



Nonrenewable Enigma Infosheet

Petroleum



Petroleum (also known as crude oil) is a fossil fuel that took millions of years to form. When tiny sea plants and animals died, they sank to the bottom of the ocean where they were buried by layers of sand and sediment, which turned into sedimentary rock. Over time, this organic matter was subject to enormous pressure and heat, causing it to change into petroleum-saturated rock.

Since 1950, petroleum has replaced coal as the nation's leading source of energy. The four biggest uses of petroleum are transportation—70 percent; industry—24 percent; homes and businesses—five percent; and electric utilities—one percent.

U.S. production of petroleum is not enough to meet the nation's demand of about 20 million barrels a day. About two-thirds of the nation's supply of petroleum is imported, mostly from Canada, Saudi Arabia, Mexico, Venezuela and Nigeria. Currently, Texas is the nation's leading producer of petroleum, followed by Alaska, California, Louisiana, and Oklahoma. About one-third of domestic production is from offshore wells.

Coal



Coal is a fossil fuel created from the remains of plants that lived and died 60 to 400 million years ago. The dead plant matter fell into swampy water, partially decaying. Under heat and pressure this plant matter was gradually changed into carbon-rich coal deposits.

The U.S. is the world leader in known coal reserves. At current consumption rates, the United States has about a 250-year supply of coal. A small percentage of the coal mined in the nation is exported to other countries. The top five coal producing states are Wyoming, West Virginia, Kentucky, Pennsylvania, and Montana.

The major method for transporting coal is by train. About 93 percent of the coal is used by electric utility companies, the rest is used by industry. Only a very small portion is used for heating buildings and homes. A major effort is made to remove the sulfur found in coal before it is burned, and the sulfur dioxide gas that is formed when it is burned.

Natural Gas



Natural gas, the cleanest burning fossil fuel, was formed millions of years ago when plants and tiny marine organisms died and were buried by sand and sedimentary rock. Methane, a colorless and odorless gas, constitutes about 90 percent of the gas extracted from a gas well. The methane is separated from the other gases and is transported by pipeline to customers. Over half of the nation's homes use natural gas for heating; the major consumer of natural gas is industry.

Compressed Natural Gas (CNG) can be used to fuel automobiles and buses. CNG vehicles are cleaner than gasoline powered vehicles and they make use of a domestic energy source.

Most of the natural gas consumed in the nation is domestically produced—about a quarter from offshore wells. Most natural gas production comes from Texas, Alaska, Wyoming, Oklahoma, and New Mexico. The U.S. imports about 18 percent of total consumption from Canada and Mexico via pipeline.

Uranium



Nuclear energy is energy in the nucleus (core) of an atom. Nuclear power plants use a process called nuclear fission to release this energy by splitting uranium atoms. Once mined and processed, uranium is ready to be used in a nuclear power plant. The atoms are split to release heat energy that is used to superheat water into steam. The steam turns a turbine generator to make electricity.

The first nuclear power plant began operation in 1957. The U.S. is the number one producer of nuclear power, which generates about 20 percent of our electricity. There are 104 nuclear power plants operating in the U.S. Over 80 percent of the uranium the U.S. uses is imported. Although the United States has a sufficient supply of uranium, the prices are much cheaper overseas.

Nuclear power plants produce radioactive waste. The main concern is not the amount of waste but its radioactivity. The U.S. government is in the process of deciding whether or not to proceed with plans to store waste in Yucca Mountain, Nevada. While nuclear power produces radioactive waste, it does not contribute to air pollution because the fuel is not burned.

Propane



Propane is found in natural gas and petroleum deposits and is separated during processing and refining. Propane, therefore, comes from petroleum and natural gas producing states. A small amount is imported. Propane is a colorless and odorless gas that can be changed into a liquid by putting it under a moderate amount of pressure, or cooling it to -43.8° Fahrenheit. When liquefied, it is a portable and clean source of heat energy. Liquid propane is sold by the gallon.

The largest market for propane is in industry and in rural and suburban areas that do not have natural gas service. Farms are big users. Propane is used for heating barns and homes, heating water, operating equipment, and cooking.

Because it is so portable, it can be used in hot air balloons and recreational vehicles. About three percent of propane is used for transportation. Propane-fueled engines emit cleaner exhaust than gasoline engines.



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Biomass



Biomass is any organic material—plants, wood, animal and agricultural waste—that can be used as an energy source. During photosynthesis, plants use the sun's energy to combine carbon dioxide and water into carbohydrates. These carbohydrates can be burned to release energy.

About 53 percent of biomass energy comes from burning wood and 36 percent is made into biofuels such as ethanol. About 11 percent comes from burning garbage and agricultural waste. The energy released from burning this waste is used to generate electricity. Although burning biomass produces some air pollution, sophisticated systems reduce the level of emissions significantly.

In a landfill, decaying biomass gives off methane gas. This gas can be captured and sent through pipelines to heat homes and buildings. Another method of using biomass is to change it into ethyl alcohol, or ethanol, through a process called fermentation. Corn is usually the source of this type of biomass. Ethanol can be mixed with gasoline to make gasohol. Much of the nation's motor fuels are a blend of gasoline and ethanol.

Hydropower



Hydropower is energy that comes from the force of moving water. Gravity causes water to flow from higher to lower ground creating a force that can be used to turn turbine generators and produce electricity. The first hydroelectric power plant was built in 1895 at Niagara Falls in New York. Currently there are 2,000 dams in the U.S. producing 5–10 percent of the nation's electricity, depending on the amount of rainfall.

Hydropower is the cheapest way to generate electricity today. While a hydropower plant is expensive to build, its energy source is free and does not contribute to air pollution. Hydropower plants do change the local environment, however, because of the reservoir formed by the dam. A reservoir can flood thousands of acres of land and disrupt wildlife in the area that is flooded.

Most good sites for hydropower dams in the U.S. are already in use. Many existing dams that are not now generating electricity could be equipped with generating equipment.

Geothermal



Geothermal energy comes from heat within the earth. The heat, produced from the radioactive decay of elements deep below the earth's surface, is absorbed by rocks. When water comes in contact with these heated rocks, it absorbs the energy, sometimes changing to steam. The hot water or steam can be used to heat buildings or to generate electricity.

The major use of high-temperature geothermal energy is to generate electricity. Most geothermal electric power plants are in western states. While the source of geothermal energy is free, the cost to develop a geothermal field is expensive. The pipes and equipment must be maintained carefully because of the corrosive nature of the steam.

Geothermal heat pumps—or geothermal exchange units—use the constant temperature of the earth under the ground to heat and cool buildings. This low-temperature geothermal energy is available everywhere.

Wind



Wind is air in motion. It is created by the uneven heating of the earth's surface by the sun. Hot air expands and rises, and heavier, cooler air rushes in to take its place, creating wind. Prior to 1935, windmills were used primarily to grind grain and pump water. Today, wind turbines are used primarily to generate electricity.

Most wind turbines are located on huge wind farms covering hundreds of acres. Many of the nation's wind turbines are located in Texas, but many places in the U.S. have enough wind to run wind machines and have begun installing them. New wind turbines generate electricity about as cheaply as thermal power plants.

Since the wind doesn't blow constantly, wind turbines only run on average about three-fourths of the time and not always at full capacity. Wind turbines do not pollute the air or water.

Solar



Solar energy is created in the sun when hydrogen atoms are combined to form heavier atoms of helium. This process is called nuclear fusion. A small amount of mass is lost during this process and is converted into heat and radiant energy. The energy radiates from the sun in all directions, and less than one percent reaches the earth.

Solar energy can be used to heat buildings and water. South-facing windows, brick walls, or solar collectors are used to absorb the solar energy. Water, stones, and other materials are used to store the solar energy at night or on cloudy days. Solar energy is also used to make electricity. One way is by concentrating the sun's rays on pipes to heat water to very high temperatures. The hot water turns into steam and turns a turbine generator, as other conventional power plants do.

The sun's radiant energy can also be converted directly into electricity using photovoltaic cells. PV cells power calculators and emergency phones on highways.