

Energy (Heat, Light and Sound)

RENEWABLE AND NONRENEWABLE ENERGY

Since human activity is using fossil fuels faster than they can be replaced, fossil fuels are considered a **nonrenewable energy resource**. The United States has 5% of the world population, but uses over 25% of the world's energy resources. Seventy percent of the electrical energy generated in the United States comes from the burning of coal and other fossil fuels. Fossil fuels are considered nonrenewable energy resources because there is a fixed amount of it on Earth and it takes millions of years for nature to form fossil fuels. They are called **fossil fuels** because they come from remains of ancient forms of life. Fossil fuels are nonrenewable energy resources that have trapped **solar energy** captured by living organisms. Generally, scientists consider renewable energy resources as those energy resources that will be around for millions of years.

How are fossil fuels formed? Over a period of millions of years sediments from erosion cover the dead remains of these organisms. Molecules in these organisms are placed under tremendous amounts of pressure from the piling up of sediments. This causes chemical bonds to break and new ones to form. Over time, this process left Earth with deposits of coal, petroleum and natural gas. Petroleum was formed mostly from the remains of plants and animals living in shallow oceans. Shallow oceans that once covered Northern Africa left behind the huge petroleum deposits found in the Middle East. Millions of years ago, fern trees, thriving in wetlands created present day coal deposits. Natural gas is usually found in association with petroleum because it is formed in the same way.



dead plants covered by swamp water

over years, great pressure is applied

after a long time coal deposits form

RENEWABLE ENERGY RESOURCES

Sunlight, wind, falling water, tides, geothermal (heat from Earth's interior), and **biomass** are considered renewable or alternative energy sources because they are, for all practical purposes, everlasting. Wood can also be considered a renewable resource as long as there is careful forest management.

- Natural ecosystems use only a fraction of 1% of the energy from the Sun. Scientists have estimated that the energy needs of all humans can be met with a similar percentage of the total solar radiation striking Earth. The heat absorbed from the Sun by **solar collectors** can heat water and homes. Photovoltaic cells convert **solar energy** directly into electrical energy such as the one you use in your solar calculator. The heat from the Sun can also be used to boil water to create steam to turn a turbine.
- As the Sun strikes earth, the atmosphere is unevenly heated. This creates **wind**. Wind energy can be used to turn the turbines of a generator producing electricity.
- Under the lithosphere of Earth, lies hot liquid rock. The heat from inside earth, **geothermal energy**, can be used to heat homes or boil water to create steam that drives turbines.
- **Wood** can be considered a renewable resource as long as trees are replanted. Wood-burning stoves have been very popular for heating homes, but the burning of wood also releases a greenhouse gas – carbon dioxide.
- Falling water can turn a turbine to generate electricity called hydroelectricity. Power plants are built next to many naturally occurring falls, such as Niagara Falls and artificial falls created by dams.

Examples of Renewable Energy Sources



Wind



Geothermal



Solar

Environmental Issues Associated With the Burning of Fossil Fuels

When fossil fuels burn, they release the gas carbon dioxide. This is one of the major suspected causes of the “Greenhouse Effect”, which is associated with the warming of Earth. Furthermore, the burning of coal contributes to acid rain. Transport of fossil fuels has also been associated with oil spills into the waterways. These oil spills

have caused much damage to wildlife directly or by damaging the wildlife's environment.

Nuclear Energy

Some scientists promote the use of nuclear energy as an alternative to fossil fuels. Energy that comes from the nucleus of an atom is considered **nuclear energy**. There are no oil spills or release of greenhouse gases when nuclear energy is used to generate electricity. The element uranium is the fossil fuel for nuclear energy. A nuclear power plant produces energy from a nuclear reaction called fission. During **fission**, the heavy nucleus of uranium breaks into two smaller nuclei. The energy released during this reaction can be used to boil water to create steam to turn a turbine.

The energy coming from the Sun is also a nuclear reaction. The Sun is composed of mostly hydrogen. Hydrogen atoms have the smallest of nuclei. When hydrogen nuclei join together a type of nuclear reaction called **fusion** occurs. The heat produced from this reaction warms Earth. Presently, fusion requires extremely high temperatures (millions of degrees Celsius). If scientists can figure out a way to make this happen at low temperatures, it could be a future source of energy for Earth.

Environmental Problems Associated with Nuclear Energy

A major problem associated with nuclear energy is disposing of the radioactive wastes. When uranium can no longer be used to produce nuclear energy, its wastes are still radioactive. Where to safely bury these wastes is of great concern to many. If a nuclear power plant should break down, there must be a plan to evacuate the surrounding region. This too has created another problem, particularly for densely populated areas such as Long Island.