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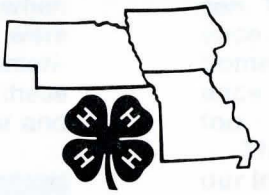
the energy challenge

A MULTI-FACETED EDUCATIONAL 4-H TV ENERGY SERIES



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Dear student/member,

To help you use this book and study our energy concerns more thoroughly, a glossary is printed in this book. The first time a word in the glossary appears in the text of this book, it will appear in **bold face** type. Take a moment to check its meaning so that you can better understand the terminology. Each lesson includes text, activities (Try This!) and discussion questions (I Wonder Why?). We hope you find this book informative and thought-provoking, and that it will help you discover "The Energy Challenge."

The Energy Challenge was written by Marge Hill Nickisch, under contract with the developing organizations. Illustrations were done by Jack Brodie, University of Nebraska–Lincoln artist.

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

The ABC's of the Energy Business

No matter who we are, what we do or where we live, we are involved in the energy process.

Everything we wear, everything we eat, everything we have around us has taken energy to produce.

It is no wonder, then, that our country's energy supplies, present and future, are a concern to all of us.

That is the subject of this book and the accompanying television programs. For the next several lessons, you will be taking an in-depth look at one of the biggest concerns facing our nation today—"The Energy Challenge."

From your classes, newspapers, magazines and television, you're probably aware of why so much attention is being given to energy. At a time when energy sources, primarily oil and **natural gas**, were both abundant and inexpensive, innovative Americans found new and numerous ways to use these fuels and their by-products to make life easier and more comfortable.

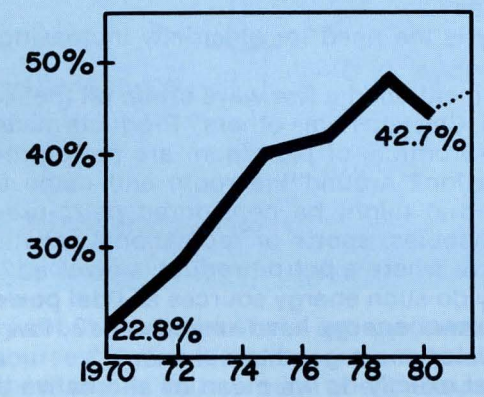


Figure 1. U.S. oil imports 1970-1980

Even after the **embargoes** of 1973-74, when supplies of oil were drastically reduced and attention was focused on how much we depended on other countries for our energy, we continued not only to **import** oil, but also to increase the amount of imports. (see Figure 1) Today nearly half of the petroleum we use comes from other countries!

However, some far-sighted experts and researchers, aware and concerned, have continued their search for **alternative** sources of fuel for our country, have continued to shout warnings to our unlistening ears, and have worked on ways we can cut down on the enormous amounts of energy we use. They alone can't solve our problems. They need our help and the help of every American citizen. That's where you come in. You have an influence on a great deal of the energy used in your home, school and community. And you can influence the use of energy in other areas of society, too.

There are many reasons why we must decrease our imports. We cannot afford to rely so heavily on the whims of leaders of politically unpredictable countries for our comforts. If all of our imports of oil were cut at once, almost half of our petroleum would be cut off. Can you imagine how our country would survive if that happened unexpectedly?

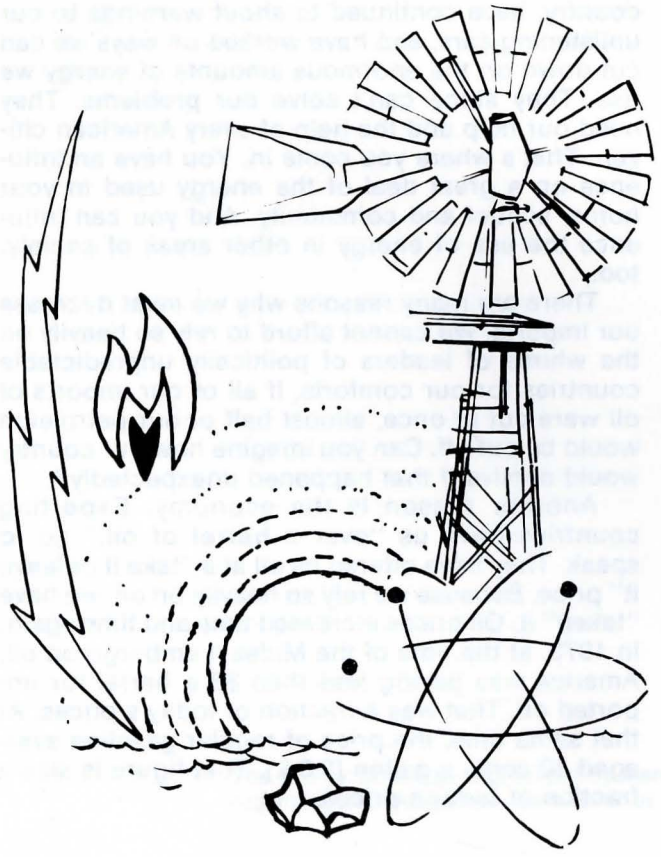
Another reason is the economy. Exporting countries have us "over a **barrel** of oil," so to speak. They have offered us oil at a "take it or leave it" price. Because we rely so heavily on oil, we have "taken" it. Oil prices increased time and time again. In 1973, at the time of the Mideast embargo on oil, America was paying less than $3 a barrel for imported oil. That was a fraction of today's prices. At that same time, the price of regular gasoline averaged 40 cents a gallon (3.8 L). That figure is also a fraction of today's prices.

There are lots of other reasons, too and some are complicated. Our country imports more goods than it exports, causing a deficit in our balance of payments. That means that more money is leaving our country than is coming in. Because international oil sales are conducted in dollars rather than in foreign currencies, the dollar has become less stable and has lost value against those currencies. That means that our money doesn't buy as much abroad as it used to. And perhaps most disturbing is that we have a greedy reputation among foreigners because we are using—and wasting—so much of the world's energy supply.

When oil supplies fluctuate and prices increase, many businesses are affected, and that situation does not contribute to a strong economy. You've heard the words **inflation, recession** and **depression** used in connection with the energy situation and our economy.

Higher prices of oil affect more than gasoline prices at the pumps and fuel oil prices in the furnaces. Every day we use products made from petroleum. We call them **petro-products**.

These by-products of petroleum are used by many industries. Packages, plastics, toys, and even some pieces of furniture are made from petroleum. Man-made fabrics, such as nylon and acrylics are made from petroleum. Many chemicals and fertilizers are developed from petroleum, and even some medicines. In fact, in our homes, schools and surroundings, you're surrounded by petro-products.



TRY THIS!

1. List all the kinds of energy used in your community. What is the fuel source of each of these kinds of energy?
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?
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.
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?
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.
6. Save your lists—you'll use them again.

I WONDER WHY?

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?
2. What advantages are there in getting electricity from hydro-electric dams? What are some disadvantages?
3. Why is the need for electricity increasing each year?
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?
5. Why do such energy sources as **tidal power** and **geothermal energy** have limited uses? How might we develop more geothermal energy?
6. What exactly do we mean by alternative energy sources?
7. List some countries from which we import oil.

LESSON 1

Through this lesson you will be able to list and discuss the present and potential sources of energy.

Where Does All That Energy Go?

The bulk of our energy in America today comes from the **fossil fuels**—a staggering 92 percent. That's staggering, becuse the fossil fuels we rely on most, natural gas and oil, (see Figure 2) are in short supply. If we continue to use energy sources at present rates, you may see natural gas supplies exhausted in your lifetime. Oil will last longer. Some oil deposits are hard to get to, and some contain minerals which would need to be extracted. Experts disagree on just how much oil is available.

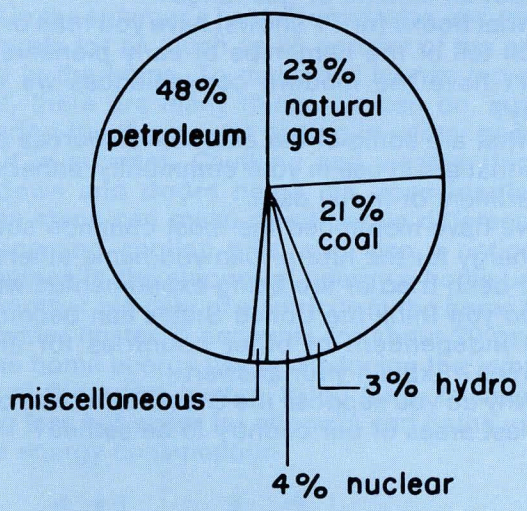


Figure 2. U.S. energy sources

Only about 8 percent of our energy comes from other sources. In the miscellaneous section in Figure 2, there are, of course, such energy sources as windmills, woodburning stoves, solar collectors and **biomass** converters.

Let's take a look at where the energy in our country goes:

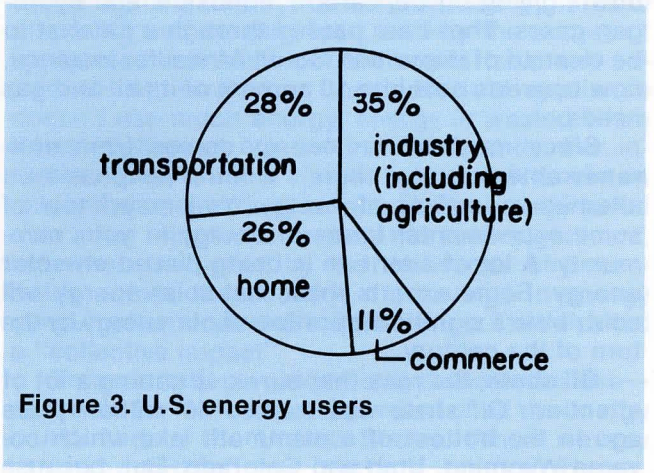


Figure 3. U.S. energy users

About a fourth—26 percent—is used in the home. That means that you, your parents and brothers and sisters and families like yours across the country have control over one-fourth of the energy used in our country. More than a fourth—28 percent—is used in transportation—the cars, buses, campers, trucks and other transportation needed for goods and services.

Commerce—businesses, libraries, schools, and the like—account for 11 percent of our country's energy usage. Industry, including agriculture, uses 35 percent of the energy to produce the food, goods and things we enjoy.

It is important to know where energy goes—how it is used—before we can take steps to eliminate waste and use our energy more efficiently.

The problem is a complex one. We must decrease our reliance on foreign oil *and* develop our own resources, perfect new energy sources and conserve the ones we have.

Nuclear power is one source of energy which has been the object of a great deal of criticism. Some people feel that it is a dangerous form of energy because of the radioactive wastes which result when nuclear power is used. But the safety record of nuclear power in the U.S. is excellent. Nuclear plants are expensive to build, and take a long time to build, but a pound (.45 kg) of uranium can supply as much energy as 3 million pounds (1,350,000 kg) of coal. So nuclear power needs to be given serious consideration in supplying our country's energy.

There are still vast supplies of **coal** in our country. In fact, coal was the largest producer of energy in our country until well into this century. Coal is expensive to transport and releases toxic fumes into the air as it burns. But we do have a good supply of coal, and there are ways of treating it so that pollution is not so great a problem. Coal can be converted into gas (**coal gasification**) or oil. The process involves heating the coal to very high temperatures under high pressure so that it breaks down, giving off oil, carbon monoxide, and hydrogen gases. These are passed through a catalyst to be cleaned of impurities. South Africa, for instance, now converts coal into 10 percent of its oil and gas needs.

Since most of our energy comes from **nonrenewable** sources, there's a lot of emphasis on alternative sources of energy. You may know of some experimental forms of energy in your community. A lot of attention is being placed on **solar energy**. Some experts think that solar energy will contribute a significant portion of our energy by the turn of the century.

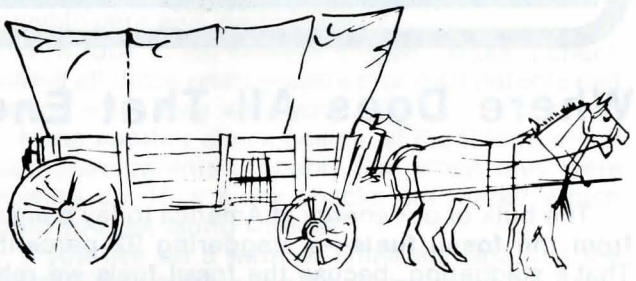
Oil shale, the rock that burns, is getting a lot of attention. Oil shale was formed 40 million years ago in the bottom of a mammoth lake which covered Wyoming, Utah and Colorado. But, because this vegetation was never subjected to the extreme temperatures and pressures needed to create the readily usable liquid oil and gas, the oil is imbedded in the rock. Man will have to work hard to extract the oil.

There are other alternatives too—biomass conversion, for instance. This involves converting all forms of natural growth—garbage, walnut shells, plants—into usable energy. Another process would use animal wastes to produce methane gas. Wood, once America's main source of energy, is used as a substitute for other fuels in many homes, especially in the northeastern United States.

Geothermal energy, wind, **hydro-electric power**, and currents of the seas are also sources of energy in use. Lots is being done, and more will happen in the next few years. You will see, in the next decade, new forms of energy advance from the experimental stage to wider use.

TRY THIS!

1. Write a 60-second radio commercial appealing to the public to conserve energy.
2. Show how the price of a hamburger might be affected by an increase in the price of crude oil.
3. Consider what businesses might be affected by fluctuating supplies and higher prices of petroleum products.



I WONDER WHY?

1. How, do you suppose, was a pilgrim mother able to prepare such a sumptuous Thanksgiving dinner without an electric or gas range?
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?
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?
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?
5. Do you think the United States can become totally independent of other countries for energy sources? Explain your answer.
6. Why do you suppose the Great Plains was one of the last areas of our country to be settled?

LESSON 2

Through this lesson you 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.

Our Home is Our Castle . . .

Actually it could be said that our country has two problems: so much of the energy we use is not **renewable**; and we use so much more than any other nation in the world.

We've already seen how the energy is consumed in the United States. Our homes take a startling 26 percent to operate. Let's analyze that figure.

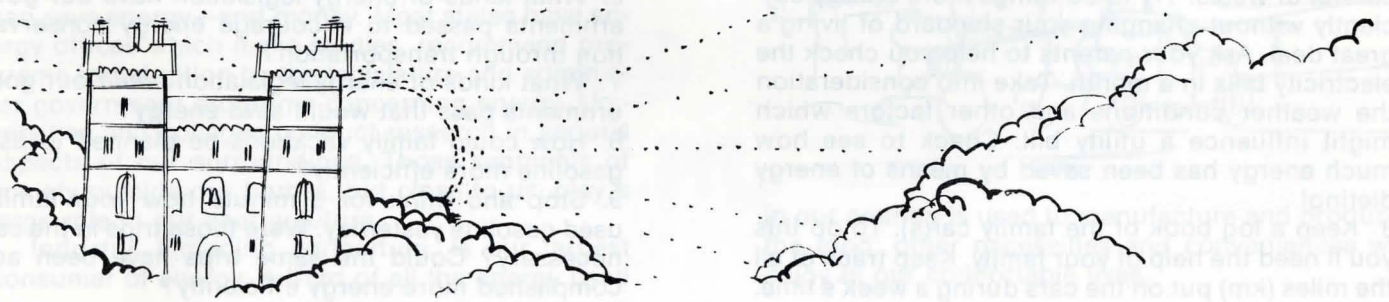
Our homes are a source of comfort to us. What determines how much energy is used in the home? People! Comfort costs energy, and energy costs money. We keep our homes warm in winter and cool in the summer's heat. This heating and cooling accounts for as much as 75 percent of the energy used in the home. To make our homes more efficient, there are many things we can do, such as lowering the thermostat setting in winter and raising it in summer. Caulking and weatherstripping windows and doors helps, as does **insulation**. These steps can make a noticeable difference on heating and cooling bills, and also a noticeable difference in the amount of energy a home uses.

Another big user of electricity in the home is the hot water heater. It accounts for about 20 percent of the home energy usage. Reducing the temperature of the water heater, fixing leaky faucets and using less hot water for showers and baths will reduce energy consumption.

Up to 10 percent of the home energy is used preparing and serving food, and by the scores of appliances that make our life comfortable and enjoyable. Although any one individual appliance doesn't use much energy, energy is wasted when these appliances are not used efficiently. For instance, every minute that a light is left on in an empty room, electricity is wasted. The energy saved over a few minutes' time does not seem significant, but when multiplied by the thousands of households across the country, the savings in energy consumption does make a difference. That's called a "collective impact".

Transportation—private and commercial use—accounts for more than 25 percent of all the energy consumed in the United States. When we say "transportation" we include trucks, buses, airplanes, boats, trains and even some other gasoline engines. It even includes the tankers which haul the crude oil and natural gas from foreign nations to our shores!

Americans drive over 100 million automobiles. Passenger cars account for over half of the energy used in the transportation part of the energy "pie". Each auto, on the average, travels about 10,000 miles (16,000 km) a year, using almost 700 gallons (2,660 L) of gasoline.



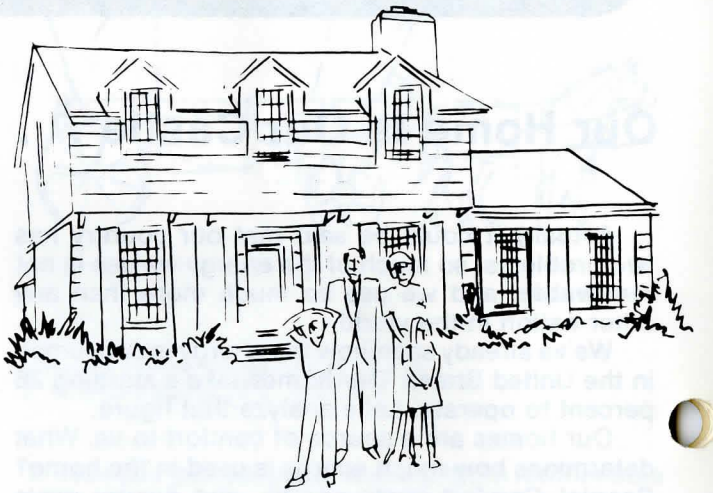
We are a society of convenience. If we decide to have a milk shake, we jump in the car and drive to the nearest drive-in. If we would like pizza for supper, we drive to the nearest pizza shop and pick up an order. And when we can't find a parking place close enough to suit us, we drive around the block again and again. We "drive in" to banks, fast food restaurants, dry cleaners, photomats, car washes, theaters and shopping centers. We make short trips, often stopping and starting quickly. And we don't always keep our cars in the best working order. So it is easy to see why the automobile offers an area of energy **conservation** we can do so much about. If just one gallon (3.8 L) of gasoline were saved each week for every automobile in the country, we'd save about 6 billion gallons (22.8 billion L) of gasoline a year!

We can't over-emphasize the importance of individual energy savings. We can all influence energy consumption. We can *all* improve on our conservation efforts.

Clearly, energy conservation makes sense. But we must also set priorities. It doesn't do any good to give up an electric toothbrush and still keep the thermostat at 80 degrees F (27° C) in the winter! Wise and efficient use of the energy we have will mean more supplies for us later on and also for future generations. It doesn't have to mean big changes in the standard of living we now enjoy, but it may mean cutting back on some of the luxuries. Conservation means to use our resources with such skill that we extend our supplies another few years. While we're doing this, researchers will have time to improve and develop new energy sources.

TRY THIS!

1. At the dinner table tonight, discuss the tips from "I Wonder Why" number 3 on this page—and other tips—with your family. Is your family aware of energy conservation?
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!
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.
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?
5. Draw up a newspaper advertisement about the type of car you've selected.



I WONDER WHY?

1. Pretend you are manager of an apartment complex. How would you encourage tenants to conserve energy?
2. Look around you right now. Do you see any wasted energy? If so, can you change the situation?
3. Discuss some energy saving tips around school and at home that you can start today.
4. What is meant by the phrase "collective impact"?
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?
6. What kinds of energy legislation have our governments passed to encourage energy conservation through transportation?
7. What kinds of energy legislation *could* our governments pass that would save energy?
8. How could family vacations be planned to use gasoline more efficiently?
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?

LESSON 3

Through this lesson you will be able to list and discuss how energy is utilized and conserved in our communities and by industry.

Changing Emphasis

Nearly everything we do, all day, every day, is part of the energy process. Our parents work in buildings or factories which consume large amounts of energy. Our cities clean our streets and keep them lighted. Libraries provide books for us to enjoy. Our schools use energy in the daily process of educating the millions of young people. And the food we eat was grown by farmers who have used energy to till the soil and harvest the crops.

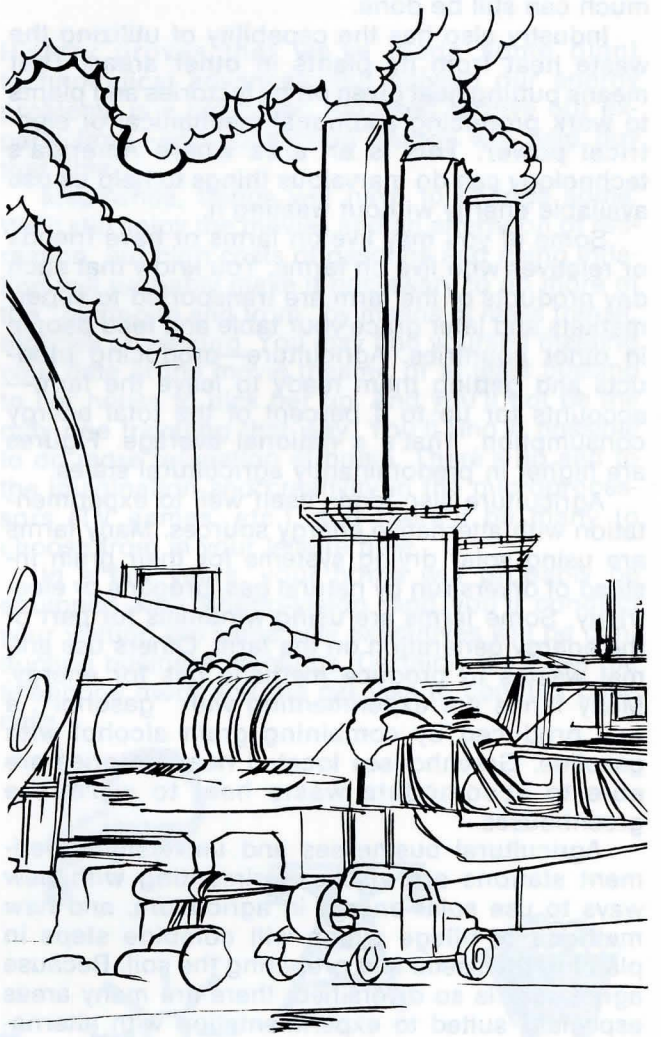
All of these parts of our society are important to our lives and well being. We cannot do without them—at least not without changing the ways we live.

Because these areas consume such a large portion of our energy, it seems that there must surely be opportunity to cut down energy usage. And there is.

Take schools, for example. Some schools in the northern part of our country have implemented longer winter vacations, to save during the costly heating months. Others have changed bus routes or rescheduled recreation activities to cut down on energy usage. Many schools have given their students the opportunity to help in the energy management process.

Many cities are establishing "energy conservation planning committees" to study ways the city can save energy—and money. Most states have energy offices which make studies, recommend programs for adoption by the legislature and administer government programs concerning energy. Universities and colleges conduct research in various aspects of our surroundings. Those segments of society outside our homes, but close to us, play a large role in our energy future.

Industry, including agriculture, is our largest consumer of energy. A third of all the energy used in our country is used to manufacture and produce the food, other necessities and conveniences we enjoy in our comfortable lives.



It may seem that we have little or no control over industry's energy expenditures. But the opposite is true. Industry produces what people want; industry meets people's demands.

At a time when gasoline was inexpensive, Americans wanted heavy, spacious, comfortable, luxurious cars. Industry produced them. Now with higher gasoline prices, consumers want smaller, fuel efficient cars. But industry cannot "change gears" overnight. It will take a few years before the gas guzzlers will be replaced by more energy-efficient varieties.

During the oil embargo of 1973-74, industries became concerned about wasted energy in their plants. Just by improving the maintenance of their plants, many industries were able to reduce their energy expenditures without making any capital investments. One aircraft industry was able to trim its energy usage by 59 percent during a 3-year period just by "cleaning house". Much has been done; much can still be done.

Industry also has the capability of utilizing the waste heat from its plants in other areas. That means putting heat given off by factories and plants to work producing additional mechanical or electrical power. This is an area where America's technology can do marvelous things to help us use available energy without wasting it.

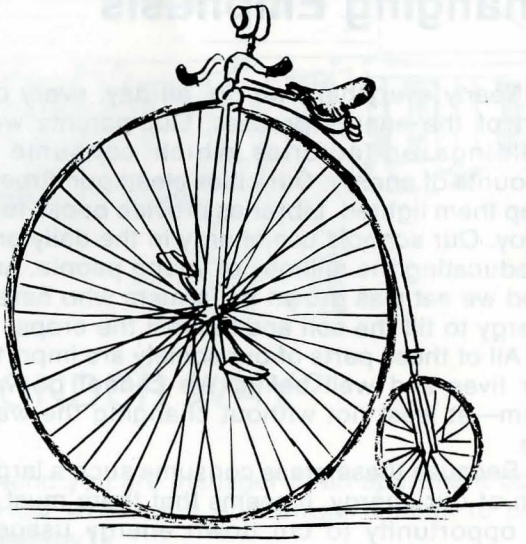
Some of you may live on farms or have friends or relatives who live on farms. You know that each day products of the farm are transported to supermarkets and later grace your table and feed people in other countries. Agriculture—producing products and getting them ready to leave the farm—accounts for up to 4 percent of the total energy consumption. That's a national average. Figures are higher in predominantly agricultural states.

Agriculture also lends itself well to experimentation with alternative energy sources. Many farms are using solar drying systems for their grain instead of dryers run by natural gas, propane or electricity. Some farms are using windmills for part of the energy generation on the farm. Others use animal wastes to produce methane gas for energy. Many farms are experimenting with "gasohol", a fuel produced by combining grain alcohol with gasoline. Greenhouses located near factories are able to accomodate waste heat to warm the greenhouses.

Agricultural businesses and university experiment stations are also experimenting with new ways to use solar energy in agriculture, and new methods of tillage which will combine steps in planting the seeds and preparing the soil. Because agriculture is so diversified, there are many areas especially suited to experimentation with alternative energy sources.

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?
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?
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"?



I WONDER WHY?

1. What does "cost effectiveness" mean to the home owner, businessman or factory foreman in regard to energy conservation?
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?
3. What industries near you have devised ways of cutting energy usage?
4. What are the utility companies doing to help consumers reduce energy consumption?

LESSON 4

Through this lesson you will be able to identify and describe potential changes in your personal future life-style as impacted by the energy situation of today and tomorrow.

What's Ahead?

What lies ahead? How is the world going to be in 20, 10, or even 5 years from now? How fast are changes going to take place? What will your life be like?

No one really knows the answers to any of these questions. Lots of people have lots of ideas. But so many things will determine the answers to those questions—so many "iffy" things—*if* we are willing to accept some trade-offs; *if* we are willing to stop being such energy-gluttons; *if* technology makes certain advances; *if* . . .

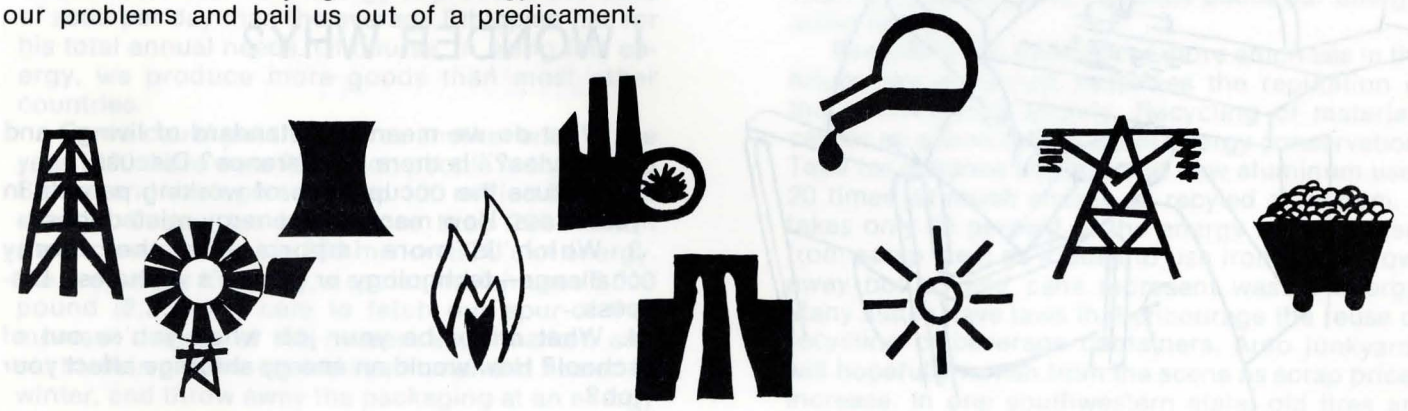
For years we have used energy as if there were no bottom to the barrel, so to speak. Man has always been an inventor. Two hundred years ago America was in the midst of the Revolutionary War. But today we have probed the workings of outer space and put men on the moon.

Half a century ago America was just beginning to use natural gas, and learn some of the ways crude oil could be put to use. Now, we've surrounded ourselves with petro-products, "energy-saving" appliances, spacious homes and comfortable automobiles.

We seem to be relying on technology to solve our problems and bail us out of a predicament. History proves that we've made some giant technological advances; but solving our energy problems is a big order. We need to give our experts time—and conserving energy will help buy that time.

Meanwhile, things will have to change some. We'll still enjoy the movies and an afternoon of recreation, but high costs of gasoline and rising inflation will probably make it necessary to do more of the "getting to and from" by means of mass transit, bicycles or walking. You may find yourself meeting your date at the movie theater, or at least bussing to her house to pick her up. And you'll not be the only one traveling that way. You'll find it possible to do more recreation at home. There's no end to the imagination and creativity in the microprocessors (TV games, etc.), and there'll be many to choose from in your leisure time.

In a few years, your home will probably be equipped with phono-vision, and you'll conduct your visiting the same way executives will be conducting business meetings. Certainly we'll use the telephone more and the car less to conduct business.



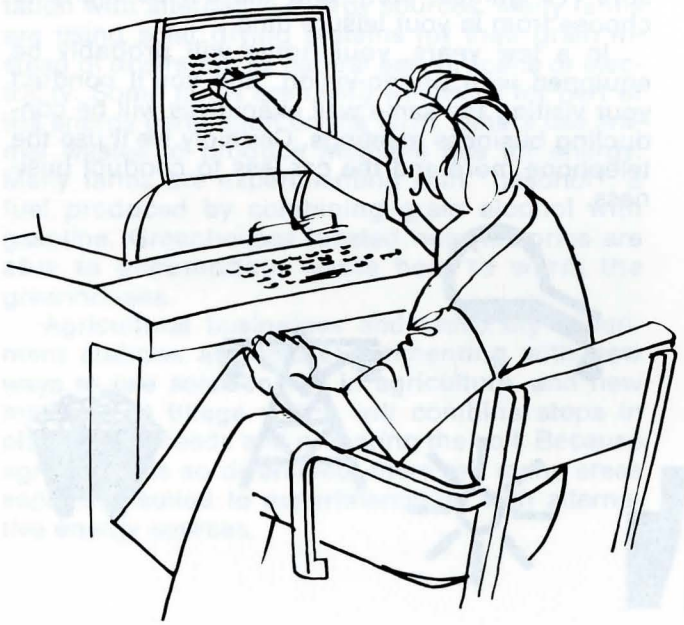
The American's love for the big comfortable auto is already subsiding in favor of a smaller, fuel-efficient car. Some developers predict that cars with 40-60 mpg will be on the market soon. Home computers will help make management decisions. Maybe you'll even read the evening newspaper on your home computer instead of having it delivered to your doorstep!

You'll probably find yourself dressing not for fad or fashion, but more for comfort. The stylish synthetic ensembles of summer will give way to cooler cottons (with new finishes to make them 'easy care') and the 'layered look' for winter may be permanently 'in'. Artificial fabrics use 10 times as much energy to produce as natural (cotton, wool, etc.) fabrics.

Although your parents moved from one house to another, you may not. Because of inflation, housing and energy costs, future families may not change residences often. They will probably live in smaller apartments or multi-dwelling homes, all more energy efficient. And maybe even the suburbs, once a symbol of affluence and social mobility, may give way to inner-city townhouses as people move closer to their work.

The cassettes which carry your favorite tunes will soon become a thing of the past too. Audio discs no bigger than a coin may take their place.

And through the changes, and because of them, new and interesting varieties of jobs will enter the scene. The research jobs of today will open up a wide spectrum of opportunities for you tomorrow including engineers, scientists, analysts, technicians, geologists, metallurgists, physicists, architects, economists, accountants, computer scientists and lots more.



It's hard to predict what life will really be like in 5 or 10 years, harder still to imagine the changes at the turn of the next century. But it seems certain that our life-styles must change some. Experts say there's no need to give up our standard of living, but they do agree that we must use our energy more efficiently, and stop being so wasteful.

Whatever solutions we find will be heavily dependent on technology. There are simply too many of us to live with woodburning stoves, dressing in all natural fabrics and living in houses made entirely of natural materials. We have become a society of technology, and technology will furnish many of the answers.

TRY THIS!

1. Conduct a survey in your community. Are there wasted lights on streets, parking lots, billboards? Which could be eliminated?
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.
3. Describe a situation when existing nonrenewable 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.
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?

I WONDER WHY?

1. What do we mean by "standard of living" and "life-styles?" Is there a difference? Discuss.
2. Discuss the occupations of working parents in your class. How many have energy-related jobs?
3. Which is more important in the energy challenge—technology or people's attitudes? Discuss.
4. What might be your job when you're out of school? How would an energy shortage affect your job?

CONCLUSION LESSON

Through this lesson you will be able to develop a personal plan of commitment for your own contribution to the wise use of energy for yourself, your family and your community.

The Case for Conservation

The debate about energy continues. Pros and cons of the various types of energy will be discussed and evaluated by experts, special-interest groups and average citizens. Some experts maintain that a plentiful supply of energy has been grossly overlooked. It is one which doesn't have to be mined, does not **pollute** the air, has no toxic waste materials, doesn't disappear on cloudy days, doesn't take giant tankers to ship, and doesn't take long pipelines to be transported. It is the energy we could conserve by changing our energy-using habits! It is estimated that we could save 30-40 percent of the energy we consume without changing our standard of living significantly. Some experts feel we could save even more.

With just 6 percent of the world's population, America uses 30 percent of the world's energy. We are using twice as much energy as we were using 30 years ago. And we are using twice as much energy per person as most Western European countries. For instance, with a comparable standard of living, Sweden uses but half of the energy we do. Are we twice as happy or twice as comfortable? It is said that we use more energy to produce two cans of soda per day than the average Ethiopian has for his total annual needs. Of course, in using this energy, we produce more goods than most other countries.

Or we could put the figures another way. In the year 1900 there were 75 million people in the United States, and each person used 100 million **BTU's** of energy. Today, we have more than 200 million Americans each using 300 million BTU's of energy. We are, to put it bluntly, a society which uses 5,000 pound (2,250 kg) cars to fetch our spur-of-the-moment desires at the nearest supermarket, and eat them in a home cooled in summer and heated in winter, and throw away the packaging at an energy loss equivalent to a third of a gallon (1.27 L) of gas. Changing those habits certainly doesn't mean sacrificing. It means being sensible about our energy-using habits.

Recycling will need to see more emphasis in the future. We've earned ourselves the reputation of the "throwaway" society. Recycling of materials can be an abundant source of energy conservation. Take for instance the fact that new aluminum uses 20 times as much energy as recyled aluminum. It takes only 25 percent of the energy to make steel from scrap steel as it does to use iron ore. Throwaway bottles and cans represent wasted energy. Many states have laws that encourage the reuse or recycling of beverage containers. Auto junkyards will hopefully vanish from the scene as scrap prices increase. In one southwestern state, old tires are

ground up and mixed with asphalt to create paving material. Some states have laws which encourage the recycling of used lubricating oil. The glass packaging industry crushes and remelts more than 600,000 tons (540,000 metric tons) of old glass each year.

Every Sunday edition of the New York Times consumes 150 acres (60 ha) of forest. During World War II our country was reusing 40 percent of the waste paper. But by the mid-70's the figure had dropped to just 16 percent.

If we would increase our recycling efforts to 50 percent, we might save 300 million trees every year! And we'd save energy while saving trees. Making paper from recycled materials takes 40 percent less energy than making it from wood.

Recycling saves—raw materials, trees, energy and money, and when we recycle we save on air pollution!

We are a nation of elaborate packaging too. Meats on the meat counter in the supermarket look nicer on styrofoam trays; razor blades are done up in paper and plastic. Even ballpoint pens are packaged on cards several times their size. We pay about $25 billion each year for packaging and 90 percent of it is thrown away.

The reasons for conserving are numerous. The most obvious is that by conserving, we are helping to provide energy resources for future generations. Hopefully these generations will be able to enjoy the same standards of living we enjoy now.

By substituting labor for energy, we will create many new jobs for those now unemployed. Of course, some jobs will be sacrificed as we change our energy-using habits.

We'll reduce our dependence on foreign suppliers by conserving. And in doing so we'll lessen the risk of embargoes such as the one our country experienced in 1973.

By using less energy in America, more energy will be available for use in the developing countries.

By making better use of energy we can maintain a cleaner **environment**: land, water and air.

From our country's beginning, Americans have believed in a "work ethic"—work hard, produce lots, be comfortable and be successful through gaining money and possessions. Because of this ethic, we have become prosperous—and at the same time we've become energy intensive and wasteful. Now with energy supplies diminishing, we need to change our behavior.

We need to have a little energy conscience sitting on our shoulder, reminding us to think in terms of wise, efficient use of energy and resources when buying, making or consuming an item. We need to ask ourselves lots of questions: Do I really need it to be happy? What resources are in it, and what energy resources are needed to use it? Are the energy resources scarce or nonrenewable? Am I promoting a less consumptive life-style by buying it? Can it be recycled? How long will it last? Is it the most energy-efficient model on the market?

Your enthusiasm and sincerity will be the best reasons for others to join you. You will be most successful in asking others to conserve by practicing conservation yourself.

There are no simple answers to the energy problem. But every little bit helps. Our future depends on all of us!

TRY THIS!

1. Through the help of your local Chamber of Commerce, Citizen's Awareness Group or County Extension Agent, 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.
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.
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.
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.

I WONDER WHY?

1. Is it possible that even if we use less energy our utility bills could be higher? Explain.
2. What are some activities which save energy and have no obvious disadvantages?
3. We are sometimes referred to as "Spaceship Earth". What does this mean?
4. What are some other ways your community can be supportive in helping to conserve energy?

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.	B.
_____ 1. porous rock that contains oil	A. BTU
_____ 2. measure of resistance to heat flow	B. Conservation
_____ 3. chemicals removed from crude oil to make other products such as plastics	C. Cubic Foot
_____ 4. energy derived from the sun's radiation	D. Crude Oil
_____ 5. term used to identify the origin of fuels formed within the earth millions of years ago	E. R-value
_____ 6. oil in its natural state before refining	F. Geothermal energy
_____ 7. unit of measure for transporting crude oil	G. Nonrenewable energy
_____ 8. process for converting coal to gas	H. Solar
_____ 9. the capacity to do work	I. Petro-Chemicals
_____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	J. Oil Shale
_____11. a unit of measurement for natural gas	K. Barrel
_____12. a term to describe energy sources which, once used, are gone forever	L. Nuclear
_____13. heat energy contained within the earth's crust	M. Energy
_____14. planned management of natural resources, including energy	N. Fossil
_____15. energy released by reaction of the atoms through a fission or fusion process	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, dried 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 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		*stucco*			
PETS					
JOB					
HEAT				*natural gas*	
APPLIANCE					

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.

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 N 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
Hydro power
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.

GLOSSARY

ALTERNATIVE: providing a choice between two or more things; another option.

BARREL: The unit of measure for crude oil. One barrel is equal to 42 gallons (159.6 L). One barrel of crude oil has the same amount of energy as 350 pounds (157.5 kg) of coal.

BIOMASS: Organic matter from plants and animals which can be burned to produce energy.

BTU (British Thermal Unit): A standard unit of measurement. The amount of energy needed to raise the temperature of 1 pound of water by 1 degree Fahrenheit.

CALORIE: The amount of heat needed to raise the temperature of 1 gram of water 1 degree Centigrade. It is approximately the amount of heat given off by burning one wooden kitchen match.

COAL: A black, combustible, mineral solid formed by the decomposition of vegetable matter away from air. Coal is formed under varying degrees of high temperature and great pressure over a period of millions of years. It is used as a fuel and in the production of coke, coal gas, water gas, and many coal-tar compounds.

COAL GASIFICATION: A process of converting coal to gas suitable for use as a fuel. The process involves heating coal to very high temperatures so that gas is given off.

CONSERVATION: Protection from loss or waste. Planned management of natural resources, including energy; the curtailment of inefficient energy use.

CRUDE OIL: Petroleum in its natural state before refining it into heating oil, gasoline, etc. Crude oil is a liquid formed from the fossils of animals and plants at the bottom of ancient seas.

CUBIC FEET: The measurement used by natural gas companies. A cubic foot of natural gas is equal to 1031 BTU's.

DEPRESSION: A period marked by slackening of business activity, much unemployment, falling prices and wages, etc.

EMBARGO: A restriction or restraint, such as the prohibition of trade in a particular commodity.

ENVIRONMENT: All the conditions, circumstances, and influences surrounding and affecting the development of an organism or group of organisms.

EXPORT: To carry or send goods from one country to another, especially for purposes of sale.

FISSION: A process in which the nucleus of a heavy element splits into nuclei with the release of neutrons and substantial amounts of energy. A nuclear reaction.

FOSSIL FUELS: Fuels derived from the fossil remains of organic materials; such as petroleum, natural gas and coal.

FUSION: A nuclear reaction involving the combination of smaller atomic nuclei or particles into larger ones with the release of energy. This is also called thermonuclear reaction by reason of the extremely high temperature required to initiate it.

GEOTHERMAL ENERGY: Heat energy within the earth's outer crust, such as the geysers in Yellowstone National Park.

HYDRO-ELECTRIC POWER: The energy in stored or moving water; water-powered turbines turn generators for production of electricity.

IMPORT: To bring in from the outside, as to bring goods into one country from another in commerce.

INFLATION: An increase in the amount of currency in circulation, resulting in a relatively sharp and sudden fall in its value and rise in prices. It may be caused by an increase in the volume of paper money issued or of gold mined, or a relative increase in expenditures, as when the supply of goods fails to meet the demand.

INSULATION: A material that provides a high resistance to the flow of heat or electricity.

NATURAL GAS: A mixture of gaseous hydrocarbons which occur naturally in the earth in certain places. Natural gas burns cleanly with little waste.

NONRENEWABLE ENERGY SOURCES: Sources of energy which, once used, are gone. Fossil fuels are an example of nonrenewable energy.

NUCLEAR ENERGY: Energy within the nucleus of the atom. It can be released by nuclear fission or nuclear fusion. Nuclear fusion is still in the experimental stage in the United States.

OIL SHALE: Underground porous rock that contains an oil product called kerogen. Indians called oil shale the "rock that burns."

PETRO-CHEMICALS: Chemicals removed from crude oil and used to make a wide range of products, such as plastics, synthetics, fibers, detergents and drugs.

PETRO-PRODUCTS: Products, such as fertilizer, medicines, cosmetics, plastics, etc., which are made from the by-products of petroleum.

POLLUTION: Unclean, impure or undesirable by-products which may be released into the environment, such as the exhaust fumes from automobiles which pollute the air or leaks from an off-shore well which pollute the sea.

R-VALUE: Measure of resistance to heat flow, used to rate insulation materials.

RECESSION: A temporary falling off of business activity during a period when such activity has been generally increasing, as during that after a depression.

RECYCLING: The process of transforming waste materials into new or reusable products, such as turning old automobiles into usable scrap metal.

RENEWABLE ENERGY SOURCES: Energy sources which are not easily depletable, such as the sun.

SOLAR ENERGY: Energy derived from the sun's radiation upon the surface of the earth.

TAR SANDS: Rock or sediments that contain heavy oil substances.

TIDAL POWER: The energy derived from the movement of water in and out of coastal areas; energy from tides.