

GROW YOUR PALS PROGRAM GUIDE



THE NATIONAL FFA MENTORING PROGRAM

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LESSON 7

How much energy is used and how can I use less?

Unit:
RENEWABLE ENERGY

PRECEPTS

- E. Awareness
 - E1. Address issues important to the community



Lesson Type:
Large Group

NATIONAL STANDARDS

- NM-NUM.3-5.3 Compute Fluently and Make Reasonable Estimates
- NM-DATA.3-5.3 Develop and Evaluate Inferences and Predictions that are based on Data
- NSS-EC.K-4 Effective Decision-making

STUDENT LEARNING OBJECTIVES

As a result of this lesson, the student will ...

1. Identify eight ways to reduce energy usage in the home.
2. Describe the magnitude of energy usage in the United States.





TIME

Instruction time for this lesson: **60 minutes.**



RESOURCES

Energy Information Administration
http://tonto.eia.doe.gov/energy_in_brief/renewable_energy.cfm

Natural Resources Defense Council
www.nrdc.org/air/energy/genenergy/easy.asp

Alliant Energy Kids
www.powerhousekids.com



TOOLS, EQUIPMENT AND SUPPLIES

- ✓ PALS.7.AS.A – 1 per student
- ✓ PALS.7.AS.B – 1 per student
- ✓ PALS.7.AS.C – 1 per student
- ✓ PALS.7.TM.A -- on overhead transparency
- ✓ markers or crayons
- ✓ writing surface
- ✓ overhead projector or LCD projector (to display PALS.7.TM.A)



KEY TERMS

renewable energy
nonrenewable energy

INTEREST APPROACH

The purpose of the interest approach is to have students think about how energy is used in their homes. To do this, mentors will have students think about how many light bulbs are in their homes and count them. Students will share answers.



Today we are talking about how we use energy in our homes and how much energy we use in the United States. Light bulbs are powered by electricity, and this is one way we use energy in our homes. Think for a moment about how many light bulbs are in your house. Count as many light bulbs you can think of in your house. Close your eyes if it helps you to think, and then write down your answer.

Have students share answers, record on writing surface, and then add up the cumulative number of all light bulbs students mention.



Let's see what we've come up with. Raise your hand to tell us how many light bulbs are in your house.

After each student has shared, announce the total number of bulbs.



That's a lot of light bulbs! Every day we use a lot of electricity just so we can see here at school and at home. Electricity is one type of energy. In order to make that electricity we use up some of the Earth's resources, some that can never be used again. If we use them all up, then we will not have anything left to make more energy, like electricity. Are you ready to discover how we can reduce energy use in our homes?

SUMMARY OF CONTENT AND TEACHING STRATEGIES

OBJECTIVE 1. | Identify eight ways to reduce energy usage in the home.



For this objective, you will help students understand how they use energy in the home and help them identify ways to reduce energy usage. To do this, you will use the Hieroglyphics e-moment to help students understand ways to reduce energy in the home.

I. Ways to reduce energy usage in the home

- A. Unplug unused appliances and chargers when not in use.
- B. Place computers on sleep or hibernate when not in use.
- C. Set the thermostat temperature for heating/cooling systems to 68 degrees in the winter and up to 78 degrees in the summer.
- D. Turn out lights when not in use.
- E. Keep the refrigerator door closed.
- F. Plant a tree to help create shade around the house.
- G. Use cold water to wash clothes.
- H. *Replace burnt out light bulbs with compact fluorescent bulbs.*

Hieroglyphics e-Moment

The Hieroglyphic e-Moment challenges students to create an icon or symbol that represents a concept – or a picture that is worth a thousand words.

Distribute PALS.7AS.A



Now that everyone has an activity sheet, let's think about some ways we can reduce energy usage in our homes. In a moment, we are going to create a map of a house and identify things we can do to reduce energy. Let's take a look at the activity sheet we just received. What we see is an empty house. We need to draw some rooms and appliances in this house. When I say CREATE, we will have two minutes to complete two levels, an upstairs and downstairs, with three rooms upstairs and four rooms downstairs. I will also draw a house on the board/flip chart (*available writing surface*) if you need some ideas. Who will tell us how many rooms to draw upstairs? *Wait for response.*

Great, three! Who will tell us how many rooms to draw downstairs? *Wait for response.*

That's right, four rooms downstairs. What questions are there?

OK, CREATE!

Mentors should circulate through the room to provide assistance while one mentor draws a house on the writing surface. Mentor should also draw items using an overhead transparency of PALS.7.AS.A and the writing surface according to the directions below.



Five, four, three, two, one ... time is up. Thanks for working so diligently.



So, we should have three rooms upstairs and four rooms downstairs. Now let's identify ways to reduce energy in this home. One thing you can do at home to reduce energy is to unplug appliances when they are not being used.

You should have markers/crayons in front of you that we will use to draw items in the house. In one of the upstairs rooms draw a fan.

You should draw the fan on your example along with all of the images that follow.



Show that this fan is unplugged.



In one of the downstairs rooms draw a computer.

Allow time to draw.



Next to the computer make a sign that says, “Sleep or hibernate computer when not in use!”

This reminds us to turn off the computer when we aren’t using it.

Select another downstairs room. Draw a little box on the wall that represents the thermostat, which is what we use to set the temperature in the house. Draw a dial on the little box. Next to the dial, write 68 – w, that reminds us to set the temperature in the house at 68 degrees in the wintertime. Also, write a 78 – s, near the dial. This reminds us that we should set the temperature up to 78 degrees in the summertime.

Now, let’s pick a room upstairs. Draw a light in the room. Also draw a light switch. Show that the switch is off by illustrating the words “on” and “off” on the switch. Anytime we are not in a room, we should make sure to turn out the lights to save energy.

Pick a downstairs room to be the kitchen. In the kitchen draw a refrigerator. On the refrigerator or next to it, make a sign that says, “Keep refrigerator door closed!” Keeping the refrigerator door closed helps conserve energy.

Outside the house, to the left or right of it, draw a tree. This reminds us to plant trees around our homes to help shade our houses in the summertime. Natural shade from trees helps reduce the amount of energy we need to use to cool our homes.

There should be one room left downstairs. This room will be the laundry room. In this room draw a washing machine. On the washing machine write, “Use cold water!” Using cold water to wash most of our clothes helps conserve energy, because we aren’t using energy to heat the water.

Finally, there should be one last room upstairs. In this room we want to show someone replacing a burnt out light bulb with a new, energy-saving light bulb. The energy-saving light bulbs typically have a curly shape. Show the new light bulb as a curly light bulb. Look up at the board/flip chart (*writing surface*) if you need ideas to draw this picture.



These are just a few ways we can help reduce energy usage in our homes. Take this map home as a reminder to you and your family of how you can use less energy.

OBJECTIVE 2. | Describe the magnitude of energy usage in the United States.



The purpose of this objective is to help students understand how much energy is used in the United States. PALS.7.TM.A will be used to show students how much energy is used. You will guide students through some math problems involving addition and subtraction in this objective.

II. Magnitude of energy usage in the United States

- A. 101.605 quadrillion units (BTU)
- B. Oil (petroleum)
 - i. 40 percent of nation's energy
 - ii. 40.642 quadrillion units
- C. Natural gas
 - i. 23 percent of nation's energy
 - ii. 23.37 quadrillion units
- D. Coal
 - i. 22 percent of nation's energy
 - ii. 22.35 quadrillion units
- E. Nuclear electric power (uranium)
 - i. 8 percent of nation's energy
 - ii. 8.13 quadrillion units
- F. Renewable energy
 - i. 7 percent of nation's energy
 - ii. 7.11 quadrillion units
- G. Biomass, 53 percent
- H. Hydroelectric (water), 36 percent
- I. Geothermal, 5 percent
- J. Wind, 5 percent
- K. Solar, 1 percent

Help students understand how much energy is used in the United States. Explain how you will measure energy (units) and ask them to think about how many units are used in the United States each year. Record student responses on the writing surface.



Now that we've looked at several ways to save energy, let's examine how much energy is used in the United States. The amount of energy we use in the United States is tough to measure. We measure weight in pounds, height in feet and liquids in ounces. One example of an energy unit is heat energy, which is measured in British Thermal Units, or BTUs. Today, we'll just say that energy is measured in units. Think for a moment about how many units of energy you think are used in the United States each year. Take a guess at the size of that number and write it down so you can remember it. Now, who will be first to share his or her numbers while I record your estimations?

Elicit responses and record.



We have some great guesses ... there is a lot of energy used in the United States each year. In fact, there are 101.605 quadrillion units of energy used in the United States each year. That number looks like this: *(Record number on writing surface)*

101,605, 000, 000, 000, 000 units of energy

101.6 quadrillion -- That's a lot! There are different types of energy used in the United States and today we are going to look at the percents or pieces of the pie that each of those types of energy make up.

Display copy of PALS.7.TM.A.



This image is our pie that represents those 101.6 quadrillion units of energy used in the United States each year. You can see that each slice of the pie is a different size. The size of that slice represents the percent that each energy source makes up of the total. The types of energy we use include: oil, natural gas, coal, nuclear and **renewable energy**. Let's see if we can determine how each of these pieces matches up to the different types of energy.

The following activity will help students understand what each slice of the pie represents in PALS.7.TM. A / PALS.7.AS. B. Each student will need a copy of PALS.7.AS.B and a writing utensil. The mentor(s) will lead students through the activity using PALS.7.TM. A displayed so that students can follow along. The mentor(s) should write (along with students) on PALS.7.AS.B.



In a moment you will receive a copy of what you see projected up here. We are going to write some things down, so let's find a writing utensil while the handouts are being distributed.

In order to discover what each of these pie pieces represents, we first need to know what the different types of energy are. On the left-hand side of the sheet under "List of energy sources," write down the following energy sources: *(Record them on writing surface as you announce them.)*

Coal

Natural Gas

Nuclear

Oil

Renewable energy

Great! Now, our job is to determine which of these energy sources matches up with each pie slice. Let's first determine how big we think each slice is. Look at the biggest slice "C" and think about whether it is more or less than 50 percent of the whole. Raise your hand if you think it is more than 50 percent. Raise your hand if you think it is less than 50 percent. Good deal! We are on the right track. Pie slice "C" is less than 50 percent. Now, think for a moment about what percent it might be. *Pause.* When you have an answer, raise your hand.

Call on students for responses and record them on the writing surface. If students do not offer 40 percent as an answer, you may make the suggestion.



Great thinking! This slice represents about 40 percent of the whole. So, next to letter "C" in the right-hand column, write 40 percent. This 40 percent represents oil. What this means is that of all these energy sources we listed on the left-hand side, oil is used to create 40 percent of our energy in the United States--the most of all these energy sources.



OK, now let's look at slices "B" and "E", they look pretty similar in size. Think for a moment about what percent each slice "B" and "E" represent. When you have an answer, raise your hand. *Pause.*

Call on students for responses and record on the writing surface. If students do not offer 22 to 23 percent as an answer, you may make the suggestion.



These are all great responses. Each of these slices represents about one-fourth of the whole, or almost 25 percent each. Slice "B" is actually 22 percent, so record 22

percent in the right column next to the letter “B.” This slice represents coal, so next to 22 percent we can write coal.

Slice “E” is bigger than slice “B” by one percent. Who can tell me what percent slice “E” is? Allow for a student to respond.

Exactly! Slice “E” is 23 percent. So, let’s write 23 percent next to the letter “E” in the right-hand column. This 23 percent represents natural gas, so we can write natural gas next to 23 percent.

Remaining are two little slices that look about the same size, slices “A” and “D.” Let’s think about these slices and what their percentages might be. *Pause.*

Call on students for responses and record on the writing surface. If students do not offer 8 to 10 percent as an answer, you may make the suggestion.



Great answers! These two slices are each just under 10 percent. Let’s look first at slice “D.” Slice “D” is 8 percent of the whole, so let’s write that down next to letter “D” in the right-hand column. This 8 percent represents nuclear energy, so we can write nuclear next to 8 percent.

Now, we just have letter “A” and we can guess what energy source slice “A” represents from our list on the left-hand side. Who can tell us what slice “A” represents? Right, this slice is **renewable energy**. We can also determine what percent of the whole slice “A” represents. Let’s write some things down in the lower left-hand corner of the paper.

Using addition and subtraction, mentors should help the students determine what percent of the whole is left to represent slice “A.” Record student responses on PALS.7.TM.A to guide students through the addition and subtraction process.



What percent of the whole does coal represent? Right, it’s 40 percent. So let’s write down a 40 in the lower left corner. What percent does natural gas represent? That’s right, 23 percent. So let’s add 23 to 40, and what do we get? If you said 63 percent, you are correct. What percent represents coal? That would be 22 percent. So let’s add 22 to 63, and what is that sum? Yes, 85 percent is right. We just found out that nuclear energy represents what percent of the whole? Exactly, it represents 8 percent. So we can add eight to 85. This equals 93 percent. Now let’s think about what we have left over. A whole pie will be what percent? That’s right, 100 percent. We only have 93 percent, so we need to determine the difference. If we take 100 and subtract 93, we will get seven. This seven percent represents what is left over,

or the amount of **renewable energy**. So now, next to letter “A” we can write 7 percent and we know this represents **renewable energy**.



We found out that oil, coal, natural gas and nuclear energy make up 93 percent of all the energy that we use in the United States. These energy sources cannot be reused, which means they are nonrenewable. On the other hand, the littlest pie slice that represents **renewable energy** only represents 7 percent. **Renewable energy** sources can be reused and will never run out. In order to help keep our communities and the world clean and make sure there will always be energy sources available (so we can have lights and heat and be able to drive automobiles), we need to try to use more **renewable energy** sources.



REVIEW / SUMMARY

Instruct students to locate PALS.7.AS.A and PALS.7.AS.B to have in front of them for the review activity. Review Objectives one and two by asking questions from the two activities.



Let’s find the map of the house and the sheet that has the pie slices on it. When we made the maps of our homes earlier, we were thinking of ways to use less energy in our homes. Let’s think about the ways to reduce energy we talked about. Raise your hand if you can share with the class one of the things we discussed that you can do to use less energy in your home.

Call on four to five students to review the ways to reduce energy.



Great job! Now, let’s look at the pie slices. Who can tell us which energy source is used most by people in the United States? *Call on a student.*

Yes, oil is used most to make energy.

Raise your hand if you can tell us what percent of the whole is **renewable energy**?

Call on a student.



You got it, 7 percent is right. We want to make this 7 percent bigger. If we could cut this pie again, we would want to make the slice for **renewable energy** bigger, because **renewable energy** sources can be used over and over and they will not run out. Once we use up the other slices, we will never get them back!

APPLICATION



Small Group Suggestion: *Mentors can break students up into small groups of three to five and conduct an activity similar to the activity in Objective 1. Small groups will identify places in the classroom and/or school where energy saving can take place. Mentors can work with group members to make a map of the classroom/school and provide suggestions such as using compact fluorescent bulbs, and planting trees outside, etc. These and other such suggestion could be presented to the teacher and/or building administrator.*



One-on-One Session: *Mentors can work one-on-one with students to reinforce math skills taught in the lesson. In addition to reviewing the concept of percentages, mentors can help students determine how many units of each energy source is used by multiplying the percentage of each by the total number of energy units used (refer to content in Objective 2).*

Or, mentors can work one-on-one with students to make a plan to reduce their individual energy use around the house.

EVALUATION

*The purpose of the evaluation is to help students recognize that we want to use more **renewable energy**. Each student will need a copy of PALS.7.AS.C and a writing utensil. Mentors will be asking students to re-cut the pie in order to make the slice for **renewable energy** larger. Each pie slice should also be assigned a percentage and the five slices should add up to 100 percent.*



If we could make our pie slices different sizes, which slice would we make larger? Call on a student.

Right, we would want the slice for **renewable energy** to be larger. Our task is to do that. We have five energy sources. Who can tell us what they are? *Call on students, and then record responses on writing surface.*

Great! Remember they are oil, coal, natural gas, nuclear and renewable. You are each going to make your own pie that has five slices, one for each of the energy sources. Each slice is going to have a percentage, just like our other pie did, and they should add up to 100 percent. Find a writing utensil while the mentors pass out our pies.

Have mentors pass out copies of PALS.7.AS.C. Mentors should then be available to circulate through room and assist students as they complete this activity.



OK, who can tell us how many slices this pie will have? That's right, five. And the percentages must add up to what total? You got it, 100 percent. Which slice do we want to have the greatest percent? **Renewable energy!** So, on the left-hand side of the pie, under each energy source, determine what percent you want each energy source to have. Be sure to write that percentage down next to the appropriate energy source.

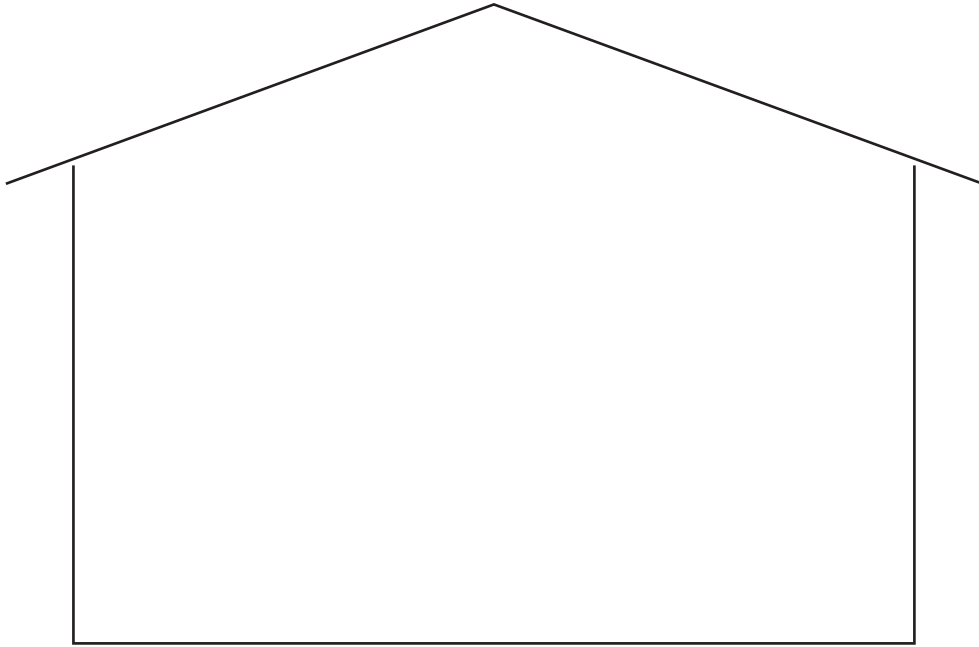
Allow students time to determine percentages. Mentors should help make sure percentages add up to 100 percent.



Now that we have determined the percentages, let's draw our pie slices. Trace them first, and then make them any color (using a different color for each slice) with the markers. If you have questions, be sure to ask the mentors for help.

The biggest slice in each of our pies should be for **renewable energy**, since we want to use more and more **renewable energy** because it can be used over and over. This will help make sure that we have enough sources of energy for years to come.

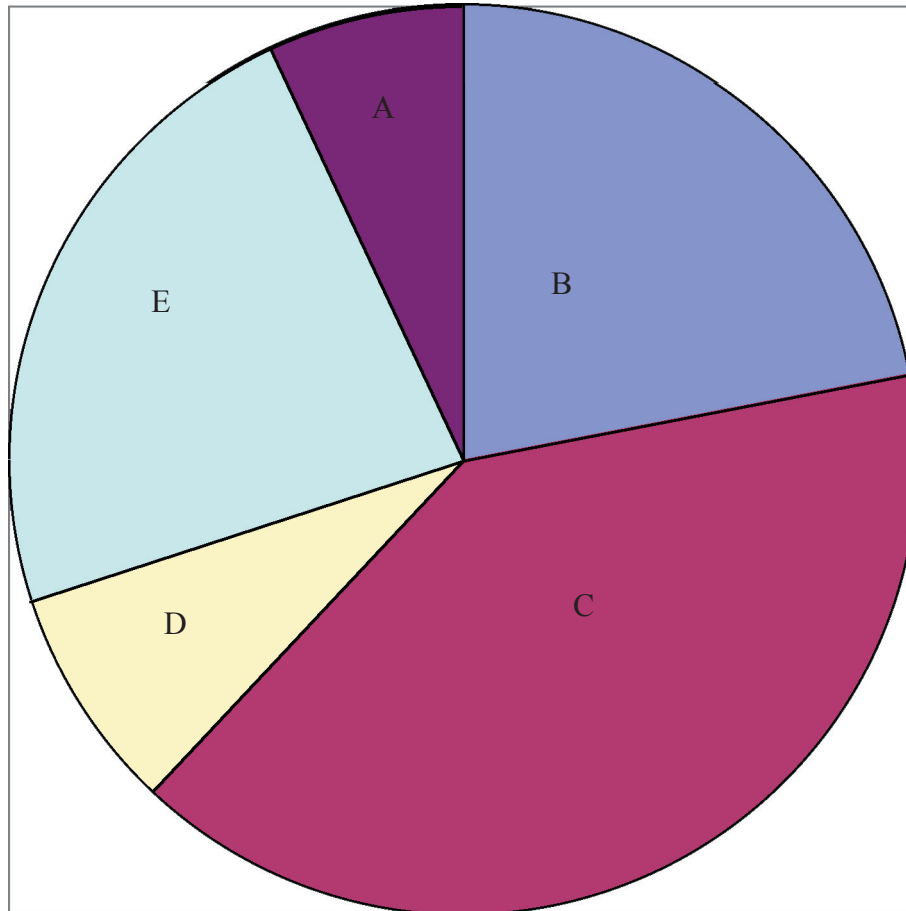
PALS.7.AS.A



PALS.7.AS.B – PALS.7.TM.A

Energy Usage in the United States

List of energy sources:



A.

B.

C.

D.

E.

PALS.7.AS.C

Coal

Natural gas

Nuclear

Oil

Renewable (most)

