump—PETROLEUM!**

Place hands together in fists in front of you. During "Pump, pump," partially extend fingers twice and return them to a fist. During "PETROLEUM," fully extend hands and move them upward, representing oil shooting from a well.

**PROPANE: Put a little pressure on me—PROPANE!**

Begin with hands wide apart and bring palms closer together at each word of the chant.

**URANIUM: URANIUM, URANIUM—split goes the atom!**

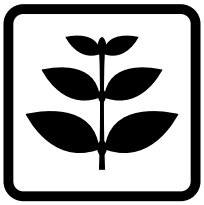
Clap twice during "URANIUM, URANIUM." During "split goes the atom," clap and bring hands out and up, representing the splitting atom.

*CONTINUED ON NEXT PAGE*

# Renewable Energy Chants

### Garbage, wood, landfill gas...it's all BIOMASS!

1. Bio means life. I am the energy in things that used to be alive.
2. My energy is stored in trees, plants, and garbage.
3. My energy comes from the sun.
4. You can burn me to make heat and electricity.
5. I can pollute the air when I am burned.



### Geo-Earth, Thermal-heat—GEOTHERMAL—Earth-heat!

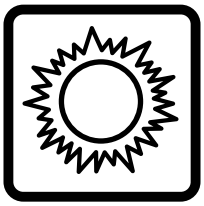
1. Geo means Earth. Therme means heat. I am heat energy from inside the Earth.
2. I heat underground rocks and water.
3. My hot water can heat houses.
4. My power can make electricity.
5. I am clean energy.

### Falling water, HYDROPOWER, HYDROPOWER!

1. Hydro means water. I am the energy in moving water.
2. Dams can harness my energy.
3. I am only available in certain parts of the United States.
4. My power can make electricity.
5. I am clean, cheap energy.

### SOLAR ENERGY—sun shine bright, SOLAR ENERGY—give me light!

1. Sol means sun. I am energy from the sun.
2. I make plants grow and I give you light.
3. When my energy reaches the Earth, it can heat homes and water.
4. Photovoltaic cells can turn my energy into electricity.
5. I am clean, free energy, but my equipment can be expensive.



### Energy is flowin' in the WIND!

1. I am the energy in moving air.
2. The sun makes the air move.
3. Some places have a lot of me, others only a little.
4. I can't make electricity 24 hours a day.
5. I don't pollute the air, except with sound.

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# Nonrenewable Energy Chants

### COAL in the hole—makes light in the night!

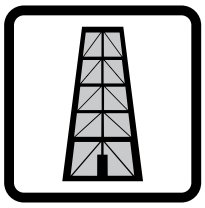
1. I look like shiny, black rock.
2. I am a fossil fuel that is buried underground.
3. There is a lot of me in the United States.
4. I am burned to make electricity.
5. I can pollute the air when I am burned.

### Burn clean, burn fast—NATURAL GAS!

1. I am a gas with no color, no taste, and no smell.
2. I am a clean-burning fossil fuel.
3. Companies drill wells to pump me from the ground.
4. My major use is transportation.
5. I am burned to heat buildings and to make electricity.

### Pump, pump—PETROLEUM!

1. I am buried underground and under the ocean.
2. I am a fossil fuel that makes more energy than any other energy source.
3. I am made into lots of things—like gasoline and plastics.
4. My major use is for transportation.
5. I can pollute the air when I am burned.



### Put a little pressure on me—PROPANE!

1. I am a gas with no color, taste, or smell.
2. I am a clean-burning fossil fuel.
3. I am buried underground with other fossil fuels.
4. I turn into a liquid under pressure.
5. I am used on farms and in backyard grills.

### URANIUM, URANIUM—split goes the atom!

1. I am buried underground in rocks.
2. There is plenty of me; I am cheap.
3. My energy is used to make electricity.
4. Using me doesn't pollute the air.
5. My waste is radioactive; it can be dangerous.


# This Week in Energy Conservation

***This Week in Energy Conservation* is designed as a television show with student-correspondents reporting on a variety of energy conservation topics. This activity will introduce students to ways of saving energy both in the home and on the road.**

## Grade Levels

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

## Preparation

- 5 minutes

## Time

- 45 minutes

## Get Ready

Prior to class, make copies of the six lead stories on pages 21-23 that you will be distributing among the student groups. You may also want to gather the supplies students may use in constructing props to accompany their energy stories.

## Get Set

- Review with the students the structure of an actual news program. Explain the role of an anchor in providing the background information or "lead" to a news story. Ask the students to recall the various ways they have seen news stories covered in the past (in a studio, on-site through interviews or video recordings). This will help them understand what they will be asked to do during the *This Week in Energy Conservation* show.
- Divide the class into six groups and distribute a news lead to each group.

## Go

- Explain to the students that each group is now a team of energy reporters. They should read the introduction to their segment of *This Week in Energy Conservation*, making note of the energy conservation tips listed below each lead. Their job will be to develop a story that follows the guidelines of the anchor's introduction and includes six of the energy tips listed on their sheet of paper. Each story should be limited to two or three minutes, and the groups will be allowed 20 minutes to develop and rehearse their stories.
- After each story is presented, the other groups will have one minute to try to list the six energy tips from the presentation they just heard. Next, the presenting group reveals their tips. Each group grades themselves using the honor system, getting one point for every tip they remembered correctly. Tally the scores of all the groups watching the presentation, and award this amount to the presenting group. This gives the presenters an incentive to do a thorough job conveying their facts and information to the audience. The team with the highest score after all the presentations is the winner. Either you or a student from each group can serve as the anchor, providing the show's introduction and the lead-in to each news story.

*OPTIONAL: This activity can be expanded to include props and costumes for actual public service announcements on school TV stations for Energy Awareness Month, NEED Week, or Earth Day.*

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# This Week in Energy Conservation
## NEWS STORY STARTERS

## Home Heating Energy News Team Introduction

The loss of home heating energy is a normal occurrence. So why the next story? Because our undercover reporter has been able to infiltrate a group of home heating energy wasters. For the first time ever, we can bring you the story from the point of view of these energy wasters. Seeing how they operate might help you, our Energy News Team viewers, prevent them from draining your energy dollars.

- Properly use and maintain your home's heating equipment.
- Clean or replace filters on furnaces once a month or as recommended.
- Clean warm-air registers, baseboard heaters, and radiators as needed; make sure they're not blocked by furniture, carpeting, or drapes.
- Control the temperature setting in your home with a programable or smart thermostat. You can save as much as 10% per year on heating and cooling by turning your thermostat down 7-10 degrees for 8 hours a day in the fall and winter and turning it up in the spring and summer.
- During winter, keep the draperies and shades open in sunny windows to allow the sunlight to enter your home. Energy from the sun provides natural warmth. Close draperies and shades at night to reduce the chill from cold windows.
- Caulk and weatherstrip around window and door frames, and other areas in the home where air leaks occur. Sealing air leaks is one of the quickest energy- and money-saving tasks you can do.
- Add insulation in the attic and walls where needed. Adding insulation can pay for itself within a few years.
- Plant trees to act as a windbreak. Trees act as a natural barrier to cold air in the winter and hot sun in the summer.

## Water Heating Energy News Team Introduction

Since heating water is the second largest use of energy in your home, we sent our best reporter straight to the hot water heater to get the hot gossip on many homeowners' energy wasting behaviors. Luckily, the hottest water droplets in town are sharing some tips for our viewers. Before your next luxurious long shower, check out their hot advice. You'll stop wasting money heating water, and hopefully you'll never jump out of an icy shower again.

- Use less hot water. About 15% of all the energy we consume at home is used to heat water.
- Wash and rinse clothes in cold water. Operating a washing machine takes very little energy. Most of the energy used by clothes washing machines goes to heating the water.
- Washing dishes by hand several times a day can use significantly more water and cost more than operating an energy-efficient dishwasher. Only run the dishwasher with full loads.
- Use low-flow shower heads. These easy-to-install devices save energy and still provide more than adequate shower pressure.
- Repair leaky faucets promptly. A leaky faucet can waste gallons of water in a short period of time. A leak of one drip per second can cost up to $35 per year.
- Turn down the thermostat on your water heater to 120° F.
- Insulate your water heater and pipes.
- When purchasing a new water heater, buy an energy-efficient model and consider a tankless water heater if your home uses less than 41 gallons of hot water daily.

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# This Week in Energy Conservation
## NEWS STORY STARTERS

## Cooking Energy News Team Introduction

Do you hate to cook? If spending hours over a hot stove isn't your idea of a good time, tonight's Energy Gourmet segment is for you. Soon you'll be telling your family, "We're having microwaved popcorn for dinner tonight because I'm saving energy." So put on your apron and sharpen your knives while the Energy Gourmet team shares a few simple tips that will save you energy and money while you cook. Who knows, you may save enough money to hire a sous-chef!

- Keep the refrigerator door closed as much as possible. Keeping the refrigerator clean and organized will help you find what you need quickly.
- Don't over chill, the optimal refrigerator temperature is 37 degrees Fahrenheit. Keeping the refrigerator full helps regulate the temperature but avoid putting containers of hot food or drink straight into the fridge as they'll add heat inside.
- Keep range-top burners and reflectors clean; they will reflect the heat better, and you will save energy.
- Match the size of the pan to the heating element. A small pan on a large burner wastes energy because the air surrounding the pan will be heated, too.
- Always boil water in a pan that is covered. Water will boil faster and use less energy in a covered pan.
- Only preheat the oven for five minutes or not at all. It's also good energy practice to cook several dishes in the oven at once to make maximum use of this concentrated heat source.
- When baking, keep the oven door closed rather than opening it to look inside — use the oven light to see inside. An open door lets valuable heat escape; maintain the heat by keeping the door shut.
- Use small appliances such as air fryers, multicookers, slow cookers, toaster ovens, electric pressure cookers, microwave ovens, or convection ovens for small meals rather than your large stove or oven. They will save energy and can save on cooling costs in the summer because they generate less heat.

## Lighting Energy News Team Introduction

And now for America's Most Wanted Energy Wasters, the segment of the show that enables you, the viewers, to help put a dangerous energy waster behind bars. The FBI has just put Killer Kilowatt-hour on its Most Wanted List for making unsuspecting families waste energy while lighting their homes. If you recognize any of Killer Kilowatt-hour's mob of associates in this next segment, don't try to apprehend them yourself, just call our toll-free number, 1-800-TURNOFF. Remember, these energy wasters are extremely dangerous because they're very bright.

- Turn off lights.
- Light fixtures with controls such as timers, motion sensors, and photocells save electricity by turning lights off when not in use.
- Use LED lightbulbs whenever possible. They last longer and use less energy than other bulb types.
- Keep your curtains or shades open to use daylighting instead of turning on lights. For more privacy, use light-colored, loose-weave curtains to allow daylight into the room.
- Over-lighting an area wastes energy. Choose small, energy efficient task lights for computer work, reading, or other focused work on desks and tables.
- Many LED bulbs are dimmable. Dimmers save electricity when used to lower light levels.
- Dust bulbs and light fixtures frequently because dirt absorbs light. Clean fixtures and bulbs give you more light.
- Install LED products and fixtures for outdoor use such as pathway lights, step lights, and porches. Many have features like automatic daylight shut-off and motion sensors. You can also find solar powered outdoor lighting.

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# This Week in Energy Conservation
## NEWS STORY STARTERS

## Home Electronics Energy News Team Introduction

In this next story, our entertainment reporter spotlights the latest craze sweeping social media - a challenge to lower your home's electricity use. Social media stars are snapping selfies with ENERGY STAR labels and posting viral videos of themselves getting unplugged. No fear of missing out here Energy News Team viewers, these social media stars are sharing their latest home hacks and trendy tips. Follow us and you'll be saving energy before you can click refresh on your likes.

- Turn off computers, office equipment, and electronics when they aren't in use.
- Use advanced power strips that can prevent electronics from drawing power when they aren't being used. Many consumer electronics continue to draw power even when they are switched off, which could add an extra 5%-10% to your monthly utility bill.
- Use power management settings on computers and monitors, which will send your equipment into low-power "sleep modes" after periods of inactivity. Avoid using screen savers.
- Make sure that computer games that prevent your computer from going to sleep are not left running while you aren't using your computer.
- Unplug battery chargers when the batteries are fully charged or the chargers are not in use.
- When streaming content, choose the smallest device that makes sense for the number of people watching. Avoid streaming on game consoles, which use 10 times more power than streaming through a tablet or laptop.
- Set your television to the "home" or "standard" setting to reduce the brightness and reduce your TV's energy use by 18%–30%.
- When buying home entertainment systems, electronics, computers, and other office equipment, look for the ENERGY STAR label. Using efficient products and taking steps to save energy can save you money and prolong the life of your products.

## Vehicle Energy News Team Introduction

This next story takes us to the Indy 500, where our sports reporter is on the track with the fastest race cars on the circuit. They know all the bad driving habits, like aggressive driving, speeding and quick starts and stops. They are well-maintained and in tip top shape. Before the green flag waves, these race cars have several driving and maintenance tips to share, so you'll save energy on fuel and cross the finish line in first place.

- Avoid aggressive driving, such as speeding, rapid acceleration, and hard braking. Avoid high speeds since gas mileage usually decreases rapidly at speeds above 50 mph.
- Reduce drag by placing items inside the car or trunk rather than on roof racks and avoid keeping heavy items in your car.
- Minimize idling your car by turning off your engine when your vehicle is parked. Any shutdown longer than 1 minute will save you money. Avoid idling to warm your engine in the winter. Most manufacturers recommend driving off gently after about 30 seconds. The engine will warm up faster being driven, which will allow the heat to turn on sooner and decrease your fuel costs.
- Combine errands.
- Carpool. Many urban areas provide carpool lanes that are usually less congested, improving your fuel economy. Use public transportation or active transportation like bicycling or walking to save on fuel and car maintenance costs.
- Use the grade of motor oil your car's manufacturer recommends.
- Inflate your tires to the pressure listed in your owner's manual or on the sticker on the driver's side door jamb. Properly inflated and aligned tires improve gas mileage.
- Don't ignore the check-engine light and get regular maintenance checks.

*CONTINUED ON NEXT PAGE*


# Conservation for Our Nation

**This activity teaches brainstorming and cooperation skills to a group or groups of 8-15 people. It also reinforces knowledge of some energy conservation tips.**

## Grade Levels

- K-12

## Preparation

- Less than 5 minutes

## Time

- 20 minutes for a group of ten

## Get Ready

You will need a marker and a large sheet of poster paper for each group. Seat the group in a circle near a chalkboard or wall where you can hang up the paper.

## Get Set

- Divide the class into groups of eight to fifteen students. Select one person from each group as the group leader and one person from each group as the recorder.

## Go

- Instruct the groups to brainstorm ideas on energy conservation. Each idea should be simple and no longer than five syllables. For example, "Turn off lights," "Tune-up," and "Insulate." Continue brainstorming until the group has at least the same number of ideas as there are group members.
- Explain the game to the group with this introduction: "Slap your thighs once with both hands and say CON; clap once and say SER; snap your right fingers and say VA; and then snap your left fingers and say TION. Slap your thighs again and say FOR; clap your hands and say OUR; snap your right fingers and say NA; and snap your left fingers and say TION. Slap your thighs a third time and say CON, clap once and say SER; snap your right fingers and say VA; and then snap your left fingers and say TION. Slap your thighs a fourth time and say READY, clap your hands and say GO. This time you must give a conservation tip between the snaps."
- After the introduction, you should give three or four sample conservation tips between consecutive snaps. Do not repeat the introduction with each tip. You can reinforce the cadence by giving the instructions to the class between the snaps.
- Tell the groups to study the sheet of paper because it will not be posted during the game. If someone forgets or repeats, the circle must begin again. The person who has made the mistake begins with the introduction, and the game continues until you have made a complete circle with everyone giving a tip between the snaps.

*NOTE: If you are running more than one circle at a time, instruct the groups that they may have to begin again on their own.*


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# Energy Roundup

## Get Ready

- Print the *Energy Chants* graphics on page 15 so that you have one slip per student and an equal number of slips for each energy source. Cut the graphics out and laminate, if necessary.
- On sheets of plain paper, write down six energy facts for each energy source using the *Energy Chants* sheet located on page 14, or use NEED's *Energy Infobooks* to create your own. Do NOT write the names of the energy sources on these plain sheets of paper. (See the extension on page 26.)
- Number ten pieces of dark colored paper, one through ten, in large numbers.
- Prepare five black poster boards for the nonrenewable energy sources and five yellow poster boards for the renewable energy sources, as follows. Mount one fact sheet to the lower half of each poster board, making sure the fact sheets correspond to the colors of the poster boards. Mount the top edge of the number sheets near the top of the posters. Do not secure the bottom edge of the number sheets to the posters; the number sheets will be used as flaps.
- Write the names of the energy sources on the posters, underneath the number sheet flaps. Lightly secure the bottom edge of the number sheets to the posters with tape.
- Mount the posters around the walls of the room. Space the posters equally apart and set up chairs for each station, if desired. Place a piece of paper and a pencil by each poster station. The players will use these toward the end of the game.

## Get Set

- Assign players to groups using the *Energy Chants* graphics cards you cut out. Let the players draw these out of a hat or pass them out randomly. (You can assign players to fewer than ten groups by eliminating one or more energy sources from the hat. Even if you have fewer groups, keep all ten posters on the walls.) Make sure each source you will use is represented by at least one student.
- Instruct the players NOT to tell anyone which group they've picked.

## Go

**PART I**

Give the players these instructions for playing the game:

- You have all been assigned to an energy source group. In a minute, you'll be getting into these groups. You must follow these instructions.
- You cannot speak or communicate with anyone during the first phase of the game.
- Decide if your energy source is renewable or nonrenewable. The ten posters on the walls around the room have been color-coded to help you find your energy source. The yellow posters represent renewable energy sources; the black posters represent nonrenewable sources. If you don't know if your energy source is renewable or nonrenewable, then it may take you a little longer to find your group.
- When I say go, walk to the closest poster and read the six clues that describe the energy source. If you think these clues describe your energy source, remain beside that poster. If the clues don't describe your energy source, move on to another poster. Repeat the process until you think you've found your energy source.
- You'll have three minutes to find your energy source. Remember, no talking or communicating is allowed. Does anyone have any questions? Ready? The first round lasts three minutes. Go!

***Energy Roundup* is a good activity to introduce an energy unit or to reinforce students' knowledge of the nation's leading sources of energy. *Energy Roundup* divides a large group into ten or fewer small groups.**

### Grade Levels

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

### Preparation

- 15-30 minutes

### Time

- 10-50 minutes

### Set-up Tip

- Premade poster sheets with facts can be printed by visiting **www.need.org/resources/powerpoint-presentations/**.

*CONTINUED ON NEXT PAGE*

- Your three minutes are up and everyone must be at their poster. Remember, remain silent. Now, will the person closest to each poster lift the flap of the poster so that only the people in your group can see which energy source the clues describe. (Players lift flaps to reveal energy sources.)
- Please close the flap. If you're in the correct group, remain at your poster. If you're not, look for your energy source again. This time you have only one minute. No talking or communicating. Go! (Round two lasts one minute. You can continue rounds until everyone has found his or her energy source. Subsequent rounds last 30 seconds to one minute each.)

**PART II**

After all the rounds are finished, give the groups these instructions:

- You will be allowed to talk during this part of the game. The members of your group must now decide which three of the six clues reveal the least about your energy source. Keep the least revealing clues and eliminate the three clues that reveal the most. I'll give you two minutes to do this, and then I'll ask three people in your group to each read a clue one at a time. After the third clue has been read, everyone in your group will say in unison, "What are we?"
- Now, one person in your group should take the pencil and paper at your station and write the numbers one through ten down the side of the paper. After a group says "What are we?" the other groups will have 15 seconds to write down the name of the energy source. Since every source has a number, just write the group's name by the corresponding number on your piece of paper.
- The group that correctly identifies the most energy groups wins.

***Reminder: Use the clues and graphics on pages 14-15 for this activity.**

# Extension

- Have your students read NEED's *Energy Infobook* sections on each of the sources and provide the facts to create posters.
- Utilize alternative colors for the posters instead of black and yellow as suggested in the instructions. For an added challenge, do not tell students what the colors signify until after they have begun the game.
- Set up the game for a digital learning environment by using a slide deck, (Google, PowerPoint, Pear Deck, etc.)


# America's Most Wanted Energy Wasters

## Get Ready

Before class, make a sample wanted poster. Have an ink pad, paper, and markers available.

## Get Set

- Explain the activity to the students. Exhibit the sample wanted poster.
- Use a digital camera to take front and side view "mug shots" of each student to generate enthusiasm for the activity. Print out the pictures.

## Go

- Brainstorm with the students a list of the common ways that they waste energy daily, for example:
  - Leaving the TV/computer/video game system on.
  - Taking long (or too many) showers.
  - Leaving the water running while brushing teeth/washing dishes.
  - Leaving doors/windows open with heat/AC on.
  - Asking for a ride when walking or riding a bike would be appropriate.
  - Running dishwasher/washing machine half empty.
  - Leaving unnecessary lights on.
- Brainstorm appropriate punishments for the crimes. (Skipping a favorite TV show, for example, as punishment for leaving the TV on. Or, loading the dirty dishes after every meal as punishment for running the dishwasher half empty.)
- Using the list, have each student keep a daily record of the energy crimes they have committed over a designated time period.
- Construct wanted posters for each student. If you did not take "mug shots" of the students before you began the activity, have the students draw or take pictures of themselves. Use a water-soluble ink pad to take fingerprints. Students should write their own crime descriptions using their daily crime records.

## Alternative

- Brainstorm with the students ways in which they can conserve energy.
- Create Energy Super heroes for students to highlight how students can make a difference.
- Construct posters advertising each hero's behaviors and attributes.

***America's Most Wanted Energy Wasters*** **increases students' awareness of their energy wasting habits and reinforces simple energy-saving behaviors.**

### Grade Levels

- K-12

### Preparation

- 10-30 minutes

### Time

- 30 minutes or longer, depending on student interest

*CONTINUED ON NEXT PAGE*

# Energy Bingo

***Energy Bingo* is a great icebreaker for a NEED workshop. As a classroom activity, it's a great introduction to an energy unit.**

## Grade Levels

- K-12

## Preparation

- 5 minutes

## Time

- 45 minutes

**Check out additional bingo options in the following NEED guides!**

- Biomass Bingo—*Energy Stories and More*
- Change a Light Bingo—*Energy Conservation Contract*
- Coal Bingo—*Coal guides*
- Energy Efficiency Bingo—*School Energy Experts* and *School Energy Managers*
- Hydrogen Bingo—*$H_2$ Educate*
- Hydropower Bingo—*Hydropower guides*
- Marine Hydrokinetics Bingo—*Exploring Marine Hydrokinetics*
- Nuclear Energy Bingo—*Nuclear guides*
- Offshore Wind Energy Bingo—*Exploring Offshore Wind*
- Oil and Natural Gas Bingo—*Oil and Natural Gas guides*
- Saving the Future Bingo—*Energy Yesterday, Today, and Tomorrow*
- Science of Energy Bingo—*Science of Energy guides*
- Solar Bingo—*Solar guides*
- Transportation Bingo—*Transportation Exploration*
- Wind Energy Bingo—*Wind Energy Guides*

## Get Ready

Duplicate as many *Energy Bingo* sheets from 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 they give 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 the person 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 is "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 them to come to the front of the room and give their name. Then ask them to tell the group how their 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 their bingo run. That player then stands and the bingo winner asks them the question they 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 they can


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answer the question correctly, the bingo winner calls out the next person's name on their bingo run. However, if they do 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 *(natural gas)*
  - 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 for residential customers

**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** 15.0 cents/kWh national average | **N** pipeline | **O** propane | **P** nuclear 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 for residential customers

**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 |



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# Energy Match Game

## Get Ready

Select eight of the energy match questions listed on the next page, according to the grade level of the students playing the game. The two most difficult questions (of the eight) will serve as the final *Energy Match Game* questions and will be awarded a double point value. For each student, take two sheets of 8 1/2" x 11" paper and cut them in half or use small dry erase boards.

## Get Set

- Put students into four to six rows so that students cannot see what their fellow team members are writing. You need a minimum of four students per team.
- Prepare a scoreboard to keep track of points for each team.
- Give each student four sheets of paper or a dry erase board. Explain to the students that if they are using paper, they will have to write on both sides of each sheet of paper in order to have enough paper for all eight rounds.

## Go

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

- Today, we're going to play the *Energy Match Game*. There will be eight rounds in the game. The final two rounds will be worth double points.
- To begin a round, I will read a question and you will have to write your answer in large letters on one of the pieces of paper I have given you. You may not look at the responses that any of your team members are writing down. If you do, your team will be penalized 25 points and will be eliminated from that round. You will have 15 seconds to write your answer and then you must put your pen or pencil down. Every match will be worth five points for the first six rounds.
- Let me give you an example of how the game is played and scored. The sample question is "Name a renewable source of energy." You will have 15 seconds to write your answer on one of the sheets of paper, and then everyone will put their pens and pencils down.
- Next, the first person on team one will show me their answer while telling the class what their answer is. Say, for example, they wrote SOLAR.
- The next person on the team will show me their answer. If the second person has also written SOLAR, team one has a match and will receive five points. If the second person has written something else, such as WIND, that would not be a match. The third person on the team will then show me their answer. If the third person's answer matches either the first or second person's answer, team one will receive five points. Then the fourth person on the team will show their answer to me. If the fourth person's answer matches either the first, second, or third person's answer, team one will receive another five points.
- We will continue in this manner until all members of team one have revealed their answers. Then, we will repeat this process for the remainder of the teams.
- If the match is made, but the answer is not correct, no points are awarded.
- Are there any questions? Let's go! Here's the first question.

***Energy Match Game* reviews and reinforces students' knowledge about energy. The activity can take as little as ten minutes or as much as an entire class period.**

### Grade Levels

- K-12

### Preparation

- 5-10 minutes

### Time

- 10-30 minutes

*CONTINUED ON NEXT PAGE*

# Energy Match Questions

- Name an energy source used to generate electricity.

  *(natural gas, coal, uranium, wind, hydropower, solar)*

- Name a nonrenewable source of energy.

  *(petroleum, coal, propane, natural gas, uranium)*

- Name a way to save energy in your car using proper driving habits.

  *(drive the speed limit, carpool, limit quick trips, etc.)*

- Name a way to save energy in your car using proper maintenance.

  *(regular oil changes, proper tire pressure, etc.)*

- Name a major energy-consuming device in your home.

  *(air conditioner, furnace, water heater, refrigerator, clothes dryer)*

- Name a country from which the U.S. imports petroleum.

  *(Canada, Mexico, Saudi Arabia, Iraq, Colombia)*

- Name a product, other than gasoline, made from petroleum.

  *(plastics, medicines, kerosene, motor oil, etc.)*

- Name a chemical characteristic of propane. *(flammable)*
- Name a unit used to measure electric power. *(watt, kilowatt)*
- Name a source of energy that does not produce air pollution when used.

  *(hydropower, solar, wind, geothermal, nuclear)*

- Name a country that uses a lot of energy.

  *(China, United States, India, Russia)*

- Name a major petroleum producing state in the U.S.

  *(Texas, New Mexico, North Dakota, Colorado, Oklahoma)*

- Name a major coal producing state in the U.S.

  *(Wyoming, West Virginia, Pennsylvania, Illinois, Kentucky)*

- Name an energy consuming device you could not live without.

  *(answers will vary)*

- Name your favorite source of energy. (*answers will vary*)
- Name the first energy source used by people. *(solar)*
- Name the source that you think will be the leading provider of U.S. energy in the year 2035

  (*answers will vary*)

- Name a way of saving energy on home heating.

  *(use a programmable thermostat, insulating or sealing cracks, put on a hoodie, etc.)*

- Name an energy saving device you could use in your home.

  *(LED bulb, power strip, smart thermostat, etc.)*


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# 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 grade level and experience of the students playing the game. You may use the lists on page 34 and cross out the words and phrases 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 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 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 with 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

*CONTINUED ON NEXT PAGE*

# 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 |
| 92 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 |


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# Energy Bumper Stumpers

## Get Ready

Before class, choose five to ten of the license plates listed on page 36. The number of license plates you use will depend on the grade level and experience of the students playing the game.

## Get Set

- Divide the students into five or more teams. Explain to the students how the game is played. Instruct each team to take out one sheet of paper for their answers.
- Write the license plates that you have chosen on the board.

## Go

- In the first round, give the students five to ten minutes to solve the *Energy Bumper Stumpers* without the clues. Once the round is over, check the teams' answers. The teams receive ten points for each *Energy Bumper Stumper* they guessed correctly.
- In round two, read the clues that correspond to the license plates on the board. The teams should now try to guess the *Energy Bumper Stumpers* they missed in the first round. When round two is completed, check the teams' answers again. The teams receive five points for each *Energy Bumper Stumper* they guessed with the clues. The team with the most points is the winner.

***Energy Bumper Stumpers* is an activity to review and reinforce students' knowledge about energy.**

### Grade Levels

- Elementary, grades 3-5
- Intermediate, grades 6-8

### Preparation

- 5 minutes

### Time

- 20 minutes

### Setup Tip

- Premade *Energy Bumper Stumpers* license plates have been created for projecting via PowerPoint. Download the slides for use by visiting **www.need.org/resources/powerpoint-presentations/**.

***CONTINUED ON NEXT PAGE***

# Energy Bumper Stumpers

1. **NRGWSTR**—This license plate would be ideal for a person who doesn't believe in conserving our resources. (*Energy Waster*)
2. **NDSTRE**—This plate would be appropriate for the leading consumer of energy. (*Industry*)
3. **SRMIK**—This plate describes the protective covering that surrounds a uranium fuel pellet. (*Ceramic*)
4. **DSTL8N**—This plate refers to the process in which petroleum is separated into various components. (*Distillation*)
5. **SWNDOO**—This plate identifies the most favorable method of access for passive solar heating. (*South Windows*)
6. **CREWDOYL**—This plate suggests another name for a liquid fossil fuel. (*Crude Oil*)
7. **SLRNRG**—This plate describes a type of renewable energy. (*Solar Energy*)
8. **GNR8R**—This plate names a device containing a magnet and a coil of wire. (*Generator*)
9. **NSL8ORS**—This plate describes the type of materials that do not conduct electricity well. (*Insulators*)
10. **POWRLYN**—This plate identifies the method of transporting electricity across our nation. (*Power Line*)
11. **YRAINEM**—This plate refers to the source of a nonrenewable energy that is not a fossil fuel. (*Uranium*)
12. **POLUTNT**—This plate identifies a hazard of burning fossil fuels. (*Pollutant*)
13. **DARYK**—This plate refers to the tower rig that is used to drill for petroleum. (*Derrick*)
14. **GRENHOWS**—This plate describes a building that effectively uses passive solar heating. (*Greenhouse*)
15. **NEWKLEYE**—This plate identifies the place where nuclear fission takes place. (*Nuclei*)
16. **RAD8**—This plate describes heat energy transfer. (*Radiate*)
17. **SLYCON**—This plate identifies the element used in turning solar energy into electrical energy. (*Silicon*)
18. **POWRTOWR**—This plate refers to a device used to collect solar energy. (*Power Tower*)
19. **POWRPUL**—This plate names the cooperative of utilities linked together to share electricity efficiently. (*Power Pool*)
20. **BBKUGRIL**—This plate names a device that many people use during the summer, some of which require propane to operate. (*Barbecue Grill)*
21. **DSYLFUL**—This plate identifies a product of petroleum distillation used by large trucks. (*Diesel Fuel*)
22. **SIZMIK**—This plate names a method of exploration used to locate types of fossil fuels. (*Seismic*)
23. **C-NMLS**—This plate names what scientists believe to be the source of several fossil fuels. (*Sea Animals*)
24. **SDIMNT**—This plate refers to the material that settled on top of ferns to form fossil fuels. (*Sediment*)
25. **FIRTLIZR**—This plate identifies a way to encourage plant growth for biomass fuels. (*Fertilizer*)
26. **YUTLIT**—This plate identifies the companies responsible for distributing electricity. (*Utilities*)
27. **RSRFOR**—This plate names the location of potential energy at a hydropower plant. (*Reservoir*)
28. **PNSTOK**—This plate signals the portion of a hydropower plant that brings the water to the turbine. (*Penstock*)
29. **FASYLFUL**—This plate identifies a term given to several of the nonrenewable energy sources. (*Fossil Fuel*)
30. **TITLPOWR**—This plate names a type of hydropower that is affected by the moon. (*Tidal Power*)
31. **WNTRBM**—This plate refers to another name for a windmill. (*Wind Turbine*)
32. **LYMSTON**—This plate identifies a type of rock in which petroleum is often trapped. (*Limestone*)
33. **CLYMTCHG**—This plate describes increases in global temperatures. *(Climate Change)*
34. **ELYDEE**—This plate describes the type of light that is most efficient. *(LED)*
35. **H2OPWR**—This plate describes a way to use streams and reservoirs to generate electricity. *(Hydropower)*
36. **CNSV8N**—This plate describes behaviors that save energy. *(Conservation)*
37. **EFSHNSY**—This plate describes managing energy use by using devices that use less energy. *(Efficiency)*
38. **MTHAN**—This plate describes the primary component of natural gas. *(Methane)*


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# 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**

| | | |
|---|---|---|
| Pablo Petroleum | Naima Natural Gas | Colin Coal |
| Reba Renewable | Ursula Uranium | Cai Conservation |
| Priya Propane | Eli Electricity | Hector 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 their 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 their knowledge. 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

*CONTINUED ON NEXT PAGE*

# 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. Burning gasoline and diesel to transport people and goods is the largest source of which greenhouse gas emission? (*$CO_2$, or Carbon Dioxide)*

**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 U.S. is* )
3. How is coal mainly transported? (*By railroad)*
4. On average, is coal typically older or younger than other fossil fuels? (*Younger)*
5. Most U.S. coal is produced from which type of mining, surface or underground? (*Surface)*

**QUESTIONS AND ANSWERS FOR RENEWABLES**

1. What type of solar cell produces electricity directly from sunlight? (*Photovoltaic cell)*
2. Renewables make up what percentage of total U.S. energy demand—2%, 9%, 27%, or 45%? *(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)*

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**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? Installing a smart thermostat lets you control your home's heating and cooling temperature settings from your "smart" phone. *(True)*
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, does the amount of energy it requires to operate increase, decrease, or remain the same? (*Decrease)*

**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 density of propane lower than, higher than, or equal to the density of air? (*Higher)*

**QUESTIONS AND ANSWER FOR ELECTRICITY**

1. How is electricity used, measured, and sold? (*By the kilowatt-hour)*
2. What is the national average cost of a kilowatt-hour of electricity for consumers? (*15 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? (*Natural Gas)*

**QUESTIONS AND ANSWERS FOR HISTORY**

1. Whose motorized vehicle created a great demand for gasoline? (*Henry Ford)*
2. Who invented the light bulb and other electrical devices? *(Thomas Edison)*
3. After World War II, which energy source replaced coal as the number one energy source consumed in the U.S.*? (Petroleum)*
4. The largest hydropower facility in the U.S., the Grand Coulee Hydro dam, began generating electricity in 1941 on the Columbia River, in which state? *(Washington)*
5. The first offshore windfarm in the U.S. began generating electricity in 2016, off the coast of which state? *(Rhode Island)*

***CONTINUED ON NEXT PAGE***

# Energy Squares

| | | |
|---|---|---|
| **Pablo Petroleum** | **Naima Natural Gas** | **Colin Coal** |
| **Reba Renewable** | **Ursula Uranium** | **Cai Conservation** |
| **Priya Propane** | **Eli Electricity** | **Hector History** |


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# Energy Source Detective

## Get Ready

Make one copy of the activity on page 42 for each student.

## Go

- Distribute a copy of the activity to each student.
- Explain to the students how to complete each energy source box, using hydropower as an example. The students begin with number 1 and decide whether the energy source is 1a or 1b, write the correct number in the box, draw an arrow, then follow the directions after the number until they discover the name of the energy source. When they discover the correct name, they write it at the bottom of the box.
- For the example for hydropower, the students must first decide whether hydropower is renewable or nonrenewable. It is renewable, so 1a is the first number to be written in the box. They follow the directions to 2 and decide whether the source can be burned. Hydropower is not burned, so they write the number 2b and follow the directions to the next clue until they discover the name of the energy source.

## Extension

- Have students work in pairs to design a flow chart that displays all of the information in this game, as well as extra information if they desire. It may serve as a graphic study tool for later.

***Energy Source Detective* is a critical thinking activity to reinforce understanding of the basic characteristics of the major energy sources.**

### Grade Levels

- Primary, grade 2
- Elementary, grades 3-4

### Preparation

- Less than 5 minutes

### Time

- 10 minutes

*CONTINUED ON NEXT PAGE*

# Energy Source Detective

1a Renewable ..... go to 2
1b Nonrenewable ..... go to 6

2a Can be burned ..... Biomass
2b Is not burned ..... go to 3

3a Energy from space ..... Solar
3b Energy in/on the Earth ..... go to 4

4a Inside the Earth ..... Geothermal
4b On the Earth's surface ..... go to 5

5a Moving water ..... Hydropower
5b Moving air ..... Wind

6a Fossil fuel ..... go to 7
6b Energy-rich mineral ..... Uranium

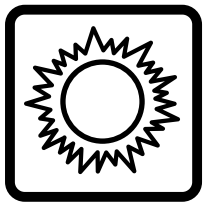
7a A gas ..... go to 8
7b A solid or liquid ..... go to 9

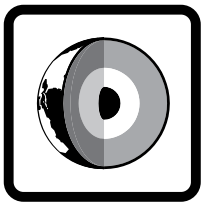
8a Moved by pipeline ..... Natural Gas
8b Shipped in tanks ..... Propane

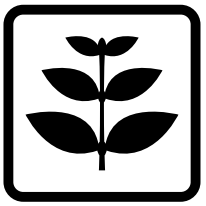
9a Mined from the Earth ..... Coal
9b Pumped from the Earth ..... Petroleum

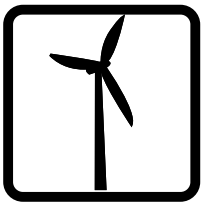
1a → 2b →
3b → 4b →
5a

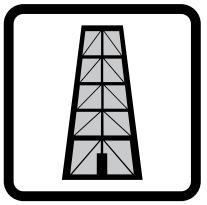
hydropower

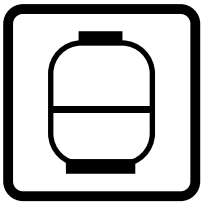








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# Energy Source Puzzle

## Get Ready

Make one copy of the puzzle you choose from pages 44-45 for each student.

## Go

- Distribute a copy of the puzzle to each student.
- Instruct the students to color the squares in each column using the key at the top of the puzzle, then cut apart the squares. While the students are doing this, discuss which energy sources the icons represent, how they are used, and whether they are renewable or nonrenewable.
- Explain to the students that the goal of the activity is to arrange the squares so that only one icon and one color is in each row and column. Explain that there are several ways to solve the puzzle and to look for patterns to help solve it.

Hint: The key is to find a pattern, such as beginning with a diagonal row of the same color or icon.

***Energy Source Puzzle* is a critical thinking activity to reinforce renewable and nonrenewable energy sources.**

### Grade Levels

- Primary, grades K-2
- Elementary, grades 3-5

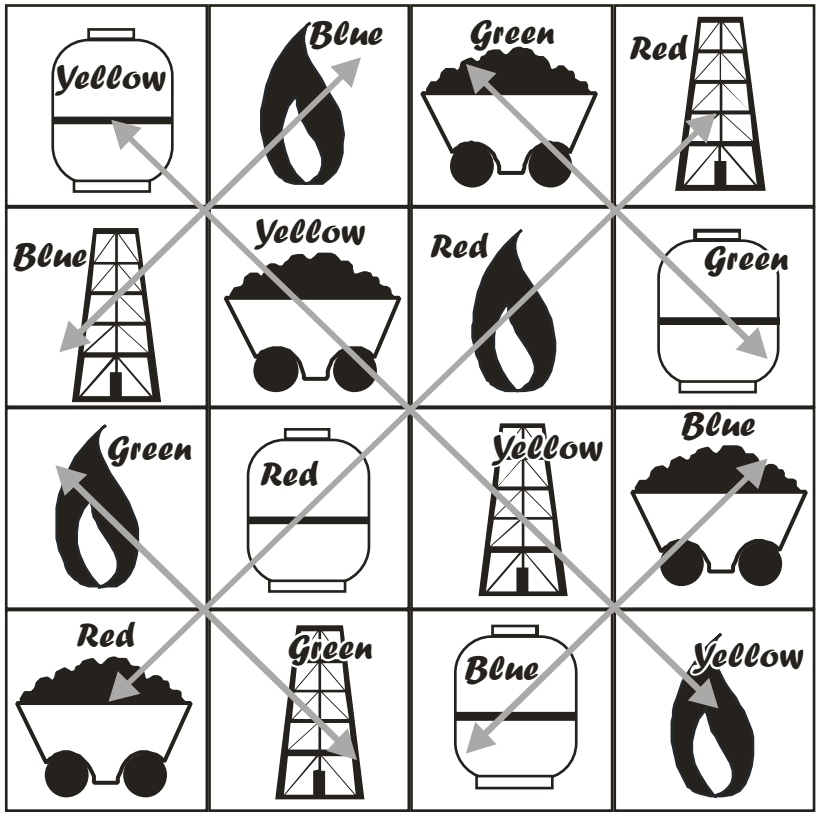
### Preparation

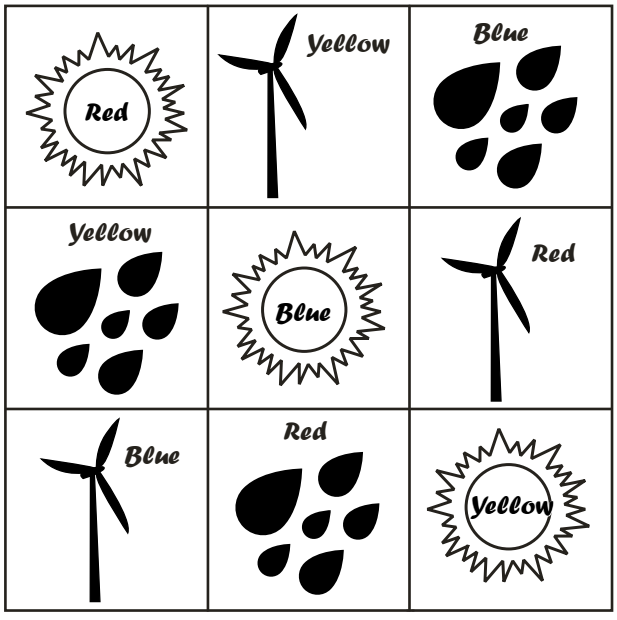
- Less than 5 minutes

### Time

- 15–30 minutes

## Sample Solutions:

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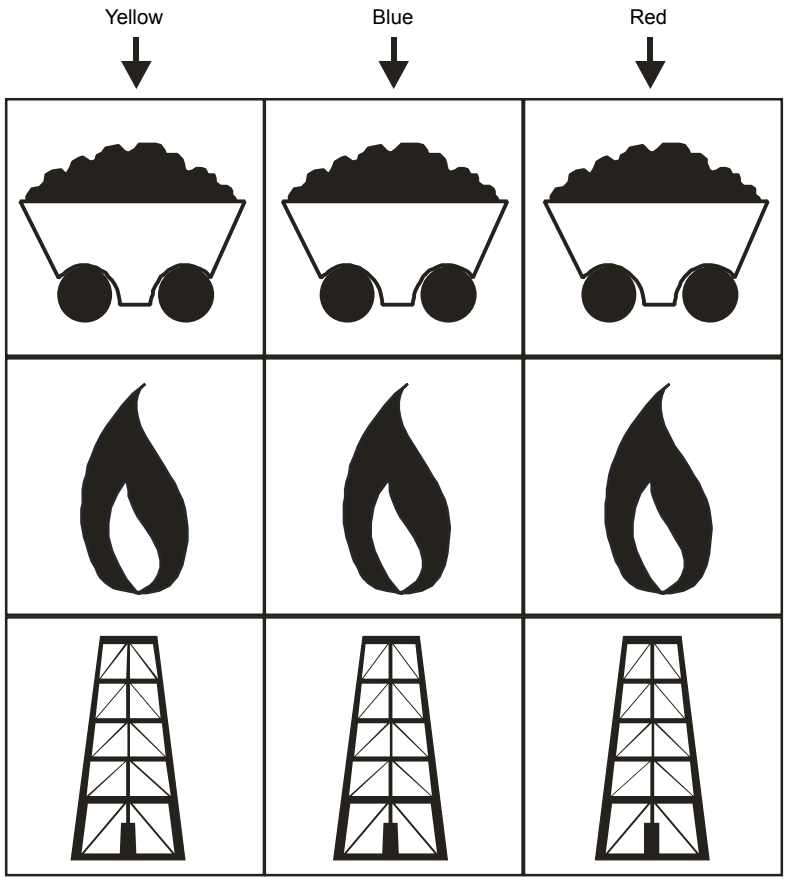


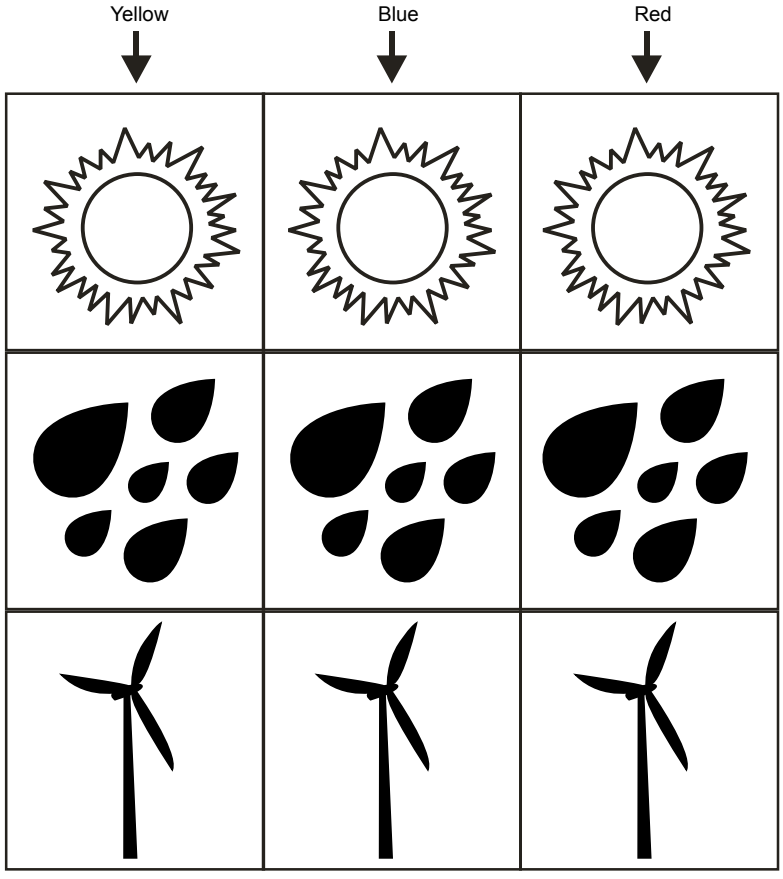


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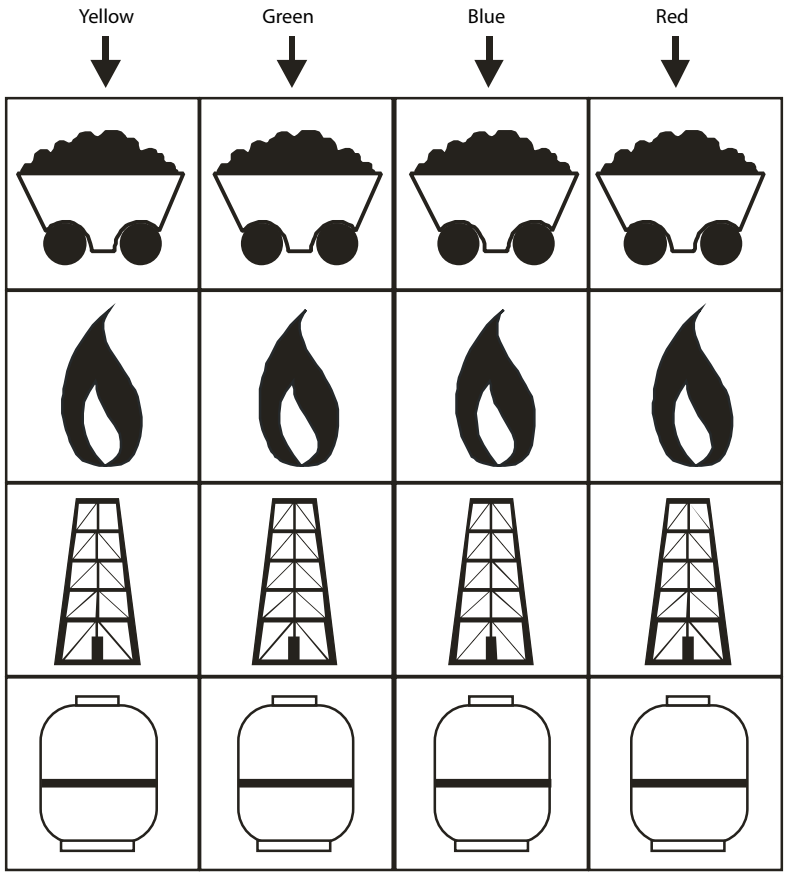
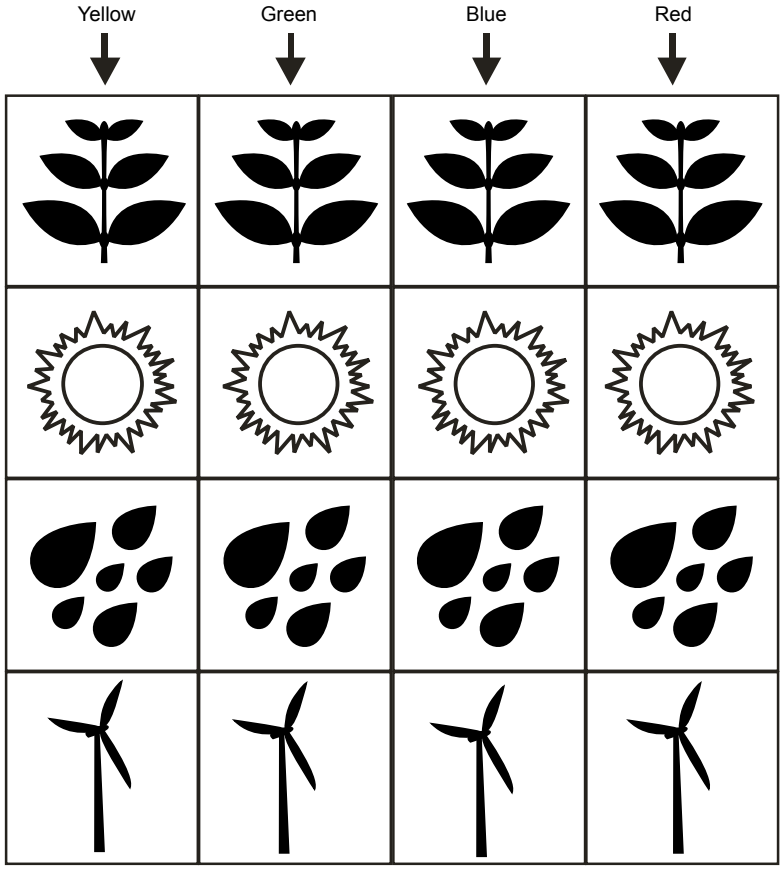

Yellow
Green
Blue
Red


Yellow
Green
Blue
Red

# 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 NEED's *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 NEED guides for more, fun "In the Round" examples!**

- Hydrogen in the Round—$H_2$ *Educate*
- Oil and Natural Gas Industry in the Round—*Fossil Fuels to Products*, *Exploring Oil and Natural Gas*
- Conservation in the Round—*School Energy Experts*, *School Energy Managers*
- 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*
- Energy Careers in the Round—*Energy Careers Excursion*

# 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 NEED's *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 statement, "I have _____."
  - That student will then read Question 1 on their 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

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## 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 33 percent of the nation's total 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 about 20 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 a facility 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 an LED bulb?

## I HAVE ENERGY SUSTAINABILITY.

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

## I HAVE ETHANOL.

1. Who has the internal energy of atoms and molecules?
2. Who has something that 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?

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## 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 92 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 can produce small amounts of 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 fuel most widely used by nuclear plants for nuclear fission?
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?

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## 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 Oklahoma?

## 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 refined into transportation fuels that produce significant amounts of carbon dioxide emissions when burned?
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 consumes energy for manufacturing, mining, construction, and agriculture?

## 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 Web Games

*SCHOOL AS A SYSTEM WEB GAME*
*HOME AS A SYSTEM WEB GAME*

***Energy Web Games*** **help students understand the interactions that affect energy use, energy costs, and indoor air quality.**

## Grade Levels

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

## Preparation

- 10-15 minutes

## Time

- 20–30 minutes

**Check out NEED's other web games that can found within the following resources:**

- Liquefied Natural Gas as a system—*Exploring Oil and Natural Gas*
- Climate Web—Climate Science guides

## Get Ready

- Copy one set of hang tags (school or home) on pages 51-58.
- Cut the cards horizontally so the object and its description are in one strip.
- Fold in half on the dotted line. For extra durability, copy on card stock and laminate.
- Get a ball of yarn or string.
- Use a single hole punch to make holes in the top corners of each folded card.
- Lace one length of yarn or string through each and tie off creating a necklace.

## Get Set

- Explain that a building is an interactive system consisting of the occupants, the mechanical systems, and the movement of heat, air, and moisture. All of these aspects relate to indoor air quality, the cost of energy, and environmental quality. This activity will help students understand the systemic nature of energy use and its impacts on the broader environment.
- Hand out the role card hang tags and ask students to read the backs of their cards. Give students a chance to ask any questions they have about what is written on their cards.

## Go

- Have students put on their hang tags and stand in a circle.
- Hand the ball of yarn to one of the students. Explain that the student should look around the circle and identify another component of the system that is related to their own component.
- The student should hold on to the end of the yarn, then pass or toss the ball of yarn to the identified student, explaining how that part of the system is related. The next student repeats the process, holding onto the yarn and passing the ball to another student with a related component of the system.
- Continue passing the yarn around until all students are holding onto the yarn. The students will have created a web made of yarn connecting all of them.
- Choose one student to give a tug on the string. Explain that this tug represents a stress of some sort on that part of the system. For instance, the person wearing the Heating System tag might give a tug, and you would say, "There is a malfunction in our heating system. It is not operating efficiently."
- Repeat this several times with different students tugging on the yarn. For each tug, describe a possible scenario for the component that is causing stress on the system.
- Ask students to describe how the system is dependent on all of the components. Students should be able to explain that a change in one part of the system can affect all other parts of the system—sometimes in unexpected ways!

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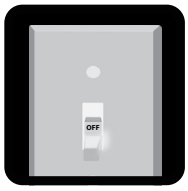


# School Hang Tags

| | |
|---|---|
| **Lights** | It's important to have good quality lighting in a school and enough light to complete tasks.<br><br>Lights use electricity, which costs money and can cause pollution. |
| **Air Conditioning** | AC helps you stay cool in hot weather.<br><br>AC uses a lot of electricity, which costs money and can cause pollution.<br><br>Is there AC anywhere in your school? |
| **Electric Bills** | Electricity costs money. Whenever you use electrical devices or lighting, the school district is charged.<br><br>This means there is less money available for classroom books and supplies and other things the district must provide. |
| **Heat** | Most areas need heat in the winter. The heat in a school building probably comes from a boiler that burns natural gas or oil.<br><br>It takes a lot of these fuels to heat a building. This is very expensive for the school district. |

*CONTINUED ON NEXT PAGE*

## Books and Supplies

You probably don't think about it much, but the materials you use in class cost money.

The more money spent on energy, the less money there is to get the materials you need to help you learn.

## Weather

The weather greatly affects energy use.

The colder it is outside, the more it costs to heat the building. The hotter it is, the more it costs to run the AC.

## Students

When you are comfortable, you learn better. Schools need to heat and cool buildings to maintain comfortable temperatures, which costs money.

Students can do a lot to save energy around the school. Can you think of some ways?

## Oil and Natural Gas Prices

The boiler that heats your school probably runs on oil or natural gas. When the cost of these fuels increases, it costs more to heat the building. The cost of these fuels usually rises during winter months.

*CONTINUED ON NEXT PAGE*



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## Indoor Air Quality

Clean air in a school is important for students to be healthy and comfortable. Your building has a system that brings in fresh air.

This system uses a lot of energy, which costs money. The more students there are in a building, the harder these systems must work.

## District Budget

The school district has a limited amount of money it can spend each year.

The less money it spends on energy, the more it can spend on classroom supplies and hiring more teachers.

## Heating Bills

Heating a building costs money. The more heat used, the more the school district has to pay.

This means there is less money available for classroom books and supplies and other things the district must provide.

## Hot Water

Heating water costs money. Your school probably uses natural gas or oil to heat water. The more hot water used, the more the school district has to pay.

This means there is less money available for classroom books and supplies and other things the district must provide.

*CONTINUED ON NEXT PAGE*

## Air Pollution/ Climate Change

Every time the heating system is operating in your building, the boiler is releasing emissions that can pollute the air. The electricity used in the building comes from a power plant, which can also add pollution to the air.

Buses and cars picking up and dropping off students release emissions that can pollute the air and even enter the building through vents near bus ramps.

Many of these emissions can contribute to climate change.

## Computers

Computers use electricity that costs money. If you leave computers on when they're not in use, it wastes energy.

Computers also cost a lot of money to buy. The more your district has to pay for energy, the less money there is to buy computers.

## Teachers

Teachers are more effective when the building is at a comfortable temperature. Buildings must be heated in cold months, which costs money.

Teachers can do a lot to save energy around the school. Can you think of some ways?

## Comfort

Your comfort is important. You need heat in the winter. You need good lighting and clean air in your school.

All of these use energy, which the school district has to pay for.

*CONTINUED ON NEXT PAGE*



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# Home Hang tags

| | |
|---|---|
| **Lights** | It's important to have good quality lighting at home and enough light to accomplish tasks.<br><br>Lights use electricity, which costs money and can cause pollution. |
| **Air Conditioning** | AC helps you stay cool in hot weather. AC also removes moisture from your home, which helps you be more comfortable when the air is humid. In humid climates, drier air is also better for your health in the summertime.<br><br>AC uses a lot of electricity, which costs money and can cause pollution. |
| **Electric Bills** | Electricity costs money. Whenever you use electrical appliances or lighting, your parents are charged for it.<br><br>This means there is less money available for other things your family needs and wants. |
| **Insulation** | Insulation helps keep your home warm in winter and cool in summer. If your house is well insulated, the heating and AC systems don't have to work as hard.<br><br>Good insulation saves money on heating and cooling costs and can reduce air pollution. |

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## Clean Air

You need clean air to be comfortable and healthy. If too much air flows through your home, however, it removes heat, making the heating system work harder.

Sealing your home too tightly, on the other hand, can trap moisture, causing air quality issues that may lead to health problems.

## Weather

The weather greatly affects energy use.

The colder it is outside, the more it costs to heat a home. The hotter it is, the more it costs to keep it cool.

## People

You want to be comfortable in your home. That means you need heat in the winter, which costs money.

One way that people affect indoor air quality is by adding moisture to the air through their activities.

## Oil and Natural Gas Prices

Most homes are heated by a furnace that burns oil or natural gas.

When the cost of these fuels increases, it costs more to heat your home. The cost of these fuels usually rises during winter months.

***CONTINUED ON NEXT PAGE***



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## Moisture

Too much moisture in a home can lead to mold growth, which can cause health problems. Too little moisture in the air can cause health problems, too.

How does moisture get into your home? How does it get into the air?

## Household Budget

Your household has a limited amount of money it can spend each month.

The less money your household spends on energy, the more you can spend on other things you need and want.

## Heating Bills

Heating your home uses a lot of energy and costs money. The more heat you use, the more your household must pay.

This means there is less money available for other things you need and want.

## Hot Water

Heating water uses energy and costs money. Most homes use electricity or burn natural gas or oil to heat water.

The more hot water you use, the more your household must pay. This means less money is available for other things you need and want.

CONTINUED ON NEXT PAGE

## Air Pollution/ Climate Change

When you heat your home, the furnace is releasing emissions that can pollute the air. The electricity you use comes from a power plant, which may also add pollution to the air.

Many of these emissions can contribute to climate change.

## Heating System

The colder it is outside, the more fuel your heating system uses.

Insulation in the walls and attic can reduce the amount of heat your home needs, saving energy and money, and reducing pollution.

## Electrical Appliances

Refrigerators, freezers, clothes dryers, TVs, computers, video game systems, lights, and other appliances use electricity, which costs money. If you leave appliances on when they're not being used, that wastes energy.

Appliances also add heat to a home. In the summer, that means the AC has to work harder, using more energy.

## Comfort

Comfort is important. You need heat in the winter. You need good lighting and clean air in your home. All of these use energy, which your household has to pay for.


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# The NEED Clap

***DEVELOPED BY LINDA HUTTON AND THE NEED STUDENTS IN KITTY HAWK, NC***

***We are NEED energy students,***
***Saving energy is our plan,***
***We save energy for our future,***
***Saving energy throughout the land.***

***Hydropower, geothermal, solar, wind, and biomass,***
***Coal and petroleum, uranium, propane,***
***the clean burning flame of natural gas.***

***Energy sources light our future,***
***Saving energy takes all hands,***
***Working together, conserving forever,***
***Saving energy throughout the land.***

## The 14 Easy Steps

Find a partner and place your palms together (thumbs up) in front of you. Face your partner.

1. Slap your hands back and forth (keeping palms together).
2. Slap hands back and forth once with the backs of your hands landing together and stop.
3. Take your right hand away from the left and clap once.
4. Clap once with your right hand and your partner's hand above your left hands.
5. Clap your hands together once as in number 3.
6. Grab your partner's right hand with your right hand below your left hands.
7. Take your left hand below your right hand and grab your partner's other hand.
8. Take your right hand and slap your right hip twice.
9. Move that hand above your other two, shaking hands, and slap your partner's hand once back and forth.
10. Grab your partner's hand and hold together with thumbs up.
11. Hit the top of your hand once.
12. Hit the top of your hand again.
13. Repeat steps 1-12.
14. Have FUN!

# See, Run, Do

***See, Run, Do* is a wonderful icebreaker and team building activity that tests students' communication skills and creativity. It makes a wonderful activity to use as an introduction to a topic or unit, and can be used in the classroom, during multidisciplinary lessons, and even during adult workshops or conferences. *See, Run, Do* is very easy to implement with all ages by adjusting the complexity of the collage.**

## Grade Levels

- K-12

## Preparation

- 10-30 minutes, depending on the collage

## Time

- 45–60 minutes

## Get Ready

- Construct a 3D energy collage or scene. The collage can use markers, paper, streamers, cotton balls, paper bags, toys, etc. Incorporate as much or as little of a challenge as you'd like.
- Gather materials for students to use to recreate your collage. Be sure to include the materials you used in the original, plus some others of varied colors, textures, etc. Create art stations with materials for students to recreate the original.
- Set up the collage in a part of the room where it will be hidden, in the hallway, or in a separate room as space and supervision allow.
- Set a boundary line with masking tape between the collage and the area where artwork will occur. The boundary should be placed so that runners may not see the collage as they approach its hidden location.
- Make a set of name tags for each student group that include "SEE", "RUN", and "DO."
- Secure an impartial judge for the final work, if necessary.

## Get Set

- Place students in groups of 3-5.
- Explain to the groups that they will each assume a role. One person from each group will be a "See-er", one person will be a "Runner", and the remaining student(s) will assume the role of "Do-er". Ask students to choose their roles and wear a name tag for their chosen role.
- Ask the "Do-ers" to pick their home base area where they will assemble their collages, Show the "Runners" and "See-ers" the boundary lines that they may not cross. Take the "See-ers" to the sheltered collage area where the original is placed.

## Go

- Explain the goal and rules for the game by reading the following: Each group will work together to recreate the collage or scene that is hidden. The only person who can look at it, however, is the person who has chosen to be the See-er. The See-er will stay by the collage and observe it. See-ers will meet the Runners at the boundary line and share information about what they see and how to recreate what they see. The Runners will return to the home base to communicate instructions to the Do-ers. Do-ers will remain at home base, using the art supplies provided to recreate the original based on their instructions. Runners can go back and forth as many times as they need in the time allotted to ask questions and take instructions from the See-ers.
- After the allotted time, bring together all of the recreated collages and post on the wall for all to see. Have the class discuss the differences, accuracies, and inaccuracies about each version. The class can vote on the most accurate recreation, or an impartial judge can do the voting. Award groups prizes if you desire.


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# Candy Collector

## Get Ready

- Gather supplies needed for the game. Each group will need the following:
  - 50 M&Ms or similar candies
  - 3 jelly beans
  - 2 bowls
  - Straws
  - A small cup
- Put the M&Ms into bowls for each group. Set up stations so that each group will have each of the materials listed above, except the jelly beans. The jelly beans will be passed out later.

## Get Set

- Divide the students into groups of 2-4. Place a group at each station with the materials.
- Explain to the students that the candy in the bowl will represent energy. The empty bowl is their discard bowl.
- Tell students that during the game they will transfer candy from the full bowl to the cup to "consume energy." However, they may use only the straws to transfer the energy – NO hands allowed!
- Make sure students know they must wait to eat the candy until the end of the game.

## Go

**Part 1: NONRENEWABLES**

- Set a timer for 15 seconds.
- Tell groups that when the time starts, they will need to provide energy for their town. They must use their straw to provide suction to extract energy from the full bowl. They must transfer this energy into the cup. They may transfer as many candies as they can before the year ends, but they may not use their hands at all – not even to hold the straw! A year will last 15 seconds.
- After 15 seconds, have students count how many candies made it into their cup during the "year." Ask students to keep a tally of how much they extracted and how much remains.
- Place any candy in the cup into the extra discard bowl.
- Extract energy for 3 more "years," following the steps above. Ask students how much energy remains in their bowl (if any). Ask them to predict how many years their energy sources would last.

**Part 2: NONRENEWABLES AND RENEWABLES**

- Tell students to place ALL candies back into one bowl. Add three jelly beans to each group's bowl.
- Explain to students that as time has passed, their town has become better able to predict how much energy it needs. Explain to them that they will still transfer candy, but each year are only required to recover 2 pieces of candy per person.
- Set the timer for 15 seconds. Remind students they may only use their suction – NO HANDS!
- Allow students to extract their energy for 15 seconds, transferring 2 candies per person into the cup. Ask students if all groups met their energy needs of 2 candies per person? How many candies remain in their original bowl?
- Ask groups to discard ONLY the M&Ms from their cup into the discard bowl. The jelly beans represent renewable resources and may be placed back into the original full bowl to be gathered for future years!

***Candy Collector* is a fun game to introduce students to the terms "renewable" and "nonrenewable". Students will get a closer look at how long energy sources will last when using only nonrenewable sources and when incorporating renewable sources of energy.**

### Grade Levels

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

### Preparation

- 5-10 minutes

### Time

- 30-45 minutes

### Caution

- If concerned about germs, it is advisable to have students complete the activity independently. Adjust the amount of candy used per person and consider altering "Part 2" instructions to remove the limit of 2 candies per person.

- Complete three more 15-second "years," each time discarding the M&Ms and returning the jelly beans. Ask students if their energy candy will last longer knowing they can reuse the jelly beans? How many "years" might their candy last?
- Explain to the class the definitions of renewable and nonrenewable energy sources. Ask the class which candies represent renewable energy sources, and which candies represent nonrenewable energy sources. Discuss as a class how this game is similar to and different from using energy sources in the real world.

# Extensions

- Have students graph their results on a class spreadsheet for each round. Groups can use the graphs to compare and discuss strategies, successes, and challenges experienced by each group, and create mathematical models to predict how long each candy will last.
- Adjust the numbers of candies for each round and the time in a year to suit the coordination of your students.
- Play another round where certain bowls have different numbers of candies of both types. Ask students to describe how this situation might be more similar to the real world.
- Substitute non-candy items if food is an issue in the science classroom.
- Utilize several types of candy of differing shapes, sizes, or colors to represent different energy sources. Have students complete the activity but create a circle graph or pie chart showing the breakdown of energy sources "consumed."

# Energy Heads Up

## Get Ready

- Create a list of energy vocabulary terms and phrases that relate to the unit and standards you are covering. Consider using some of the words from page 34 to get you started if your unit covers the energy sources. Students may also provide the list of words used by asking each student to think of one word or phrase.
- Put the words onto note cards or small strips of paper, making sure to write large enough that the clue can be seen from a distance. Make multiple sets if needed. Fold the vocab cards and place them in a hat, box, or bag for students to draw from.
- Divide the students into teams. You may choose to do two teams for a smaller class, or several small teams that will run simultaneously. If doing two teams, the two teams can alternate, taking turns guessing. After an equal number of turns for each team, determine the winner based on the number of correct guesses. If doing several teams, you may choose to give each team the same vocab cards. Teams will determine the winner at the end after you play several rounds.
- Set up a timer or stopwatch with 45 seconds on the timer.

## Get Set

- Give students an overview of the game or find a YouTube clip of the game being played on TV.
- If playing with multiple groups simultaneously, elect one student in each group to be the scorekeeper.

## Go

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

- In this game students will take turns guessing vocabulary words based on the clues provided by their team. Each round will last 45 seconds.
- Each team member will take a turn drawing a card, and without looking, place the card on their forehead so the team can see the word, but the player cannot. Once time starts, the team will provide clues that will help the player guess the word. The team may NOT use any word on the card or say, "It rhymes with___."
- If the team member guesses correctly, they will earn one point and draw more cards, continuing until the round is complete.
- Team members can elect to "pass" the word, but it must go back into the pile and does not earn a point.
- At the end of 45 seconds, the scorekeeper will tally up the points earned and a new player will begin their turn.
- At the end of the game, the team with the most points will be declared the winner.

## Extensions

- For large classes or groups, set up a tournament or system of brackets, similar to a sports tournament, so that small teams can play several other teams to earn points. As teams get knocked out, it can become a spectator event, and they must help to provide additional words to keep the tournament moving.

***Energy Heads Up*** **is based on a classic game played with playing cards or popular culture words, in which the player is unable to see what is on their forehead and they must guess based on clues provided by the remainder of their group. Students may be familiar with this game in an app form or from television shows.** ***Energy Heads Up*** **is a fun way to introduce or review energy terms during a unit, as an interest grabber before beginning a unit, or even as a fun activity for workshops or professional developments.**

### Grade Levels

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

### Preparation

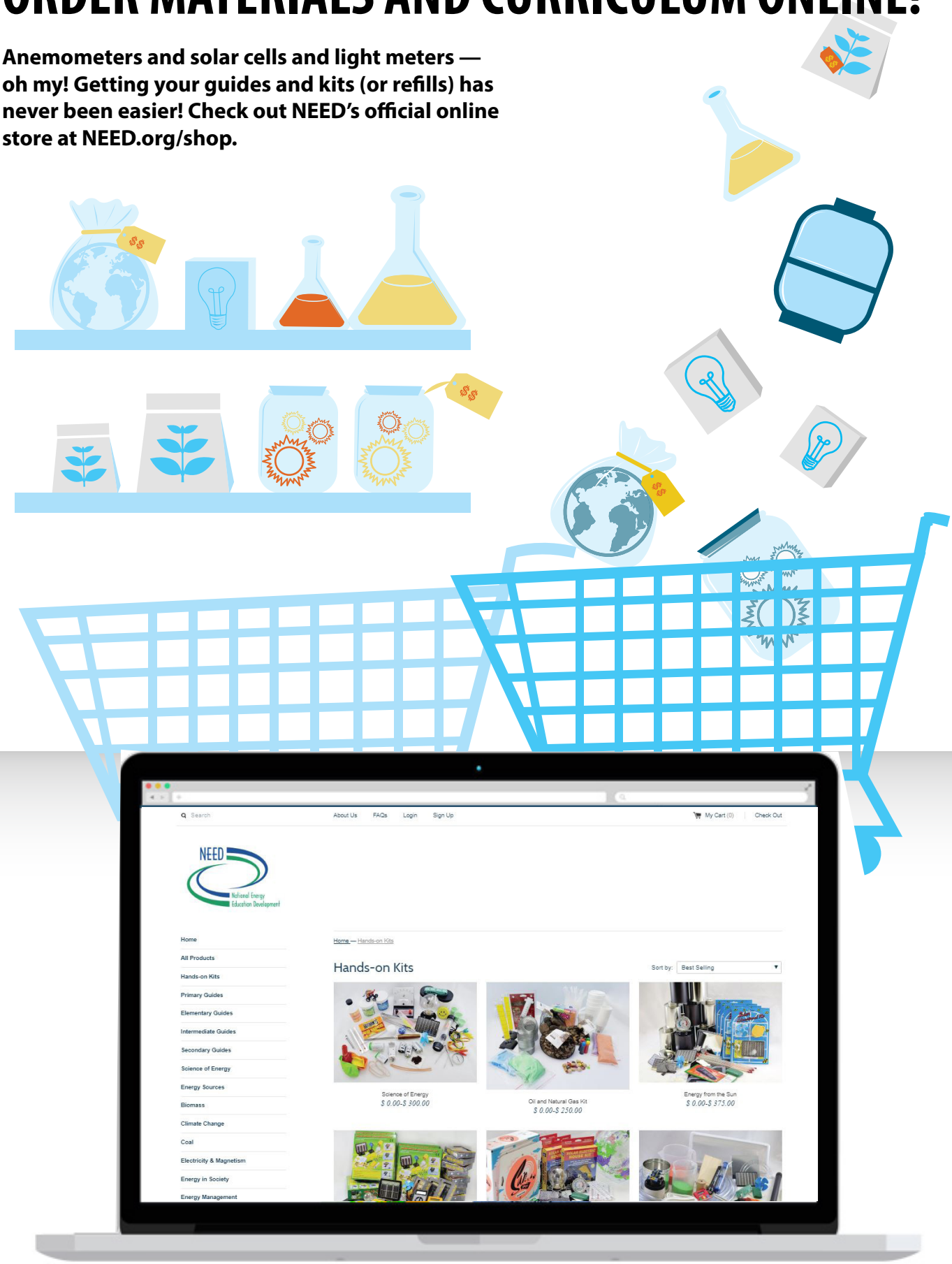
- 5-10 minutes

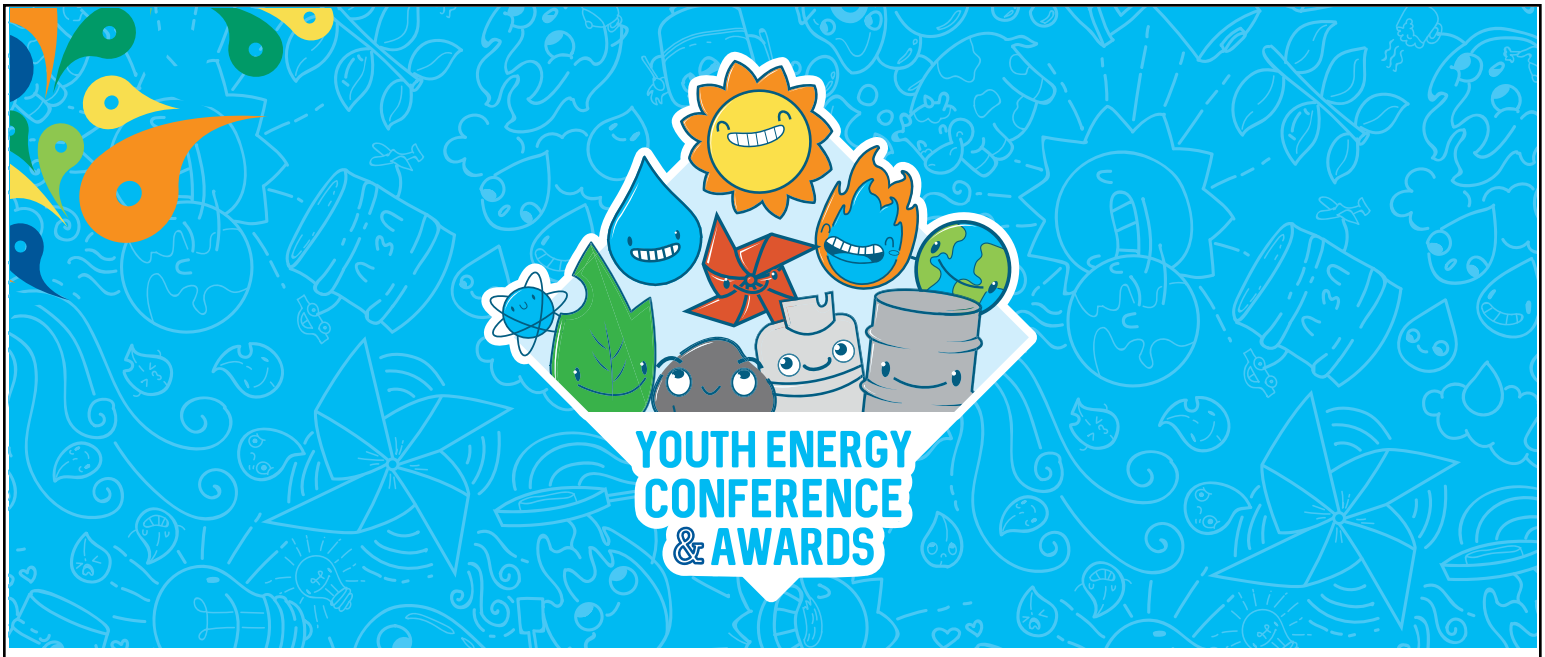
### Time

- 20 minutes and up

# ORDER MATERIALS AND CURRICULUM ONLINE!

**Anemometers and solar cells and light meters — oh my! Getting your guides and kits (or refills) has never been easier! Check out NEED's official online store at NEED.org/shop.**






# YOUTH ENERGY CONFERENCE & AWARDS

The NEED Youth Energy Conference and Awards gives students more opportunities to learn about energy and to explore energy in STEM (science, technology, engineering, and math). The annual June conference has students from across the country working in groups on an Energy Challenge designed to stretch their minds and energy knowledge. The conference culminates with the Youth Awards Ceremony recognizing student work throughout the year and during the conference.

**For More Info: www.need.org/youthenergyconference/**

# YOUTH AWARDS PROGRAM FOR ENERGY ACHIEVEMENT

**All NEED schools have outstanding classroom-based programs in which students learn about energy. Does your school have student leaders who extend these activities into their communities? To recognize outstanding achievement and reward student leadership, The NEED Project conducts the National Youth Awards Program for Energy Achievement.**

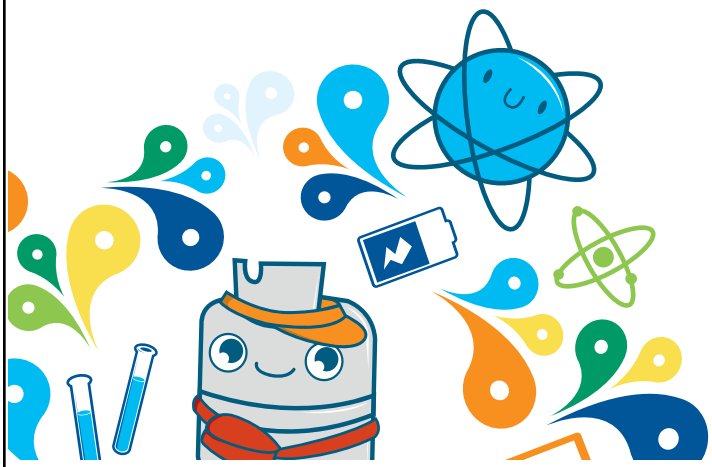
Share Your Energy Outreach with The NEED Network!
This program combines academic competition with recognition to acknowledge everyone involved in NEED during the year—and to recognize those who achieve excellence in energy education in their schools and communities.

## What's involved?

Students and teachers set goals and objectives and keep a record of their activities. Students create a digital project to submit for judging. In April, digital projects are uploaded to the online submission site.

## Check out:

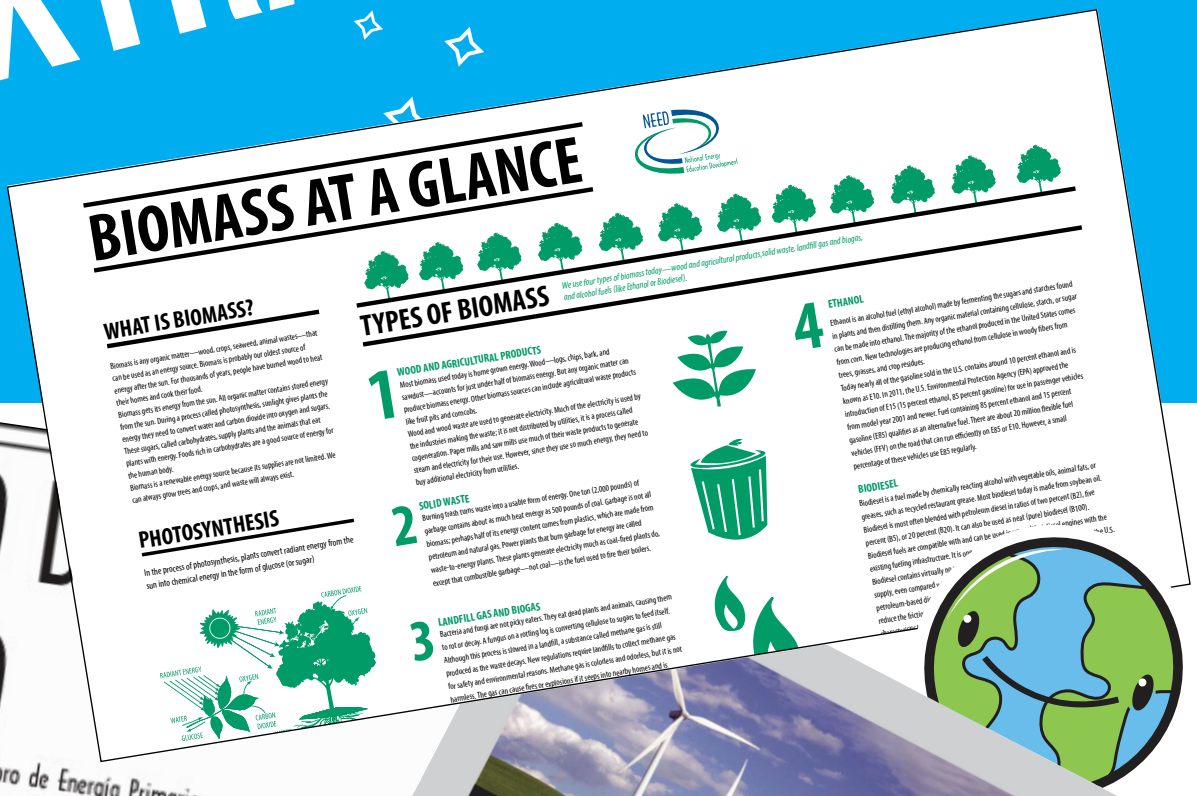
**https://youthawards.need.org/** for more project and application information. Be sure to explore the remainder of the site to learn more about the Awards weekend, see past winner sample projects, and more!



# AWESOME EXTRAS!

Our Awesome Extras page contains PowerPoints, energy graphics, and other great resources to compliment what you are teaching!

**www.need.org/educators/awesome-extras/**







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# Energy Games and Icebreakers
# Evaluation Form

**State:** _____ **Grade Level:** _____ **Number of Students:** _____

| | | |
|---|---|---|
| **1. Did you conduct all of the activities? If no, specify which ones below.** | ❑ Yes | ❑ No |
| **2. Were the instructions clear and easy to follow?** | ❑ Yes | ❑ No |
| **3. Did the activities meet your academic objectives?** | ❑ Yes | ❑ No |
| **4. Were the activities age appropriate?** | ❑ Yes | ❑ No |
| **5. Were the allotted times sufficient to conduct the activities?** | ❑ Yes | ❑ No |
| **6. Were the activities easy to use?** | ❑ Yes | ❑ No |
| **7. Was the preparation required acceptable for the activities?** | ❑ Yes | ❑ No |
| **8. Were the students interested and motivated?** | ❑ Yes | ❑ No |
| **9. Was the energy knowledge content age appropriate?** | ❑ Yes | ❑ No |
| **10. Would you teach these activities again?** | ❑ Yes | ❑ No |

*Please explain any 'no' statement below.*

| | | | | |
|---|---|---|---|---|
| **How would you rate the activities overall?** | ❑ excellent | ❑ good | ❑ fair | ❑ poor |
| **How would your students rate the activities overall?** | ❑ excellent | ❑ good | ❑ fair | ❑ poor |

**What would make the activities more useful to you?**

**Other Comments:**

**Please fax or mail to:** **The NEED Project**
8408 Kao Circle
Manassas, VA 20110

FAX: 1-800-847-1820
Email: **info@need.org**

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