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The Energy Challenge - Teacher/Leader Guide : Extension Circular 13-22-80

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TEACHER/LEADER GUIDE

the energy challenge

Extension work in "Agriculture, Home Economics and subjects relating thereto," The Cooperative Extension Service, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln, Cooperating with the Counties and the U.S. Department of Agriculture
Leo E. Lucas, Director

A MULTI-FACETED EDUCATIONAL 4-H TV ENERGY SERIES

"The Energy Challenge," a 4-H TV Energy Series, was developed under contract with the Iowa Energy Policy Council; Missouri Department of Natural Resources, Division of Energy; Nebraska Energy Office; and the U.S. Department of Energy, Region VII; with federal funds disbursed under Public Laws 94-163 and 94-385.

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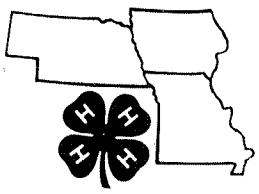
The four television programs of the series were produced by University of Nebraska–Lincoln Television, Joan LeBaron, producer.

Printed materials were written under contract by Marge Hill Nickisch. Cover design and illustrations were done by Jack Brodie, University of Nebraska–Lincoln artist.

TABLE OF CONTENTS



The following overall statements were utilized as a guide in the development of the 4-H TV Energy Series package:

- to help participants acquire and apply energy knowledge toward becoming effective energy consumers.
- to help participants accept themselves and others through learning about similarities and differences influencing energy utilization by interaction with others.
- to help participants gain personal satisfaction through developing and practicing an energy conservation ethic.
- to build on the natural curiosity in the participant about energy and what makes it important to people.
- to use energy information and activities as the avenue for youngsters to develop a better feeling about themselves and their relationship to others in acquiring life skills.

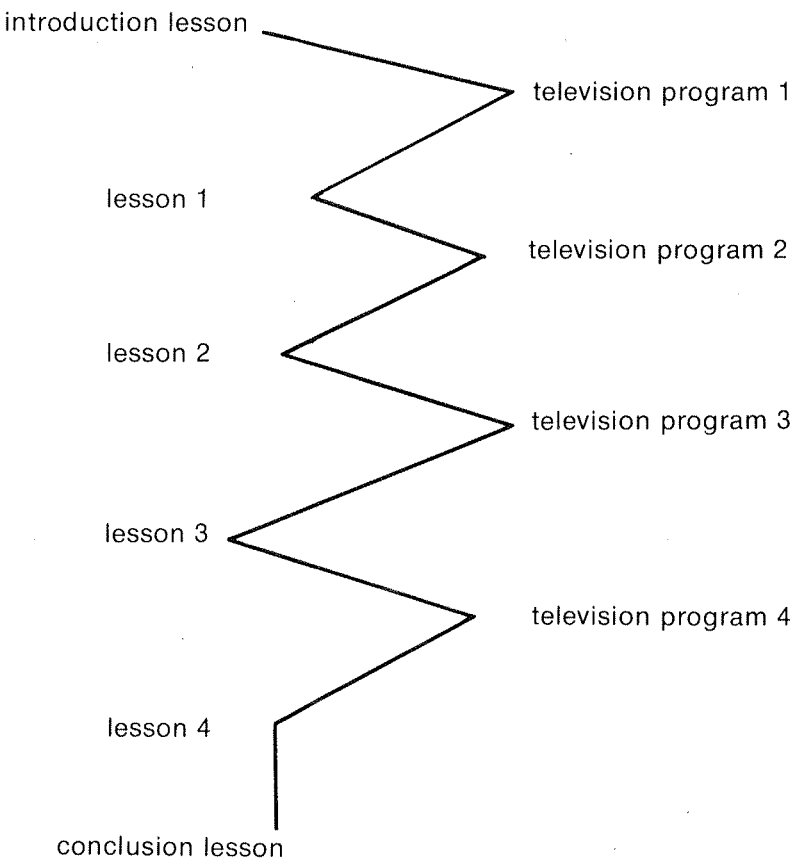
Introduction to Teacher/Leader

Dear Teacher/Leader,

Introduce yourself to "The Energy Challenge", an energy-awareness package designed with hopes of fostering a commitment to energy conservation among junior high age youth. Your young people need you to help guide them toward that commitment.

"The Energy Challenge" is a package. It consists of a student/member book, this teacher/leader guide, and 4 half-hour television programs. For information on the scheduling of the television programs, contact your local County Extension center, area Extension specialist or state energy offices.

"The Energy Challenge" is intended to flow in this manner:



The introduction lesson sets the stage for a study of energy. It is intended to help the students "think energy" before watching the television programs. Lessons 1, 2, 3 and 4 track closely with the contents of the television programs, elaborating on basic information and statistics to complement each program. With the conclusion lesson, the students/members will be able to make their own decisions about energy, and make their own commitment to energy conservation.

For your reference, a review of America's energy story is included in this guide. A brief synopsis of the television programs is included, as is a list of suggested readings for additional information. A glossary of common energy-related terms is found in the student/member book. *(Continued on next page)*

Activity sheets are at the back of both the teacher/leader guide and the student/member book. It is recommended that the teacher/leader duplicate the activity sheets when possible. By doing so, the student/member books will remain unmarked, and therefore be recyclable to other students. If duplicating facilities are not accessible, however, the activity sheets can be used from the student/member book. Answers to each activity sheet are at the end of each lesson guide.

Each lesson guide is arranged in the following manner:

- Lesson Objectives—At the beginning of the lesson.
- Teaching Suggestions—A guide to executing the lesson.
- Try This!—Class and outside activities, repeated from student/member book but including suggestions for answers and accomplishing the activities.
- I Wonder Why?—Discussion questions repeated from student/member book, but with suggested possible answers.
- You Might Also . . .—Additional activity or project ideas.
- Assignment—For next class/club meeting.
- Prepare for TV—A reminder regarding guidelines and specifics of the next television program.

You may find that your students/members possess quite varied states of knowledge about energy. That, of course, depends on their previous exposure to energy discussions. Activity sheet 1 will help you to take a survey of your students to determine their level of energy information. A discussion about energy will help too. This guide contains background information about energy which you can use to bring your students to similar knowledge levels if necessary.

"The Energy Challenge" is designed for use both by junior high age students in the classroom and members of 4-H or other clubs. Therefore some of the activities and discussions are more suited to club members, some to classroom students. Some activities and questions are more suitable for the urban dweller, others for the rural youth. As a teacher/leader you will find it necessary to select the activities and questions most suitable to your young people, the setting, circumstances, and the time available.

If you are meeting in a school situation, the lessons can be used over several days; if you are meeting in a club situation, each lesson can be covered in one meeting. It will be necessary for you to read through the lessons and organize them accordingly.

All references to junior high students or to club or group members in this Teacher's Guide will be as "students." Even though club members are not really in their student roles, the term seems the simplest for use in the text.

Some films and resource data are listed for you. For additional information about films which would enhance learning experiences, you may want to contact your nearest public utility office, County Extension office, state energy office, or public and university libraries. Audio-visual services are also good sources for films. Speakers, presentations and brochures are available from some of these same institutions and organizations.

It is hoped that this presentation of energy information in an informative, matter-of-fact manner will help you and your students discover "The Energy Challenge."

Energy Information

Energy use is an important part of every segment of the United States economy. The American energy-intensive society not only consumes more total energy than any other country in the world, but also uses more energy per capita than any other nation in the world. We have used energy to free us from much hard work and drudgery, but over the years we have allowed our energy wants to exceed our energy needs.

The sun, as the primary source of all energy, provides us with heat and light. It gives the plants the ability to use air, water and soil to make food.

Experts tend to classify energy sources into two types: non-renewable and renewable. Non-renewable are those sources of energy which, once used, are gone forever. There is a finite amount of these energy sources remaining. The most common non-renewable sources of energy are the "fossil fuels"—coal, natural gas and oil—which were formed millions of years ago by fossils and vegetation under great pressure in the earth.

Coal is the fossil fuel which exists in the greatest abundance. Scientists disagree as to exactly how much, but at present consumption levels there's probably enough coal for another 200 or 300 years, perhaps more. Coal is, however, a relatively dirty fuel, for when it burns, many chemicals are released into the atmosphere as smoke. Coal is mined by one of two methods: strip or surface mining and deep or underground mining. Our oldest major deep mining area stretches along the Appalachian Mountains. Surface mining, used when the coal lies close to the surface of the earth, is done by huge shovels that strip away the earth on top of the coal, and then scoop the coal from the earth. The land is "stripped" away. There are great reserves of coal in the western states. But these reserves have been developed slowly because of lack of industry and water in the areas near the coal. Potential change to the environment is one of the biggest disadvantages of using coal. Coal is costly to transport, and the cost of land reclamation is expensive. Scientists are studying ways to turn coal into gas (coal gasification), but this is as yet in the experimental stages.

Natural gas is the cleanest burning of the fossil fuels, but there is little which is easily accessible. At present consumption levels it will run out in the next century.

Oil is the most commonly used of the fossil fuels, providing such products as fuel oil for heating homes and gasoline for transportation. By-products of petroleum are used in hundreds of products such as asphalt for highways, plastics for packaging, toys and furniture, phonograph records, fabrics (nylon, polyester, acrylic), medicines, fertilizers and other chemicals. The United States currently imports almost half of its crude oil supply from other countries.

Another product formed by fossils and vegetation years ago is oil shale. Oil shale is a very fine sedimentary rock which contains organic matter (hydrocarbons). The shale must be heated in order to melt the oil within the rock. Both our government and private industry are developing ways to extract the oil from the rock economically.

Though not a fossil fuel, uranium is a chemical element mined for use in nuclear reactors. It is a controversial source of energy. Proponents point out that the potential energy of a given quantity of uranium is several million times greater than the energy available from an equal quantity of any one of the three fossil fuels. Opponents of nuclear energy argue that the radioactive wastes and safety concerns from nuclear energy do not warrant its use. Today about a tenth of our nation's electricity is provided by nuclear energy.

The non-renewable sources of energy supply us with 92 percent of our energy. It is no wonder that our country is placing emphasis on "alternative" sources of energy, such as the renewable sources. The sun, wind, water and biomass are the most common renewable energy sources. Fifty years ago, the United States got a third of its electricity from hydro-electric dams. Many hydro-electric generating stations were closed down during the period of cheap oil.

Geothermal energy exists in volcanoes, geysers and hot springs. This energy can sometimes be reached by sinking wells into the reservoirs of hot

water and steam that are located between layers of rock close to the earth's molten lava. Steam, coming to the surface, turns turbines that generate electricity. Iceland gets much of its energy from this energy source.

Wind is getting increased attention as an energy source. From 1880 to 1930, over 6 million windmills pumped water, sawed wood and generated electric power in the West. Wind is strong and constant enough on the Western Plains and in the Northeast to be a potential energy source.

Anyone who has watched the violence of the sea in a storm knows the power of the ocean. Our country's experts are examining the energy that can be harnessed from tides, waves, heat and currents.

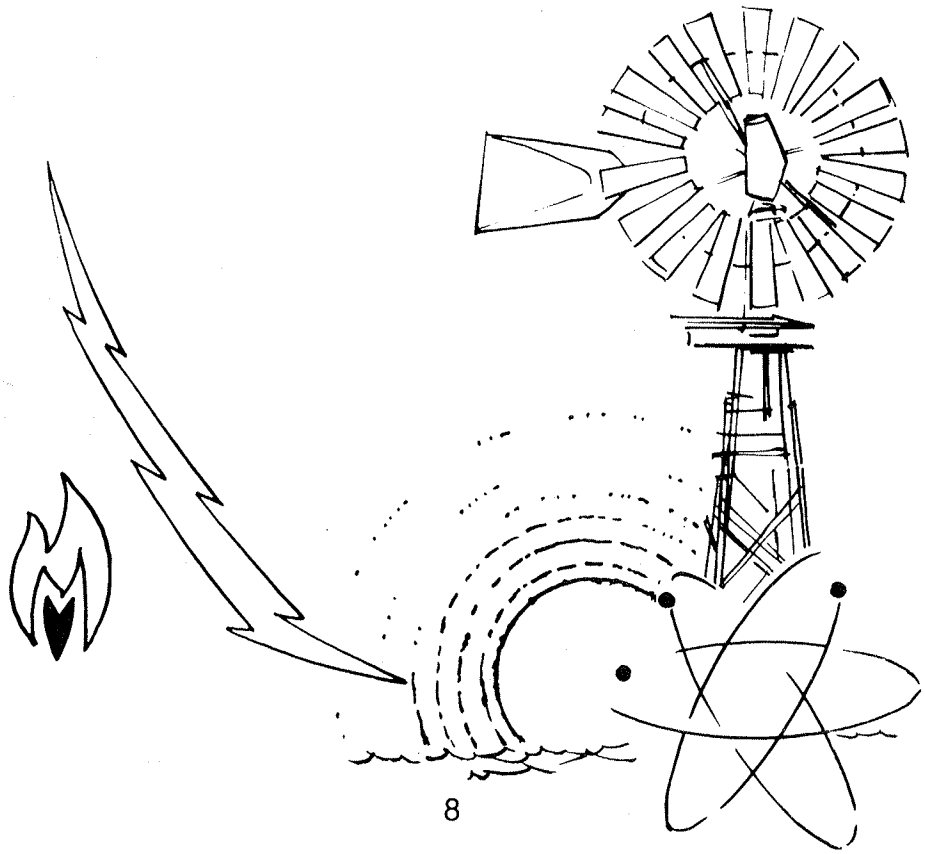
The sun currently provides only 1 percent of our nation's energy, but has a great deal of potential. The sun's output of energy is tremendous. But today's solar technology still has to be greatly refined before it can be a major supplier of energy.

Biomass conversion is also getting attention. Wood is the most popular biomass fuel, especially in New England and other heavily forested areas. Other examples of biomass are urban garbage, sugar cane, walnut shells and plants. Many cities have constructed plants to burn garbage to produce electricity.

Much attention has been focused on the "energy crisis". This crisis is often spoken of in connection with the oil exporting countries. When the Arab-Israeli war broke out in October, 1973, oil became a weapon. When the Arab countries learned that the United States was about to ship arms to Israel, they placed an embargo on oil shipped to the United States. The effect was dramatic. Prices of oil increased. Shortages of fuel oil and gasoline affected the economy and had Americans waiting at the gas pumps. It is important to remember that the Arabs did not cause the energy crisis. They merely brought to our attention the fact that we do have a shortage of petroleum supplies, and that we are relying on foreign countries for half of our petroleum.

The gravity of the situation came to light again in 1979 during the revolution in Iran, once a significant supplier of oil to the United States. This unrest in oil exporting countries has caused Americans to become increasingly concerned. We have not changed our energy-using habits much. Even after the embargo of 1973-74, when the crisis brought our dependence on others into focus, we failed to curtail our energy usage, and in fact increased our imports! As we have found ways to make life easier and more enjoyable for ourselves, we have also found new countries from which to import oil to meet our demands.

The United States has an energy problem. Our most commonly-used energy sources are the nonrenewable sources which are finite in supply. Most renewable sources aren't used abundantly yet. Scientists are working to assure a plentiful supply of energy for future generations. The next 20 years will see some dramatic, exciting changes in our energy-using habits. It certainly is our "energy challenge".



"The Energy Challenge" TV Programs

"The Energy Challenge" package includes four television shows, each 28½ minutes in length, produced by the University of Nebraska–Lincoln Television. Filmed in color and on location at sites in Missouri, Iowa, Nebraska and Colorado, the programs are designed to tell their own story, in addition to complementing the written material.

A synopsis of the TV films:

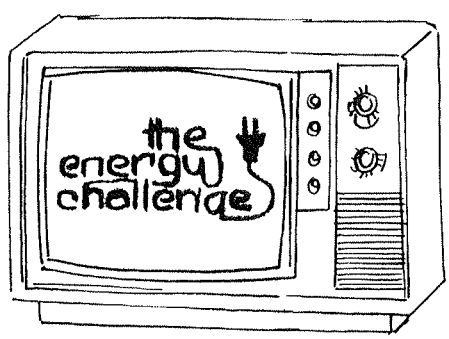
PROGRAM 1: The historical aspects of energy use help us understand our energy past and how we have come to use such enormous amounts of energy. This film includes scenes from the Living History Farms in Iowa, and shows how our energy use has expanded to the petro-products found everywhere today. The film also includes a discussion with an expert who tells us how we have gotten ourselves into a crisis situation—that the shortages of fossil fuels were not caused, but rather brought to our attention, by embargoes. The program highlights several energy systems which could help us reduce our dependence on foreign oil. Program 1 is informative, dramatic and questioning—and opens the door to a new experience.

PROGRAM 2: This program explores the uses of energy in our society. Nearly half of the energy in our nation is consumed in personal transportation and in homes. How are American families responding to the energy shortage? Sit down in the living rooms with city and farm families and listen to them tell how they feel about the changes they've made in order to cope with dwindling supplies of fuel. How do they feel about the changes in their life-styles? Are these changes a challenge or an irritant? How can houses be made more energy efficient? Experts tell us some ways. With this program the student can look beyond himself—to his home, his way of getting around, people around the world, and see how others are managing their energy supplies.

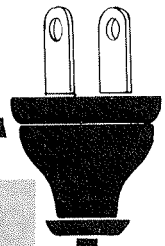
PROGRAM 3: The student learns that right here, in his own community, things are happening. This program takes an in-depth look at the consumers in the community—industry, for instance. Industry, including agriculture, is the largest consumer of energy in our society, for it consumes power in manufacturing goods to meet our needs and desires. Take a look at the energy chain in a large corporation; see how businesses have met the energy challenge through innovations in their operations. Schools are also energy consumers. See how schools can and do make progress in the field of energy management.

PROGRAM 4: What does the future hold? It is hard to predict what life will be like for any of us 10 or 20 years from now, but our life-styles will certainly have changed. Program 4 focuses our attention on the future—the subtle and drastic changes in our energy-using habits that are bound to take place. Take, for instance, transportation. With rising costs of automobiles and steadily increasing costs of gasoline, even many of the well-intentioned will have to forego the automobile in favor of buses, bicycles and feet. Phonovision may enter the scene in homes. Cassettes may give way to discs. Even dating habits may change. This program raises a lot of questions—and hopes to foster some serious thinking in the minds of the young people who watch.

The programs deal with many aspects—me, the world about me, my community, and how it all affects me.



GUIDE TO THE INTRODUCTION LESSON



LESSON OBJECTIVES

With your help in this lesson the participant will be better able to understand and describe at least five positive and negative aspects of the role of energy in our society.

TEACHING SUGGESTIONS

• Establish an energy knowledge level. Begin this lesson with the Energy Awareness Survey from the Appendix. Give the students 5-10 minutes to complete the matching questions. Correct the papers as a group. If the students average 12-15 correct answers, you're ready to sail into the lesson; 9-12 correct answers, you'd better discuss energy first. If the students average less than 9 correct answers, it would be wise to pause, read and discuss the background information on energy (teacher/leader guide) and the words in the glossary (student/member book) before going on.

• Once you have established a knowledge level for this class/club, and have discussed energy a bit, you're ready to move on. Assign the students the text of the Introduction Lesson. In this lesson the students will learn that there are many aspects to energy which affect us—economic, social, political and historical. Encourage the students to discuss the lesson with their parents around the dinner table, and to look at the discussion questions (I Wonder Why?) at the end of the reading assignment.

• After the students have read the text of the lesson, you're ready to pursue the questions and activities in the student book.

TRY THIS! (suggested activities)

1. List all the kinds of energy used in your community. What is the fuel source of each of these kinds of energy?

Check with the local utility company to see how its electric power is generated: coal, fuel oil, nuclear, etc. Learn how homes are heated: electricity, natural gas, propane, fuel oil, etc. Does your community have any energy supplied by solar heat, biomass conversion, wind?

2. Now take a mental trip through your home, and make a list of the energy-using things in and around your home. Be sure to peek through the cupboards and closets for things like electric popcorn poppers and electric toothbrushes. Include the lights and automatic heat. How about checking in the garage or backyard storage for things like snowblowers and lawnmowers?

This list will likely be very long if the student does it correctly. Encourage the students to go from room to room in the house and garage, searching out every energy-using product, including gas grills and power hedge trimmers! See how many different energy-using products your group comes up with!

3. Now look at list number 2 again. Make a check behind all those energy-users that your parents had around when they were your age.

Discuss with your young people the life of their parents—encourage them to ask their parents if they felt "deprived".

4. Make another check beside all the things which your grandparents probably had when they were growing up. How many checks are there? Which could *you* get along without?

If the grandparents aren't available for questioning, encourage the student to ask an elderly couple in the community to help answer these questions.

5. If you live on a farm or small acreage, list the energy-using machines outside the home. You may want to have a parent help you list these.

If the students all live in the city, this question may be eliminated. Or you may discuss in class some of the products you think might be listed here.

6. Save your lists - you'll use them again.

Encourage the students to keep their lists for use in the conclusion lesson. Which of the items on the list use the most energy? Our biggest energy users in the home are the air conditioner, furnace, water heater and refrigerator.

I WONDER WHY?

(discussion questions)

1. If our country has so much coal, why do you suppose it is not using more? Do you know of any factories or industries in your locality which use coal for power?

Coal is abundant in supply, and our country may find it necessary to "trade off" some of its disadvantages for its abundance. Coal is difficult to mine, costly to transport, and gives off pollution into the air. Strip-mined land is expensive to reclaim. Check with local factories or plants to see if any use coal for power.

2. What advantages are there in getting electricity from hydro-electric dams? What are some disadvantages?

Many dams for hydro-electric power already exist; some inactive dams could be brought back into energy production. Dams rely on water, which is a renewable energy source. Hydro-electric dams do not contribute to air pollution. However, hydro-power has some disadvantages. Some river flows are too weak to be usable. And some people object because they fear dams require large reservoirs that destroy land for agricultural and recreational purposes.

3. Why is the need for electricity increasing each year?

The need for electricity increases each year because population increases, and more electricity is needed in all aspects of society to provide for added population. In addition, we are constantly finding new things to make life more enjoyable—energy is needed to produce and often to use them.

4. We mentioned a few ways crude oil (petroleum) is used. Can you name others? Products made from the by-products of petroleum are petro-products. Take a look around the room and name all the things that might be considered petro-products. What hobbies, sports or recreational activities do you have where a petro-product is involved?

The following is a list of some petro-products:

tennis shoes	luggage	shirts
raincoats	windbreakers	draperies
epoxy paints	motorcycle helmets	dice
dish drainers	garden hoses	wigs
deodorant	eyeglasses	drinking straws
shoe trees	guitar strings	skis
transparent tape	rollerskate wheels	snorkels
steering wheels	skateboards	traffic cones
lighter fluid	drinking cups	water skis
credit cards	dresses	bike parts
welcome mats	ice cube trays	fake furs

5. Why do such energy sources as tidal power and geothermal energy have limited uses? How might we develop more geothermal energy?

Experts explain that suitable locations for tidal power—limited to coastal areas—are often not where the demand is. And environmentalists are concerned about the effects of moving massive amounts of water in and out of coastal areas. Although heat is found in the earth's crust, only limited locations are practical for tapping geothermal energy. Most of the development and exploration of geothermal energy in the United States is concentrated in the West. There, steam from the earth is used to turn turbines which generate electricity. Technologists are looking for ways to control the corrosion to equipment caused by minerals in the hot water, and the escaping hydrogen sulfide, which smells like rotten eggs. Experts say, however, that even though an energy source may offer only a very small output in terms of total energy production, every energy source is important to our country's future.

6. What exactly do we mean by alternative energy sources?

"Alternative" sources are those which provide another option for energy besides the ones we rely on so heavily, mainly fossil fuels. Fossil fuels supply abut 92 percent of our country's energy. Other "options" to our energy supplies include wind, biomass, geothermal, tidal, solar, etc.

7. List some countries from which we import oil.

Our country, at this writing, imports oil from a number of countries including Saudi Arabia, Nigeria, Algeria, Libya, Indonesia, Venezuela, Canada, Mexico and others.

YOU MIGHT ALSO . . .

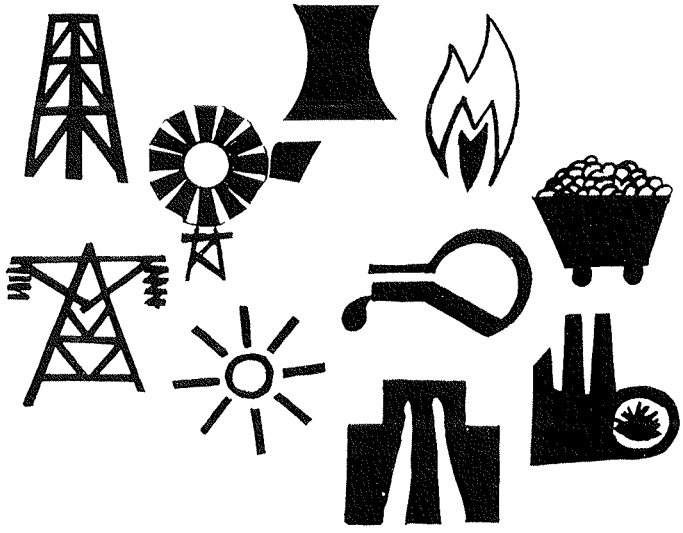
- Have the students bring newspaper clippings which concern energy. Post them on a bulletin board with the heading "Energy Makes News".
- Have the students conduct "Man on the Street" interviews with neighbors, other students or teachers. Ask the question: "What is the energy problem?" Have them record the comments and discuss them in class/club.

ASSIGNMENT

- Assign the reading text of Lesson 1, including the activities and discussion questions plus the upcoming television show.

PREPARE FOR TV

- Help the students prepare for the first television program by making sure everyone understands the channel, date and time of the broadcast. This information will vary from locality to locality. Give the students a brief summary of what to expect in the program.



Answer Sheet

ACTIVITY SHEET #1

Energy Awareness Survey

Place the letter of the word in column B in the space in front of the appropriate definition in column A.

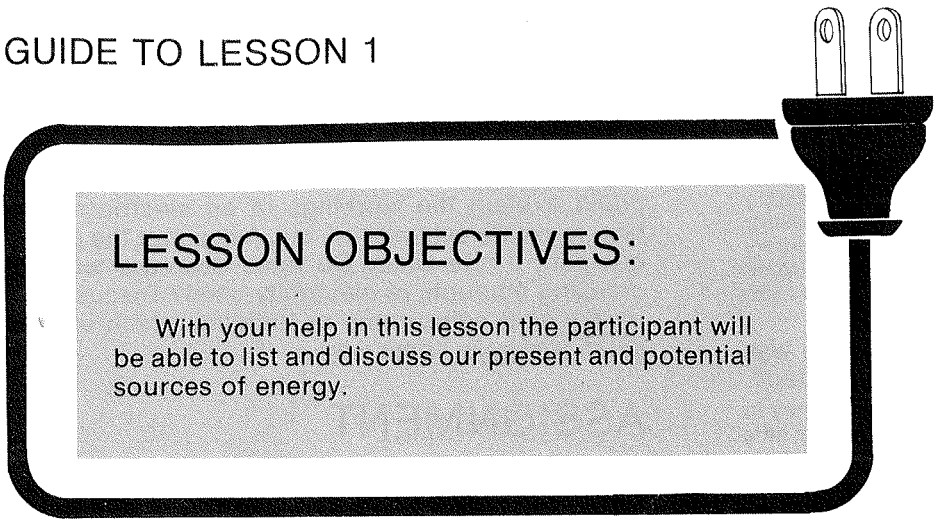
A.

J 1. porous rock that contains oil
E 2. measure of resistance to heat flow
I 3. chemicals removed from crude oil to make other products such as plastics
H 4. energy derived from the sun's radiation
N 5. term used to identify the origin of fuels formed within the earth millions of years ago
D 6. oil in its natural state before refining
K 7. unit of measure for transporting crude oil
O 8. process for converting coal to gas
M 9. the capacity to do work
A 10. abbreviation for measuring of heat energy; the amount of energy needed to raise the temperature of 1 pound of water by 1 degree Fahrenheit
C 11. a unit of measurement for natural gas
G 12. a term to describe energy sources which, once used, are gone forever
F 13. heat energy contained within the earth's crust
B 14. planned management of natural resources, including energy
L 15. energy released by reaction of the atoms through a fission or fusion process

B.

A. BTU
B. Conservation
C. Cubic Foot
D. Crude Oil
E. R-value
F. Geothermal energy
G. Non-renewable energy
H. Solar
I. Petro-Chemicals
J. Oil Shale
K. Barrel
L. Nuclear
M. Energy
N. Fossil
O. Coal Gasification

GUIDE TO LESSON 1



LESSON OBJECTIVES:

With your help in this lesson the participant will be able to list and discuss our present and potential sources of energy.

TEACHING SUGGESTIONS

• Discuss the television program. What were the major concepts? What did the student learn? Why is a study of energy important?

• Give the students Activity Sheet #2. (Appendix). The students will need 10 minutes to do the work. This fill-in-the-blank exercise has no set answers—answers will vary. The purpose of this exercise is to make the students aware of how much we rely on petro-products and throwaways in our society. After the students have filled in the blanks, discuss other situations where these same type products are involved. Which ones provide a necessary service? Which ones could be substituted? Should an "energy tax" be placed on "nice but not necessary" items? Ask the students what they think.

• Discuss Lesson 1 in class. Make sure the students understand how dependent we are on foreign countries for oil, and that development of many alternative sources of energy is still in the infant stage of development.

TRY THIS!

1. Write a 60-second radio commercial appealing to the public to conserve energy.

When the students write their commercials, have them judged by a panel of teachers, officials of a public power plant or energy products company. Send the best ones to a radio station and ask that the commericals be used as public service announcements.

2. Show how the price of a hamburger might be affected by an increase in the price of crude oil.

Energy is needed to: manufacture the equipment needed to plant, harvest and process crops for the cattle, transport the beef to market, slaughter the beef, transport the carcass to the supermarket, butcher the carcass into cuts of beef, grind the meat into hamburger, drive to and from the supermarket to purchase the meat, cool the meat in the refrigerator until meal preparation time, cook it . . . and there are many more other "hidden costs" which your group can name.

3. Consider what businesses might be affected by fluctuating supplies and higher prices of petroleum products.

Nearly all businesses are affected: motels, truck stops, restaurants, tourist attractions, airplanes, bus companies, trucking companies, gas stations, campgrounds, resorts, clothing manufacturers, to name a few. In a sense, any business is affected if its customers are affected in getting to the business.

I WONDER WHY?

1. How do you suppose a pilgrim mother was able to prepare such a sumptuous Thanksgiving dinner without an electric or gas range?

Perhaps you'd like to have the students write a story describing the pilgrim mother making this meal, for it is hard, in modern day society, to imagine how she did it!

2. What books (or TV shows) have you read or seen which tell of the hardships of early pioneers who didn't have the modern conveniences we enjoy today?

Discuss the story in books such as "The Long Winter" by Laura Ingalls Wilder; "Giants in the Earth" by Rolvaag; "O Pioneers" by Willa Cather; "Nothing To Make a Shadow" by Fay Cashatt Lewis; or "In No Time at All" by Carl Hamilton. You might even suggest that an English teacher consider assigning a book with a pioneer setting for students to read at the same time you are studying energy.

3. What are some of the alternative sources of energy that are in use in your community, either as an experiment or in full use?

Check with the local County Extension office, power company, or city council's "energy committee" to find out what alternative sources are in use.

4. We have mentioned the most common sources of energy for the future. Can you name others that have been tried or are being experimented with?

Some possibilities are fusion, tar sands, geothermal, tidal, grain alcohol, and different types of biomass such as cheese whey, cornstalks, peanut shells, corn cobs, cow manure and urban garbage.

5. Do you think the United States can become totally independent of other countries for energy sources? Explain your answer.

Probably not, at least for the next 20 years. The "new" sources of energy—wind, solar, grain alcohol, etc., now supply only about 1 percent of our energy. Almost half of our energy currently comes from crude oil. It takes time to develop, experiment with and produce workable alternatives in quantity to reduce the dependence. Meanwhile, our energy needs increase annually!

6. Why do you suppose the Great Plains was one of the last areas of our country to be settled?

Wood supplied 90 percent of the energy in this country in 1850—and the Great Plains were known as barren land with little or no wood to supply the necessary energy for heating or cooking.

YOU MIGHT ALSO . . .

- Assign the students reports on important people in energy's history, such as Galileo, Ben Franklin, Robert Bunsen, Thomas Edison, Albert Einstein, Ernest Rutherford, Ernest O. Lawrence, Gabriel Fahrenheit, Robert Fulton, James Watt. Ask the students to write a brief report telling what accomplishments these men made in energy's development.
- Invite an expert to speak to the class. This might be someone from the power company who could explain the workings of an electric meter, how rates are established, etc. Ask about the power company's rate scale. Do rates decrease with increasing amounts of electricity used? Discuss.
- Visit a solar home or building which utilizes solar energy in some way.

ASSIGNMENT

- Assign the text in Lesson 2, and the second television program. Ask students to discuss the questions and activities from the text at home with family members.

PREPARE FOR TV

Prepare the students for TV Program 2 by giving a summary of what to expect, what to look for, and making sure the students understand the time, date and channel.

Ben Franklin

Answer Sheet

ACTIVITY SHEET #2

Energy Story

Using the words provided finish this story by filling in the blanks with the name of a petro-chemical product or a throwaway product. You and your class/clubmates may use different answers. You may use the words more than once.

Bill and Jim, eighth graders at the Washington Junior High, decided to spend a Saturday of recreation together. Bill donned his **polyester** jogging shorts, **acrylic** shirt and grabbed his **vinyl** gym bag and bicycled to Jim's house.

He found Jim still eating his breakfast of orange juice, cereal, and eggs cooked in a **teflon**—coated fry pan.

Jim's mother was wrapping sandwiches in **plastic-wrap** and mixing fruit in covered **plastic** containers for their lunch. She wiped a spill with a **paper towel**. She packed their lunch, **plastic** spoons, and **aluminum** cans of soft drinks in a **styrofoam** cooler. Jim grabbed his badminton racquets and the two were off, through the **plexiglass** door, down the **asphalt** street, for a day at the park.

Meanwhile, Bill's brother Bob had started football practice for the state university. In the locker room he donned his football **jersey** over the **plastic** shoulder pads, put an **adhesive bandage** over a cut on his hand, and with his football **helmet** on his head headed for the **astro-turf** for an afternoon of practice. Bob's girlfriend carried a **stadium cushion** into the bleachers to watch.

Bill's older sister was getting ready for the movies. After a bath in the tub with lots of **bubble bath**, she put on her makeup—**mascara** and **lipstick**, put the **contact lenses** in her eyes, while listening to her favorite **cassette** in the tape recorder.

Bill and Jim batted the **plastic** birdies around for nearly an hour with their racquets. Then Jim suggested that they play with their **plastic** frisbees. They spread their lunch, turned on their portable **radio** and ate. After their lunch they neatly gathered their trash and put it in the **plastic** garbage can.

After a few more games of badminton and frisbee, the boys bicycled home.

Jim showered and washed his hair with **detergent** shampoo from a **plastic** disposable bottle, dryed it with a **plastic** blow dryer and combed it with his **plastic** comb. He put on his **wash 'n wear** trousers, **nylon** shirt, and plopped in the **naugahyde** recliner and ate a **TV dinner**.

GUIDE TO LESSON 2

LESSON OBJECTIVES

With your help in this lesson the participant will be able to identify how energy is utilized in homes and transportation, and also be able to discuss or demonstrate how this energy use can be reduced.

TEACHING SUGGESTIONS

• Discuss the television program. How did the students feel about the families' reactions to conserving energy and changing life-styles? Why do you suppose other countries have not become such enormous energy consumers, and yet enjoy comfortable life-styles? What can *you* do *today* to conserve energy?

• Discuss the reading assignment in class. Review the energy usage in the home (heating and cooling, up to 75 percent, hot water, up to 20 percent and all other energy users, 5 percent or more). Discuss the dependence of Americans on the automobile, and how that dependence can be decreased.

• Pass out Activity Sheet #3 (Appendix). Explain the directions. Give the students some time in class to get started. Encourage the students to have parents help in solving the energy puzzle. Answers may differ slightly.

TRY THIS!

1. At the dinner table tonight, discuss the tips from "I Wonder Why" (number 3 on page 17) and other tips with your family. Is your family aware of energy conservation?

How aware are those around you of energy conservation? Discuss the results of conversations with family members.

2. Make plans to put your home on an "Energy Diet". Decide what you will strive to do. Set the example for the family, and remind others to be careful of waste. Try to do things more energy efficiently without changing your standard of living a great deal. Ask your parents to help you check the electricity bills in a month. Take into consideration the weather conditions and other factors which might influence a utility bill. Check to see how much energy has been saved by means of energy dieting!

Ask students to work with their family on the "energy diet" at home. Ask for periodic reports from students on progress, reactions from family and changes in life-styles, if any. Ask students to make a report of their efforts.

3. Keep a log book of the family car(s). To do this you'll need the help of your family. Keep track of all the miles (km) put on the cars during a week's time. Your log might have these headings: date, purpose of trip, miles. When the week is over, study the number and distance of the trips, and the total miles. Try to develop a plan, with the help of your family, that will reduce the number of trips and the miles driven. Compare this with other students and their life-styles.

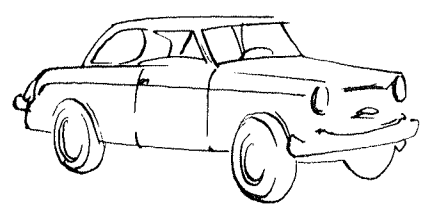
Check to make sure the student is keeping a log book of the miles on the family cars. After a week help him/her analyze the family's use of the car: wasted trips or the efficient use. Let the student decide how efficiently the cars have been operated.

4. Pretend that you are going to purchase a new family automobile. What type of auto would you buy? What questions would you ask of the salesman? On what basis would you choose options for the car?

Discuss the pros and cons of air conditioning, and power options and other accessories. Discuss size of the auto and size of the engine. The publication "Gas Mileage Guide" by the U.S. Dept. of Energy is available from your state energy council, office or department and will help answer some questions about auto efficiency.

5. Draw up a newspaper advertisement about the type of car you've selected.

Post the advertisements on the bulletin board. Discuss how advertising also influences our purchases.



I WONDER WHY?

1. Pretend you are manager of an apartment complex. How would you encourage tenants to conserve energy?

Encourage tenants to save energy by keeping the building in good repair—be sure that no leaks exist around improperly vented laundry facilities, that doors into the building are weatherstripped, that windows are caulked and that insulation, where cost effective, has been installed. Encourage tenants to help in the weatherization process. Provide caulking and weatherstripping materials. Will it foster energy conservation if the tenants are required to pay their own heat and electricity?

2. Look around you right now. Do you see any wasted energy? If so, can you change the situation?

Are there unused lights? Windows open with heat on? Dripping faucets?

3. Discuss some energy saving tips around school and at home that you can start today.

Refer to the pamphlet "Tips for Energy Savers", (Dept. of Energy publication available from your state energy office) to help with ideas.

4. What is meant by the phrase "collective impact"?

"Collective impact" could be described as gathering together many small portions of something, so that when gathered, a larger portion results. A *large* portion of energy saved would make an impact on our overall energy usage.

5. Why do you think hot water takes such a big bite out of our energy budget? Do you think you could get along with less hot water?

As Americans we feel hot water at our fingertips is a necessity. Except for the food service facilities in a school, and hot water if steam heat is utilized, is hot water really necessary in a school? in a store? in a bank? There's a difference between "nice to have" and "need". Discuss the difference in hot water usage with baths versus showers.

6. What kinds of energy legislation have our governments passed to encourage energy conservation through transportation?

Speed limits nationally are 55 mph. Fuel economy standards for car manufacturers have been changed.

7. What kinds of energy legislation *could* our governments pass that could save energy?

The government could: subsidize more mass transit; pass stiffer fuel efficiency standards; require service stations to have simple-to-use tire testing equipment for the self-serve patrons; etc.

8. How could family vacations be planned to use gasoline more efficiently?

Families could plan short trips which could be made on a tank of gas, plan vacations closer to home, plan vacations for alternating years, plan vacations to stay in one place rather than drive around, plan new activities such as hiking.

9. Stop and think for a minute how your family used gasoline yesterday. Were those trips in the car necessary? Could the same trips have been accomplished more energy efficiently?

Discuss the use of the auto in the average family—and discuss what is "necessary" and "convenient" about the family car. Must students drive a car to school?

YOU MIGHT ALSO . . .

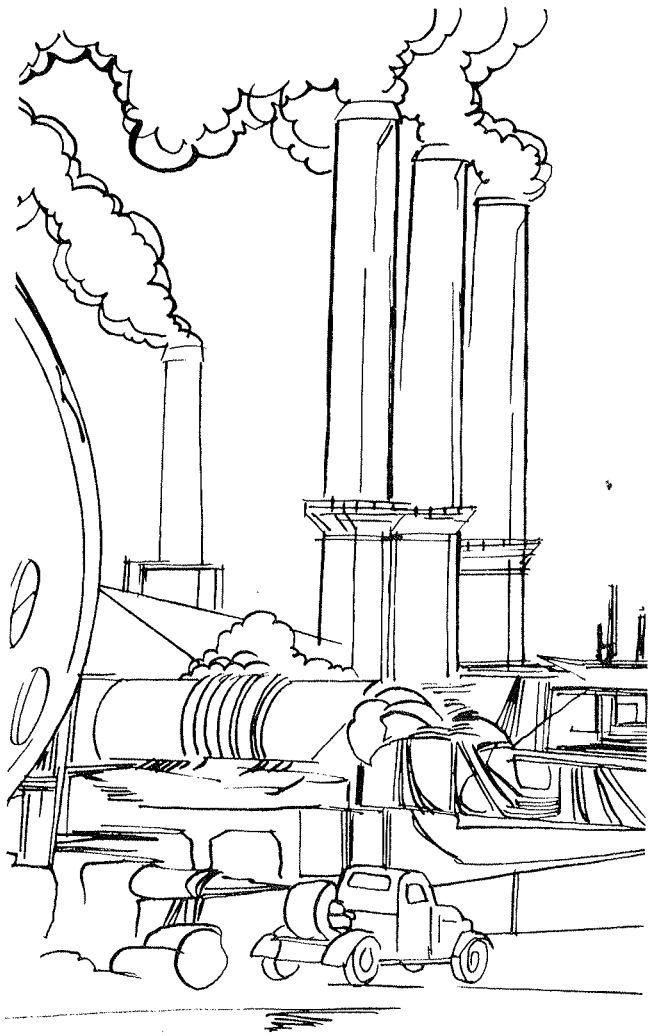
- Invite the school's driver's education teacher or an auto dealer to discuss energy saving tips for the auto.
- Discuss the advantages and disadvantages of raising the driving age by a year or two in your state.

ASSIGNMENT

Assign the text of Lesson 3, including discussion questions and activities, and the third television program.

PREPARE FOR TV

Prepare the students for the third television program by giving a summary of the program, telling what to look for, and reminding students of the exact date, time and channel.



Answer Sheet
ACTIVITY SHEET #3

Energy Puzzle

Read the energy puzzle given below. Read *all* directions first before beginning. Then fill in the puzzle with the information given. Ask your family to help. You may have different answers than your class/clubmates and still be correct.

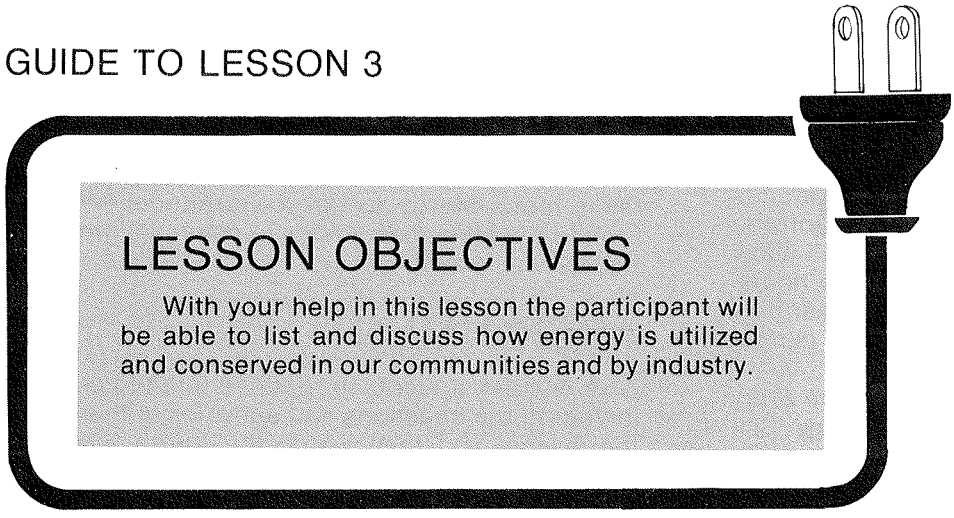
There are 5 houses, each of a different kind of construction, inhabited by men of different occupations who have different pets, appliances, and use different forms of energy. Read the directions and fill in the blanks.

a. The recycling center operator lives in a glass and steel house.
b. The meter reader owns a cat.
c. Coal provides energy in the stucco house.
d. The insulation installer uses natural gas for heat.
e. The brick house is immediately to the left of the stucco house.
f. The man with the microwave oven keeps tropical fish.
g. The man in the cement block house brushes with an electric toothbrush.
h. Electricity provides energy in the middle house.
i. The man with the trash compactor lives in the house next to the man with the dog.
j. The man with the electric toothbrush lives in the house next to the house with the parakeet.
k. The home heated with wood has an electric dishwasher.
l. The oil distributor has a power lawn mower.
m. The gas station owner lives in the wood frame house.

Who uses solar energy? Who raises hamsters?

HOUSE	BRICK	STUCCO	WOOD OR GLASS + STEEL	CEMENT BLOCK	GLASS + STEEL OR WOOD
PETS	CAT	HAMSTERS	PARAKEET OR FISH	DOG	FISH OR PARAKEET
JOB	METER READER	OIL DISTRIBUTOR	GAS STATION OWNER OR RECYCLING CENTER OPERATOR	INSULATION INSTALLER	RECYCLING CENTER OPERATOR OR GAS STATION OWNER
HEAT	WOOD	COAL	ELECTRICITY	NATURAL GAS	SOLAR
APPLIANCE	ELECTRIC DISHWASHER	POWER LAWNMOWER	TRASH COMPACTOR OR MICROWAVE OVEN	ELECTRIC TOOTH BRUSH	MICROWAVE OVEN OR TRASH COMPACTOR

GUIDE TO LESSON 3



LESSON OBJECTIVES

With your help in this lesson the participant will be able to list and discuss how energy is utilized and conserved in our communities and by industry.

TEACHING SUGGESTIONS

- Discuss the television show. What was learned about industry's efforts to stem energy usage? Why does agriculture lend itself well to energy management experimentation (agriculture is so diversified)?
- What can cities do to aid conservation? What is your school doing to encourage conservation? What is happening in your community in energy management?
- Discuss the reading assignment in class. What could your school do to save energy? Are sports activities held at night or in the day-time? If winter heating is a big factor in your area, could your school institute longer winter vacations (and curtail spring or summer vacations) to cut down energy consumption? Is there unnecessary lighting in the halls? Are the halls heated?
- Give the students Activity Sheet #4 (Appendix). There are 20 energy-related words in the energy-gram.

TRY THIS!

1. Does your community have an "energy conservation coordination committee"? Find out from your mayor or city government what energy saving actions the city has made. What has the state done?

Call the city council or mayor's office to find out about an "energy conservation coordination committee". If there is one, call a committee member for a report. Invite a committee member to class/meeting to speak.

2. What energy saving programs are in effect for your school? Can you write a set of guidelines for students and faculty to follow in conserving energy?

Ask the superintendent, principal or member of the Board of Education to come and discuss energy management with you. Ask students to examine bus routes, car pools, bicycle rack availability, etc., in regard to transportation to school. How many teachers drive alone in cars to school? How many travel by bus? How many walk? How many car pool?

3. Notice that many advertisements mention the energy situation. Make a scrapbook from newspaper and magazine ads. Which ones urge conservation? Which say "there is plenty of energy"?

Discuss the advertisements and the saying that "advertising sells". Examine the advertisements for the motive of the sponsor.

I WONDER WHY?

1. What does "cost effectiveness" mean to the home owner, businessman or factory foreman in regard to energy conservation?

Cost effectiveness means to determine the overall cost of installing, operating and maintaining a new installation, and compare it with the cost that might be realized from not making the change. If it costs $800 to better insulate a house, but the savings would be only $25 a year, then the effort might not be considered "cost effective" before the end of the expected life of the insulation. However, if a $100 investment in weatherstripping and caulking could be recovered in three years then it would probably be "cost effective". But costs (and therefore savings) rise with inflation.

2. List some "energy saving" products we use which don't actually save energy, but rather time and effort. Which of these products is down-right wasteful?

Many appliances are for convenience rather than energy saving: hair blow dryer, electric can opener, electric pencil sharpener, curling iron, frost-free refrigerator, electric lawnmowers, etc. "People power" could replace these and more.

3. What industries near you have devised ways of cutting energy usage?

Check with industries in your community, and find out what they have done toward energy conservation.

4. What are the utility companies doing to help consumers reduce energy consumption?

Call the local electricity supplier and natural gas distributor for answers to the question. Many offer incentives for lower usage; others have informational campaigns.

YOU MIGHT ALSO . . .

- Have a "Dark Day" at school where use of fossil fuels is kept to a bare minimum. Light the classrooms by natural light; lower temperature settings to 55 degrees (13°C) (winter). Arrange for the school cafeteria to serve a cold lunch. Don't allow cars in the parking lot with less than three riders. Students should walk or bike to school. Wear only natural fiber clothing. Experience energy curtailment!
- Plan an "Energy Day" at school, where every class for one day concerns itself with energy. Science classes would devote efforts to energy; drafting classes could design energy efficient homes; home economics classes could prepare "solar cooking" demonstrations; language and English classes could research and give debates on aspects of energy; political science classes could debate legislation for energy conservation, and so on.
- Ask the students to write down what they had for breakfast this morning. Now ask them to figure out where the products they ate might have come from. For instance, cereal may have come from Michigan, bacon from Nebraska, eggs and milk locally, coffee from Brazil, oranges from Florida or California, etc. Or you might take a cafeteria meal for your example. Then discuss the energy used in preparing the products for shipment, the shipment and the preparation of those products for eating. It takes more energy to get the products from the farm to the table than it does to plant, till, grow and harvest the crops!

ASSIGNMENT

- Ask the students to read the text of Lesson 4, including the questions and activities at the end of the lesson, and then watch the fourth television program.

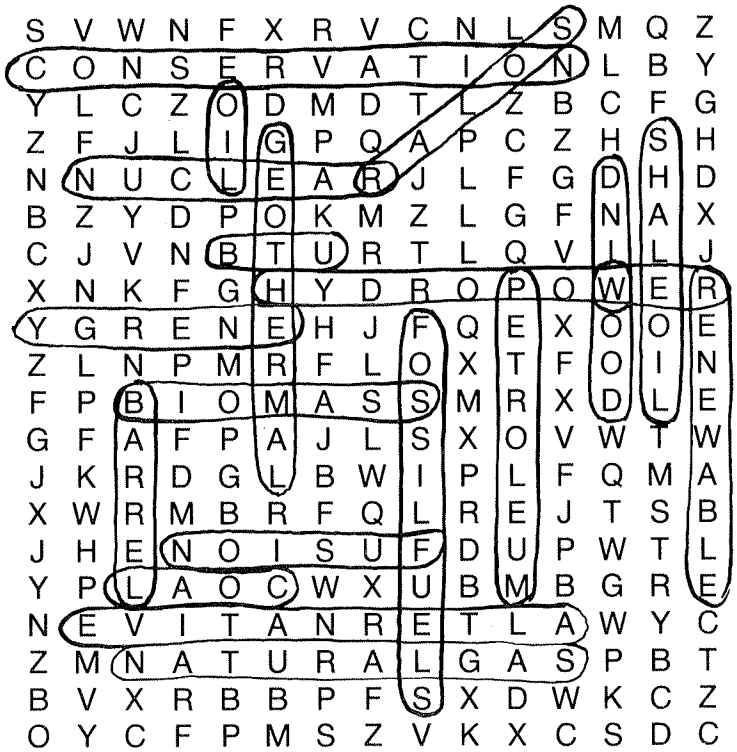
PREPARE FOR TV

Give the students a summary of program 4. Brainstorm for a few minutes on what the energy future might be. See if the students can make predictions as to what will happen in a few years, energy-wise. Be sure students know the channel, time and date of the next TV program.

Answer Sheet

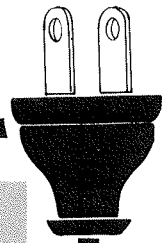
ACTIVITY SHEET #4 — Energy-Gram

INSTRUCTIONS: Find the energy-related words and abbreviations in the word-gram. There are 20 words. The words are listed below. You may find the words horizontally, vertically, diagonally, frontwards and backwards.



Alternative
Barrel
Biomass
BTU
Coal
Conservation
Energy
Fossil fuels
Fusion
Geothermal
Hydropower
Natural gas
Nuclear
Oil
Petroleum
Renewable
Shale oil
Solar
Wind
Wood

GUIDE TO LESSON 4



LESSON OBJECTIVES

With your help in this lesson, the participant will be able to identify and describe potential changes in his/her personal future life-style as impacted by the energy situation of today and tomorrow.

TEACHING SUGGESTIONS

- Discuss reactions to the TV show. How do the students react to the uncertainties, predictions? How do the students react to changing life-styles?
- Discuss the text of the reading assignment. What future changes do the students think might be for the best, in addition to energy conservation?
- Discuss careers. Have the students considered their own careers? How many are energy-related?
- Give the students Activity Sheet #5 (Appendix). Ask the students to use their imaginations and describe in a few paragraphs how the world might look after a long Rip Van Winkle rest.

TRY THIS!

1. Conduct a survey in your community. Are there wasted lights on streets, parking lots, billboards? Which could be eliminated?

Ask students to think about the things they have seen on the way to school or around home which are examples of wasted energy.

2. Take a look in a store. What do you see in elaborate packaging that is going to be disposed of as soon as the product is purchased and put into use? List some examples.

You might consider bringing some examples to school—batteries, razor blades, pens, hardware, hair curlers, cosmetics, and the like, which have been packaged elaborately.

3. Describe a situation when existing non-renewable sources of energy are depleted. Use your imagination and describe how you think your community will look and how people will go about their ways.

Discuss the 21st century in a brainstorming session in class/club. Isaac Asimov has written some interesting things in this regard.

4. Select one hobby or sport you enjoy. List the objects you use. How many are made of petroleum by-products? Could they be made of other materials?

Begin the discussion by asking students to name their hobby or favorite sport. Then discuss what the sports-related objects are made of.

I WONDER WHY?

1. What do we mean by "standard of living" and "life-styles?" Is there a difference? Discuss.

The dictionary defines "standard of living" as the level of subsistence, with reference to the adequacy of necessities and comforts in daily life. A life-style might be considered the manner in which something is accomplished. A person can give up certain aspects of his life-style without affecting his standard of living. For instance, changing from a large auto to a smaller fuel efficient auto might change the life-style—but not necessarily hamper the standard of living.

2. Discuss the occupations of working parents in your class. How many have energy-related jobs?

Ask the students to list occupations represented by parents. If possible, invite a parent who has an energy-related job to speak to the class.

3. Which is more important in the energy challenge—technology or people's attitudes? Discuss.

Let the students' imaginations run wild!

4. What might be your job when you're out of school? How would an energy shortage affect your job?

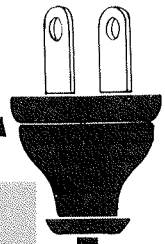
Consider some employment possibilities which might be affected by energy shortages, such as civil engineers or highway construction workers, geologists or electronic engineers. If gasoline shortages curtail car usage, will we have jobs for mechanics?

YOU MIGHT ALSO . . .

- Invite a career counselor to talk to the class/club about changing career patterns.
- Invite a psychologist to the class/club to talk about the challenge of changing attitudes.

ASSIGNMENT

Assign the text portion of the conclusion lesson, including the activities and discussion questions.



LESSON OBJECTIVES

With your help in this lesson, the participants will be able to develop a personal plan of commitment for their own contribution to the wise use of energy for themselves, their families and their community.

TEACHING SUGGESTIONS

- Discuss the text of the conclusion lesson. Discuss specificially the advantages of a strong conservation effort.
- Discuss the advantages of recycling. What other things could be recycled besides aluminum, newspapers and glass jars? Seek out such answers as egg cartons, grocery sacks and milk bottles.

TRY THIS!

1. Through the help of your local Chamber of Commerce Citizen's Awareness Group or County Extension Office, make a list of any and all ways that your community is supporting energy conservation, such as recycling centers, walk and/or bicycle paths, neighborhood stores, etc. Are local citizens familiar with these? Are there special hours of operation? Where are they located? Make posters which can hang in supermarkets, business places and libraries pointing out the location and hours of recycling centers. Help make people aware of the need for energy conservation.

If there are recycling centers, how well known are they? Encourage students to make posters advertising these centers. Hang the posters in appropriate places. Start a recycling campaign!

2. Write a 30-second radio commercial advertising the local recycling center. Present it to the radio station; perhaps you can persuade them to use the commercial as a public service announcement.

Encourage radio stations and businesses to advertise recycling centers.

3. If your community has no recycling center, what can you, as a concerned citizen, do about it? Discuss with your teacher the possibility of helping to start a recycling center. Approach your local Chamber of Commerce or service organization for help.

Look into the possibility of starting a recycling center in your community if none exists. Is it "cost effective?" Can you pay something for what people bring in?

4. Earlier in your study of energy you made a list of energy - using things around your home. Study that list again. Make a check beside all the things you could get along without.

Discuss the results of this exercise with the students. What types of energy-using items were the students willing to forego?

I WONDER WHY?

1. Is it possible that even if we use less energy our utility bills could be higher? Explain.

Yes, bills may become larger as costs go up and usage goes down. It is a fact of life that rates are going to increase, not decrease.

2. What are some activities which save energy and have no obvious disadvantages?

Some activities are car pools, showers vs. baths, bicycling or walking instead of riding in a car. Perhaps students can discuss the possibility of "street-sharing" major equipment like lawnmowers or snowblowers. Or where streetside mail boxes are located on both sides of the street, could they be changed to one side of the street? The mailman could reduce his driving on the mail route if all mail boxes were on the same side of the street.

3. We are sometimes referred to as "Spaceship Earth". What does this mean?

We are like a spaceship. A spaceship must recycle water and wastes, take advantage of the sun's rays for power and light and not waste energy for later maneuvers. The Earth is much like the space craft, also floating along in space with the same abilities to recycle and conserve.

4. What are some other ways your community can be supportive in helping to conserve energy?

The community could establish bicycle paths, promote better bus service, establish car/van pool offices, establish "work at home" offices, and promote using telephones instead of cars to communicate.

YOU MIGHT ALSO . . .

- Create bulletin board displays throughout the school urging conservation.
- Create posters or a series of posters to be hung in business places in the community.
- Construct a museum display for use at the library or school.
- Write newspaper feature stories on some aspect of the energy field.
- Invite energy experts to speak to a school assembly.
- Have an Energy Career Day. Invite specialists, such as engineers or computer scientists, to discuss briefly aspects of various energy-related careers.

CHALLENGE

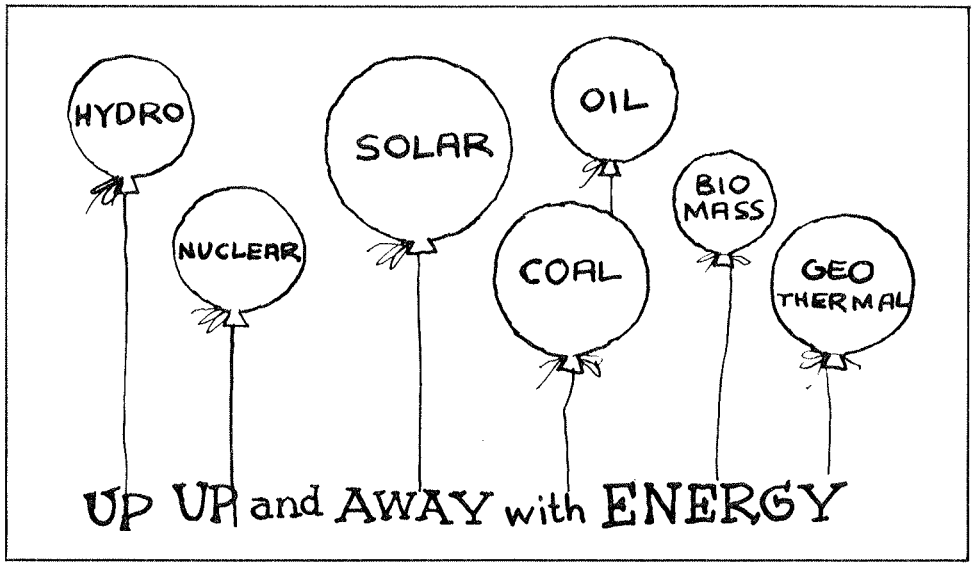
- Challenge the students to commit themselves to energy conservation. They might be encouraged to write a pledge or write a paper on "My Commitment to Energy Conservation". But remember to set a good example as an energy conserver!

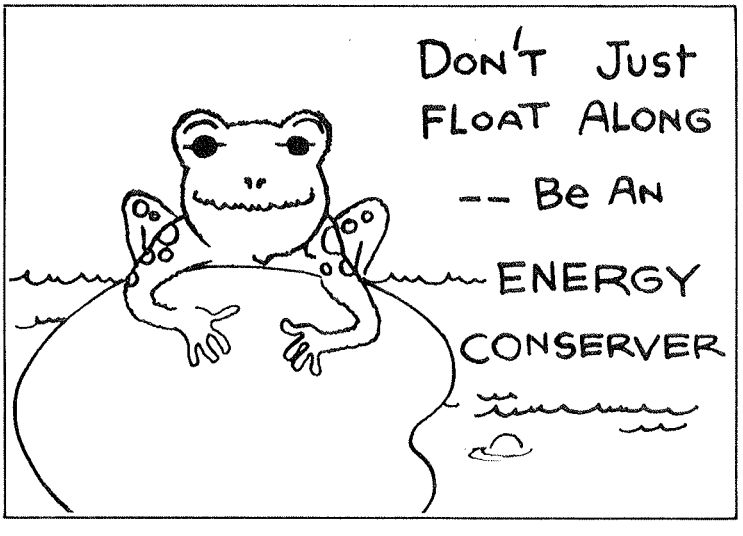
The ultimate purpose of "The Energy Challenge" is to prompt a challenge to the students to commit themselves to conservation. This commitment may serve as a final evaluation.

- Ask each student or the students as a class/club to organize a project at home, at school or in the community which will contribute to the over-all conservation effort. Help them carry out the plans and evaluate their efforts.

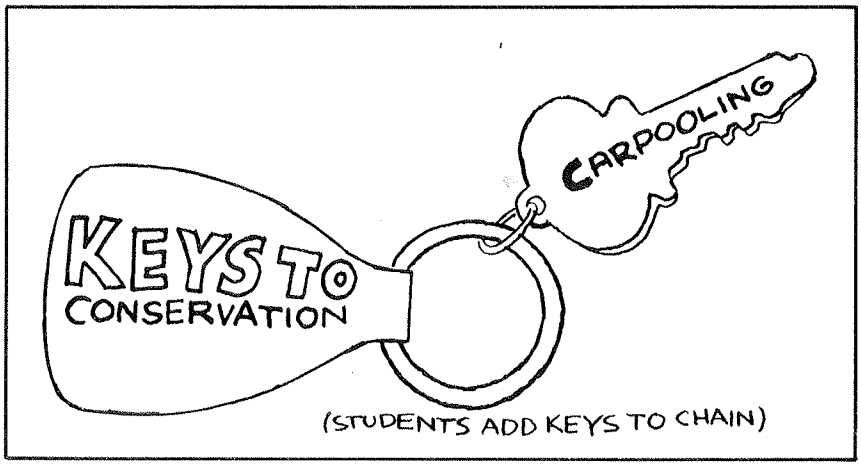
Appendix

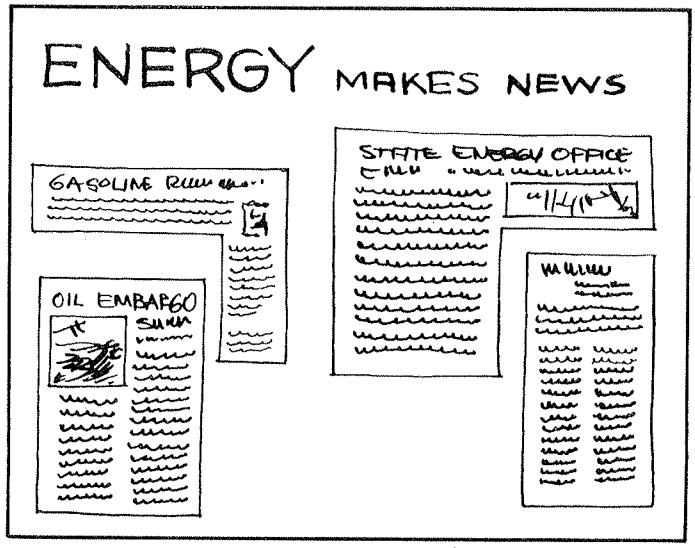
BULLETIN BOARD IDEAS

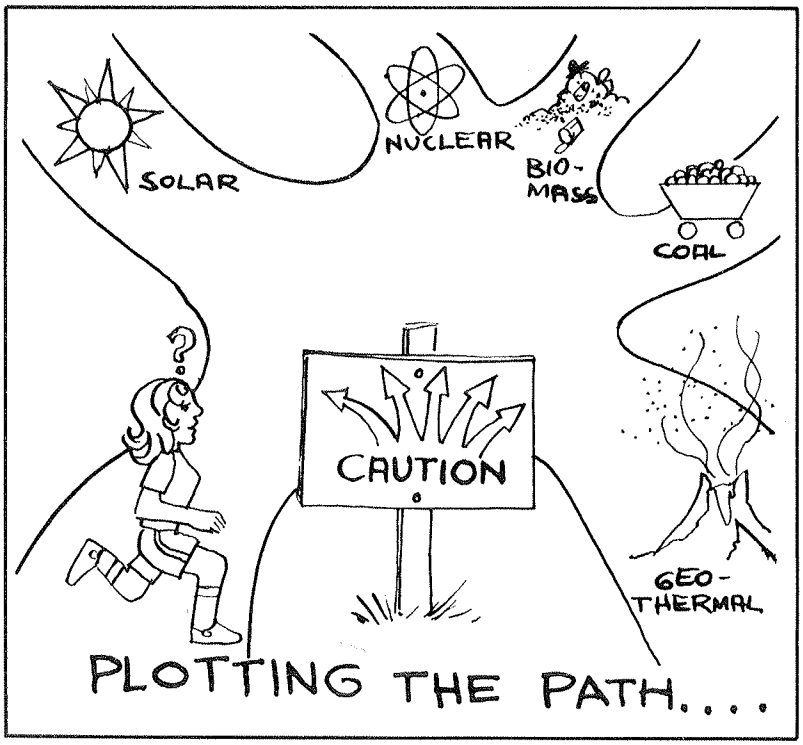


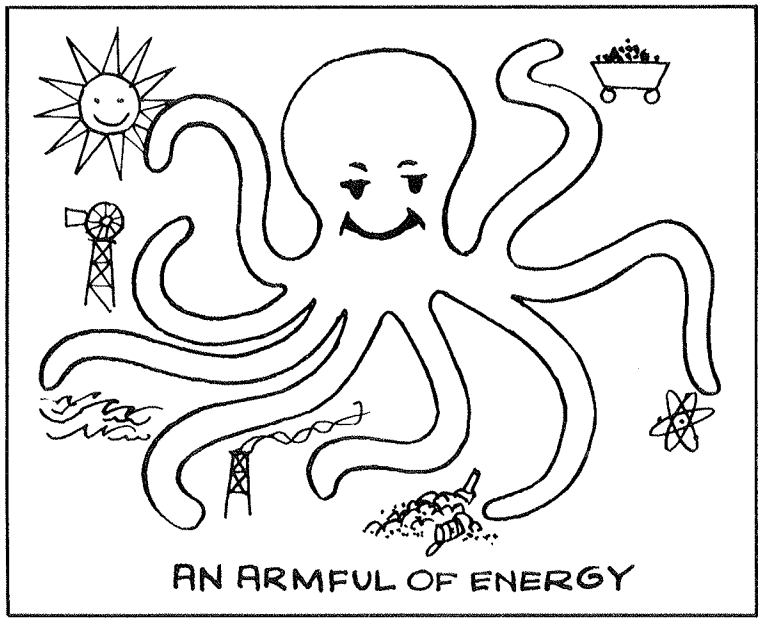


BULLETIN BOARD IDEAS



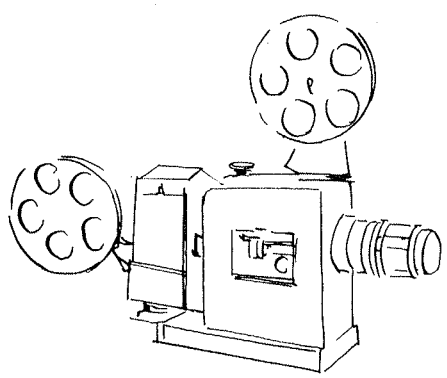






SOME MORE TO DO . . .

- Research a community problem. Define the problem, explain its cause and examine some solutions.
- Organize a group of volunteers to help the school maintenance personnel with "weatherization" projects such as caulking and weatherstripping.
- Learn how to conduct home energy audits for elderly or handicapped people. Your County Extension office and the state energy office can provide information to help you.
- Have the students interview an elderly person and write a short story on "I Remember When . . .".



SUGGESTED READINGS

"Energy: Fuels of the Future.", *Time*. June 11, 1979.

"Exit Throwaway Era, Enter Recycling.", *U.S. News and World Report*. March 19, 1979.

"Tapping the Riches of Shale." *Time*. November 19, 1979.

"The ABC's of the Energy Crunch." *U.S. News and World Report*. March 19, 1979.

"Use Less, Pay More." *Time*. April 16, 1979.

Grove, Noel. "Oil, the Dwindling Treasure." *National Geographic*., June 1974

Hodgson, Bryan. "Natural Gas: The Search Goes On." *National Geographic*. November 1978.

Weaver, Kenneth F. "The Power of Letting Off Steam." *National Geographic*. April 1979.

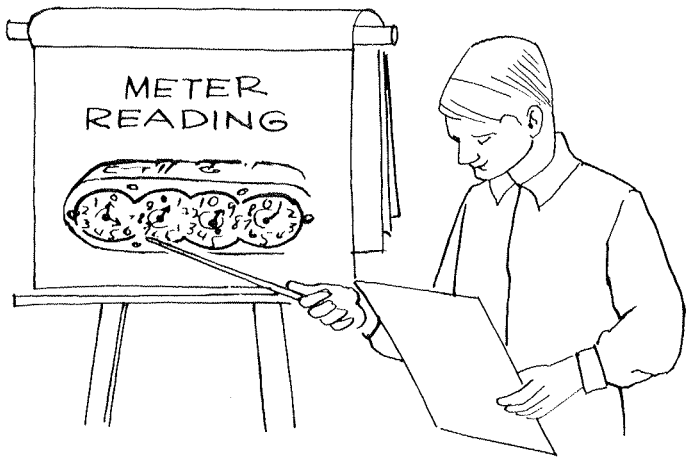
Wilhelm, John L. "Solar Energy, The Ultimate Powerhouse." *National Geographic*. March 1976.

Young, Gordon. "Will Coal Be Tomorrow's 'Black Gold'?" *National Geographic*. August 1975.

Stobaugh, Robert, and Daniel Yergin, editors. *ENERGY FUTURE*. Report of the Energy Project at the Harvard Business School, Random House, 1979.

U.S. Federal Energy Administration, *Tips for Energy Savers*. Washington, D.C., U.S. Government Printing Office, 1977.

U.S. Environmental Protection Agency, *Gas Mileage Guide*. Published and distributed by the U.S. Department of Energy. Published annually.



4-H DEMONSTRATION IDEAS:

- How to read and interpret an electric meter and/or gas meter. Contact a public utility company for information and assistance.
- Principles of good auto maintenance—demonstrating ways to check tire pressure, oil, air filters, tire tread, etc.
- Developing a solar: water heater, green house, hot dog cooker, etc. Include the principles of solar energy and some basic "how to's".

FILM SUGGESTIONS

Many informative and educational films exist on the subject of energy. Check your normal avenues of acquisition for the availability of films including:

- "Coal, The Rock That Burns," produced by the National Coal Association. Shows advantages and disadvantages of America's most abundant source of energy.
- "Oil—From Fossil to Flame," shows oil and how it is refined to produce gasoline, kerosene, fuel oil, etc.
- "Introducing Atoms and Nuclear Energy," a film explaining how the methods of fission and fusion are accomplished. Excellent visuals.
- "Saving Energy at Home," a film explaining how home energy waste can be reduced.
- "Running on Empty," developed by the Department of Energy, a film which explains driving techniques and maintenance tips for automobiles.
- "When the Circuit Breaks," a general energy information film showing energy sources of the present and possible ones in the future.

Energy Awareness Survey

Place the letter of the word in column B in the space in front of the appropriate definition in column A.

A.

_____ 1. porous rock that contains oil
_____ 2. measure of resistance to heat flow
_____ 3. chemicals removed from crude oil to make other products such as plastics
_____ 4. energy derived from the sun's radiation
_____ 5. term used to identify the origin of fuels formed within the earth millions of years ago
_____ 6. oil in its natural state before refining
_____ 7. unit of measure for transporting crude oil
_____ 8. process for converting coal to gas
_____ 9. the capacity to do work
_____10. abbreviation for measuring of heat energy; the amount of energy needed to raise the temperature of 1 pound of water by 1 degree Fahrenheit
_____11. a unit of measurement for natural gas
_____12. a term to describe energy sources which, once used, are gone forever
_____13. heat energy contained within the earth's crust
_____14. planned management of natural resources, including energy
_____15. energy released by reaction of the atoms through a fission or fusion process

B.

A. BTU
B. Conservation
C. Cubic Foot
D. Crude Oil
E. R-value
F. Geothermal energy
G. Non-renewable energy
H. Solar
I. Petro-Chemicals
J. Oil Shale
K. Barrel
L. Nuclear
M. Energy
N. Fossil
O. Coal Gasification

ACTIVITY SHEET #2

Energy Story

Using the words provided finish this story by filling in the blanks with the name of a petro-chemical product or a throwaway product. You and your class/clubmates may use different answers. You may use the words more than once.

Bill and Jim, eighth graders at the Washington Junior High, decided to spend a Saturday of recreation together. Bill donned his _____ jogging shorts, _____ shirt and grabbed his _____ gym bag and bicycled to Jim's house.

He found Jim still eating his breakfast of orange juice, cereal, and eggs cooked in a _____— coated fry pan.

Jim's mother was wrapping sandwiches in _____ and mixing fruit in covered _____ containers for their lunch. She wiped a spill with a _____. She packed their lunch, _____ spoons, and _____ cans of soft drinks in a _____ cooler. Jim grabbed his badminton racquets and the two were off, through the _____ door, down the _____ street, for a day at the park.

Meanwhile, Bill's brother Bob had started football practice for the state university. In the locker room he donned his football _____ over the _____ shoulder pads, put an _____ over a cut on his hand, and with his football _____ on his head headed for the _____ for an afternoon of practice. Bob's girlfriend carried a _____ into the bleachers to watch.

Bill's older sister was getting ready for the movies. After a bath in the tub with lots of _____, she put on her makeup—_____ and _____, put the _____ in her eyes, while listening to her favorite _____ in the tape recorder.

Bill and Jim batted the _____ birdies around for nearly an hour with their racquets. Then Jim suggested that they play with their _____ frisbees. They spread their lunch, turned on their portable _____ and ate. After their lunch they neatly gathered their trash and put it in the _____ garbage can.

After a few more games of badminton and frisbee, the boys bicycled home.

Jim showered and washed his hair with _____ shampoo from a _____ disposable bottle, dryed it with a _____ blow dryer and combed it with his _____ comb. He put on his _____ trousers, _____ shirt, and plopped in the _____ recliner and ate a _____.

ANSWERS:

acrylic
adhesive bandage
aluminum
asphalt
astro-turf
bubble bath
cassette
contact lenses
detergent
helmet
jersey
lipstick
mascara
naugahyde
nylon
paper towel
plastic
plastic wrap
plexiglass
polyester
poly-vinyl
radio
stadium cushion
styrofoam
teflon
TV dinner
vinyl
wash n' wear

ACTIVITY SHEET #3

Energy Game

Read the energy puzzle given below. Read *all* directions first before beginning. Then fill in the puzzle with the information given. Ask your family to help. You may have different answers than your class/clubmates and still be correct.

There are 5 houses, each of a different kind of construction, inhabited by men of different occupations who have different pets, appliances, and use different forms of energy. Read the directions and fill in the blanks.

a. The recycling center operator lives in a glass and steel house.
b. The meter reader owns a cat.
c. Coal provides energy in the stucco house.
d. The insulation installer uses natural gas for heat.
e. The brick house is immediately to the left of the stucco house.
f. The man with the microwave oven keeps tropical fish.
g. The man in the cement block house brushes with an electric toothbrush.
h. Electricity provides energy in the middle house.
i. The man with the trash compactor lives in the house next to the man with the dog.
j. The man with the electric toothbrush lives in the house next to the house with the parakeet.
k. The home heated with wood has an electric dishwasher.
l. The oil distributor has a power lawn mower.
m. The gas station owner lives in the wood frame house.

Who uses solar energy? Who raises hamsters?

HOUSE		*stucco*			
PETS					
JOB					
HEAT				*natural gas*	
APPLIANCE					

ACTIVITY SHEET #4

Energy Puzzle

INSTRUCTIONS: Find the energy-related words and abbreviations in the word-gram. There are 20 words. The words are listed below. You may find the words horizontally, vertically, diagonally, frontwards and backwards.

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

Alternative
Barrel
Biomass
BTU
Coal
Conservation
Energy
Fossil fuels
Fusion
Geothermal
Hydropower
Natural gas
Nuclear
Oil
Petroleum
Renewable
Shale oil
Solar
Wind
Wood

ACTIVITY SHEET #5

IN THE CRYSTAL BALL

Pretend, that just like Rip Van Winkle, you have gone to sleep for 20 years. You wake up, and see a world different from the one you are living in today. Write a story, describing what you see as you wake up. Be specific. Describe the houses,' businesses, people, recreation.