Nonrenewable Enigma Infosheet

Petroleum

Petroleum (also known as crude oil) is a fossil fuel that took hundreds of 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.

Petroleum is the nation's leading source of energy. The vast majority of petroleum is used by the transportation (71.50 percent) and industrial (23.26 percent) sectors. Very little is used by the residential and commercial (4.61 percent) and electric power (0.63 percent) sectors. Petroleum must be burned, and therefore can contribute to emissions and pollution.

U.S. production of petroleum is not enough to meet the nation's demand of about 18.7 million barrels a day. About 41 percent of the nation's supply of petroleum is imported, mostly from Canada, Saudi Arabia, Mexico, Venezuela, Russia, and Iraq. Currently, Texas is the nation's leading producer of petroleum, followed by North Dakota, California, Alaska, and Oklahoma. About one-sixth of domestic production is from offshore wells.

Coal

Coal is a fossil fuel created from the remains of plants that lived and died millions to hundreds of millions of 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. Depending on consumption rates, the United States has about a 200 year supply of coal. A little less than 10% of the coal mined in the nation is exported to other countries. The top five coal producing states are Wyoming, West Virginia, Kentucky, Illinois, and Pennsylvania.

The major method for transporting coal is by train. Over 92 percent of the coal is used by electric utility companies, most of the rest is used by industry. A major effort is made to remove the sulfur found in coal before it is burned, and from the sulfur dioxide gas that is formed when it is burned.

Natural Gas

Natural gas, the cleanest burning fossil fuel, was formed hundreds of 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 up to 95 percent of the gas extracted from a gas well. The methane is separated from the other gases and is transported by pipeline to customers. About half of the nation's homes use natural gas for space heating. Natural gas is used most by the industrial sector (34.05 percent). The electric power sector (31.13 percent) and residential and commercial sectors (31.38 percent) also use a sizeable portion of our nation's natural gas. A small amount is used by the transportation sector.

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 six percent from offshore wells. Most natural gas production comes from Texas, Pennsylvania, Louisiana, Oklahoma, and Wyoming. The U.S. imports about 11 percent of total consumption, mostly from Canada 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 thermal 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 100 nuclear reactors in 62 plants operating in the U.S. The U.S. Navy even uses it to power some submarines. The majority 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. There is currently no permanent disposal facility in the U.S. for nuclear waste. Nuclear waste, or spent fuel, is stored on-site at nuclear plants. 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. Only 9.96 percent of the nation's propane 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 -44° 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 one percent of propane is used for transportation. Propane-fueled engines emit cleaner exhaust than gasoline engines.

Renewable Enigma Infosheet

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 46 percent of biomass energy comes from burning wood and 43 percent is made into biofuels such as ethanol. About 10 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 1882 on Fox River in Appleton, WI. Currently there are more than 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 in operation require maintenance and can undergo upgrades to become more efficient.

Geothermal

Geothermal energy comes from thermal energy within the Earth. The high temperatures are produced from the radioactive decay of elements deep below the Earth's surface and the immense pressure from the surrounding layers of the Earth. This thermal energy 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. In the past, 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 the midwest or western portions of the country, with Texas as the leading producer of wind energy. While wind energy is free, the equipment must be constructed and maintained. New wind turbines generate electricity about as cheaply as thermal power plants.

Since the wind doesn't blow constantly, wind turbines operate between 65 and 90 percent 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 small atoms are combined to form larger atoms. This process is called nuclear fusion. A small amount of mass is lost during this process and is converted into thermal and radiant energy. The energy radiates from the sun in all directions, but only a small amount 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 method concentrates the sun's rays on pipes to heat liquids to very high temperatures. The hot liquid creates 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 homes, calculators, and even emergency phones on highways. Solar energy is free to use and does not contribute to pollution. However, the installation of equipment can sometimes be costly, and cannot be used reliably on cloudy days or at nighttime.