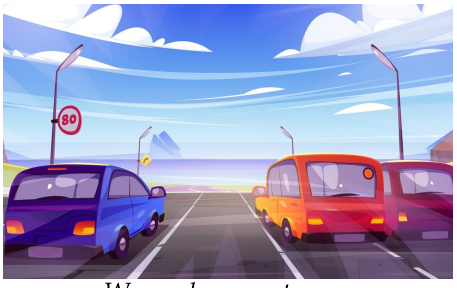
Introduction

It is a well-known fact that nothing lasts forever. Our **energy** resources are no exception. We need *energy* to power our cars and factories, heat our schools and homes, refine metals, make steel, and to do many of the things that we take for granted. Because the price of **petroleum** or **oil** tends to increase and their supply is limited, we are trying to find other methods for producing energy. **Coal**, gas, *oil*, wind, water, the sun, the tides, and nuclear reactions are but a few of Earth's energy resources. Some are **renewable** and some are not. If we understand these resources, and whether they are *renewable* or **nonrenewable**, we can make informed decisions about producing and using energy.

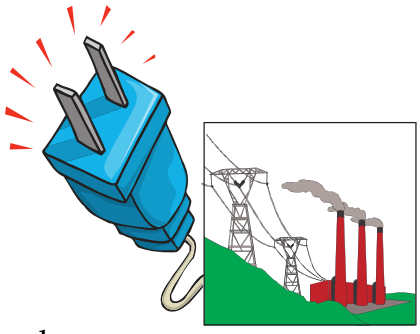


We need energy to power our cars and factories.


The price of petroleum tends to increase and supply is limited.

Sources of Energy

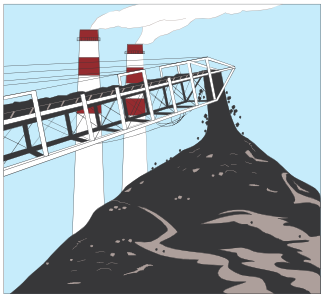
Energy is the ability to do work. We get energy from our **natural resources**. Some energy is used directly, such as burning **natural gas** to cook. Many times we change a *natural resource* into another form of energy, such as **electricity**. *Electricity* is produced by a generator. A generator uses energy from coal, gas, oil, wind, uranium, steam, tides, or falling water to turn the blades of a large wheel called a *turbine*. The turbine turns the coils in the generator to produce electricity.


Electricity is produced by a generator.

Our major sources of energy include the sun, moving water and wind, tides, **fossil fuels**, nuclear reactions, plant and animal materials, and heat inside Earth's crust.

Types of Energy

Some of the energy we use comes from natural resources which can be used over and over again, such as water and wind. Other resources, such as soil and forests, can be replaced within a relatively short period of time. These resources are said to be *renewable*; they can be replaced or used over again. Other resources, such as *fossil fuels*, are *nonrenewable*. Fossil fuels—oil, gas, and coal—take millions of years to form. They can be used up faster than they can be replaced in nature or used only once. We must **conserve** our use of nonrenewable resources so that they do not run out in the foreseeable future.



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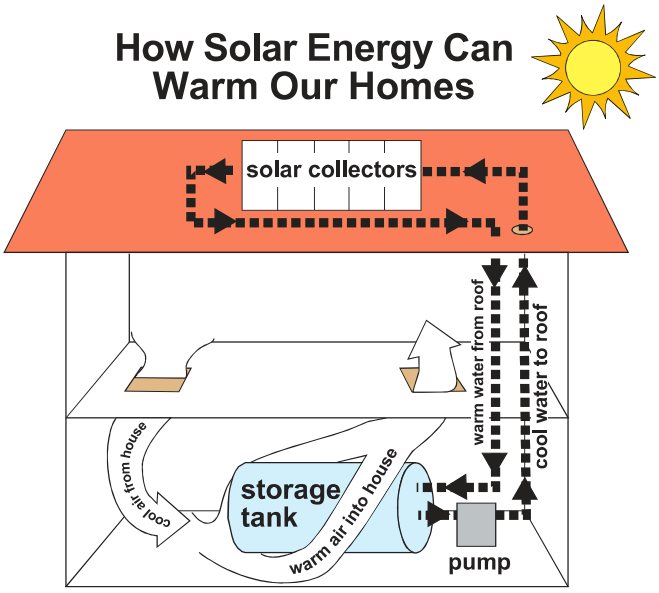
Renewable Resources

Solar Energy. Energy from the sun is called **solar energy**. Many homes and buildings are heated by using **solar collectors**. *Solar collectors* are panels, usually put on the roof of a house, to collect heat to use for hot water, cooking, washing, and heating swimming pools. *Solar energy* can also be converted to electricity through the use of **solar cells**. Using *solar cells* is expensive. They are not used very often, except in spacecrafts.



The *advantages* of using solar energy include the following:

1. It is a renewable resource because there is a continuous supply of sunshine.

2. Solar energy does not pollute the atmosphere, land, or water.

The *disadvantages* of solar energy include the following:

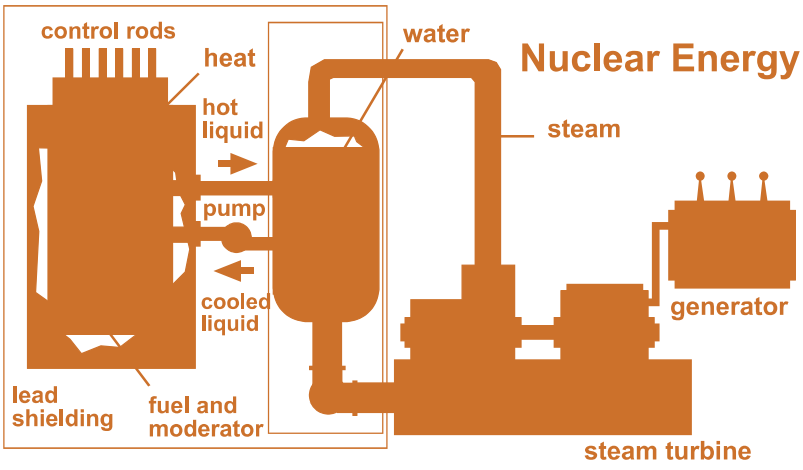
1. It cannot be collected at night.

2. It can only be used in areas that receive a lot of sunshine.

3. It is impractical for large buildings because too many solar panels would be required.

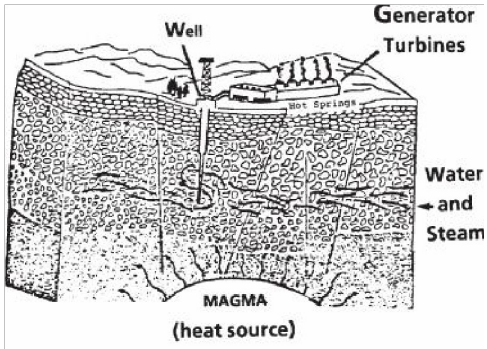
4. Converting solar energy to electricity by using solar cells is currently expensive.

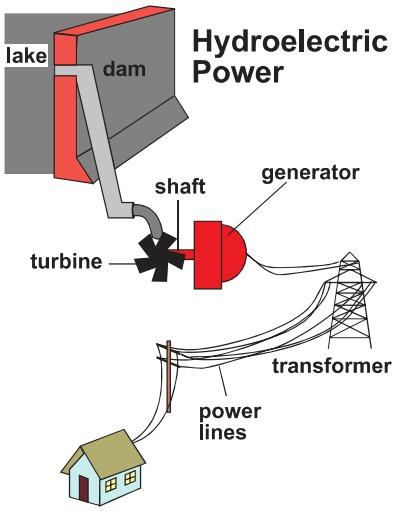
Nuclear Energy. **Nuclear energy** is produced by splitting the nucleus or center of the uranium atom. When the atom splits, a great deal of energy is released as heat. This heat energy is then used to turn water into steam. Then, the steam turns the turbines of generators that produce electricity. A major disadvantage of *nuclear energy* is that it produces radioactive wastes that can destroy cells and change or destroy genetic material. These wastes may leak from storage facilities. The leaked wastes may contaminate the soil or groundwater. In extreme instances, cores may *melt down*. That is, they may become so hot due to faulty power plant operation that they may melt through the floor and shielding.



Geothermal Energy. **Geothermal energy** uses the heat from inside Earth's crust. Wells are drilled into hot water deposits in Earth. The water then escapes to the surface as steam. The steam is then used to run generators to make electricity. Sometimes the hot water comes to the surface naturally in hot springs and geysers. In Iceland, most homes get their hot water from hot springs and geysers. *Geothermal energy* is renewable; however, even if all of the geothermal energy available were used, it could only provide a very small amount of the energy we need.

Geothermal Well





Water Power. Water is one of the major sources of electricity in the United States. Water power produces electricity called **hydroelectricity**. To harness the power of water, a dam is built on a river to control the flow of the water. The flow of the water turns the turbines of generators that produce electricity. Hydroelectric power has many advantages. It is renewable and relatively inexpensive, and does not pollute the atmosphere. One disadvantage is that many times rivers are not located where the power is needed.

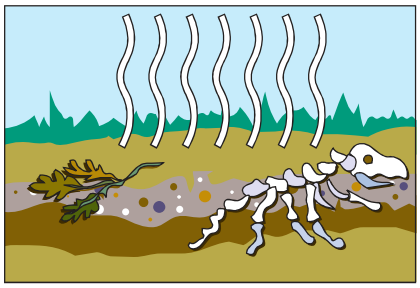
Wind Power. The energy of the wind, or **wind power**, can be turned into electrical energy through the use of windmills. Windmills can be used to pump water or grind grain. Prior to the industrial revolution of the 1800s, windmills were very common, but many have been replaced by electric and fossil fuel-operated motors. The recent energy shortages have brought about an increase in new, modern types of windmills that do not require fuels in order to perform the work desired. Because the wind is not predictable in most areas of the world, it is not a widely used resource. Wind is a renewable resource.

Tidal Power. The energy from the two-way flow of the tides through narrow passages can also be used to generate electricity. **Tidal power** is not a widely used source of energy because there are only a few areas in the world with usable tidal conditions. Tides are a renewable resource. Experimental *tidal power* plants have been built in Canada, near the Bay of Fundy, where the vertical difference in low and high tides is 13.6 meters (44.6 feet).

Biomass Fuels. **Biomass fuels** are combustible fuels made from plant and animal materials. Some plants can be converted into alcohol and burned for fuel. Wood can also be burned to create heat. *Biomass fuels* are a renewable resource. Burning garbage is being considered as an alternative to some biomass fuels.

Nonrenewable Resources

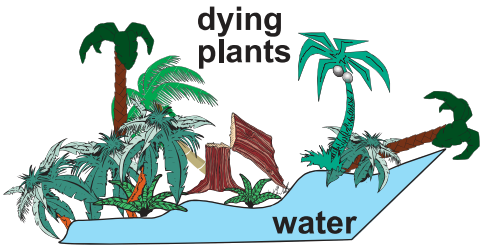
Fossil Fuels. Fossil fuels include coal, oil or *petroleum*, *natural gas*, and **oil shale**. Fossil fuels come from plants and animals that died millions of years ago. Over the years, these remains were chemically changed to produce our fossil fuels. Since millions of years are required to form deposits of fossil fuels, they are nonrenewable resources. These fuels are currently our most important source of energy for industry, transportation, and for use in our homes. Since they are nonrenewable, they must be *conserved*.



Fossil fuels come from plants and animals that died millions of years ago.

The largest deposits of coal and shale are found in North America. Because they are usually buried, it takes considerable effort (strip mining or shaft mining) to extract this fuel. New reserves of oil and gas are being discovered, but many environmental considerations must be weighed before drilling and recovery can begin.

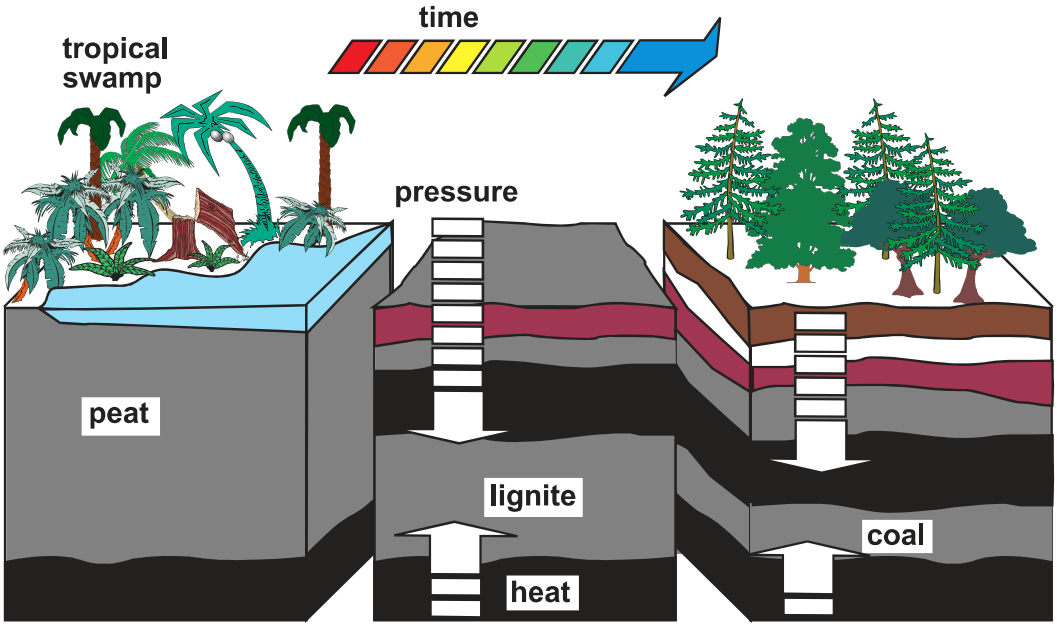
In the United States, *coal* is almost everywhere—it has been found in 38 states. Nearly one-eighth of our country lies over coalbeds. Coal comes from plants that died about 300 millions of years ago. As trees and plants died in swamps, they fell into the water. Since the water was low in oxygen, the trees and other plants did not rot, but piled up. These dead plants were then covered with more dead plants and turned into **peat**.



Coal comes from plants that died millions of years ago.

Heat, pressure, and time eventually turn the *peat* into **lignite** or brown coal. *Lignite* contains bits of woody tissue but retains some moisture; therefore, it does not burn well. **Bituminous**, or soft coal, is the next stage in coal formation. *Bituminous* coal gives off a lot of heat when burned. It is abundant. The last stage of coal formation is the production of **anthracite**. It is the hardest type of coal and burns the most cleanly, but it is very scarce. Coal is used to provide energy for trains and ships and for generating electricity in power plants and factories.

Coal Formation



As trees died in the tropical swamp, dead plant matter built up on the bottom of the swamp. These layers of dead plants turned into peat.

Over time, layers of sediment were deposited. The weight of the sediment compacted the layered plant matter into lignite.

More and more sediment was deposited over the peat. Over millions of years, the weight of the sediment changed the peat into coal.

Petroleum or oil is a liquid fossil fuel formed from plants and animals that lived in shallow coastal waters. Oil is used as a lubricant and to make gasoline, plastics, synthetic fabrics, medicine, building materials, kerosene, wax, and asphalt.

Shale is a sedimentary rock that has oil trapped between its layers. It is plentiful, but it is difficult and expensive to remove the oil from the rock. However, shale oils may be used in the near future.

Natural gas is usually found along with oil. It is the only fossil fuel that can be used as it comes from Earth, without having to be processed first. **Methane** is the most common natural gas. It is used in gas stoves and to heat homes.

Fossil fuels have some *disadvantages*, however. They include the following:

Disadvantages of Fossil Fuels

1. Fossil fuels are nonrenewable (once used up they cannot be replaced).
2. Many fossil fuels contain traces of sulfur, which causes pollution when burned. If spilled or in contact with living organisms, many fossil fuels are extremely toxic and damaging.
3. It is expensive and often difficult to remove fossil fuels from Earth's surface.

In the last 100 years, the burning of coal, oil, and gas has added carbon dioxide to the air. Some scientists have hypothesized that these increased levels have led to global warming.

Use of Natural Resources

The use of natural resources must be carefully planned and monitored.

It is crucial that the use of natural resources be carefully planned and monitored. Fossil fuels and mineral supplies are continually decreasing, and the world's population continues to rise. Without safeguards and regulations, uncontrolled burning of wood and coal can pollute the air. Inorganic materials from industries and some pesticides can pollute our waters, and nuclear energy pollutants may become a danger to not only humankind but all living creatures.

Efforts at conservation include recycling and the use of alternative energy sources. Coal is more plentiful than petroleum, so the United States is using more coal for energy production every year. Minerals, such as aluminum, can be recycled. Some minerals are found in ocean water, and in the future, these may be used more extensively.

Some of Earth's energy resources are renewable; others are nonrenewable. Several nonrenewable energy sources are being rapidly exhausted. The wise use and conservation of natural resources is necessary to ensure that these resources remain available for future generations.

Summary

Our natural resources supply the energy needed to do work or move objects. Types of energy include solar energy, nuclear energy, geothermal energy, water power, *wind power*, tidal power, biomass fuel, and fossil fuels. Some of the sources of energy are renewable, and others are nonrenewable. Our natural resources must be conserved to safeguard the supply for our future.

Wise use and conservation are necessary to ensure that natural resources remain available for future generations.