Reading 3

Background on Energy

For as long as humans have lived, acquiring food has been a top priority. We require a certain amount of calories (a unit that measures the amount of energy stored in food) in order to survive. Over time, humans also learned to harness energy resources for purposes beyond basic survival.[1]

One of the first advancements humans made in the field of energy was the utilization of fire. Thousands of years ago, humans learned to use fire to cook their food and provide heat for their bodies. Why would cooking food before eating it be beneficial? Not only can cooking food such as meat kill harmful bacteria, but it also makes the food more digestible.[2] This means that a person's body might be able to absorb more calories from the same source, providing more energy.

Other advancements helped early human societies become more efficient in producing food calories, particularly agriculture. For a long time, however, we relied on direct energy sources, using animals, wind and water for transportation and wood fire for cooking and heating.

Energy Powers a Revolution

By the 1500s, England was using wood energy not only to cook food, but also to fuel its industry. British ships were built from wood and sailed using wind energy. Wood was also burned for fuel to manufacture materials such as steel and iron.[3]

Eventually, the use of wood outpaced regeneration of forests and the English were faced with a wood shortage, known as the timber famine. Between 1500 and 1630, people in England witnessed a sevenfold increase in the price of wood.[4] Although wood was the preferred fuel for heating and manufacturing at the time, the shortage and rising price of wood forced many people to turn to coal for fuel.[5] Coal was used as an energy source for much of human history, often for smelting metals. This replacement of wood with coal not only solved Britain's wood fuel crisis—it revolutionized industry.[6]

As the English began to deplete coal found near the surface of the earth, they started to dig coal mines deeper and deeper. This caused water to seep through the walls of the mines and flood them. To solve this problem, the steam engine was invented to pump water out of the mines. Coincidentally, coal became the main fuel used for steam engines.

People soon developed many other uses for the steam engine; it was used to power machines in factories, move trains, and fuel ships. As a result, people could move around the world faster than ever and machines could perform the work that used to require the labor of hundreds of people or animals. In the early 1700s, producing one kilogram of yarn by hand

The steam engine was invented during the Industrial Revolution to pump water out of coal mines.

required 1,100 hours of labor. By the early 1800s, it took only three hours of labor.[7] The widespread use of the steam engine revolutionized industry and established coal as one of its primary sources of energy.

Meanwhile, scientists had been experimenting with electricity. An important advancement came in the early 1800s, when the British physicist Michael Faraday showed that electricity could flow in a metal wire influenced by a changing magnetic field. However, until Nikola Tesla (a Serbian immigrant to the United States and an innovative scientist, engineer, and inventor) demonstrated how to transmit this electricity over long distances in the 1880s, electricity was not a practical supply of energy.[8] **Electricity** is a secondary form of energy resulting from the existence of charged particles, meaning that another form of energy such as coal or wind must be used to produce it.

Petroleum Moves Us

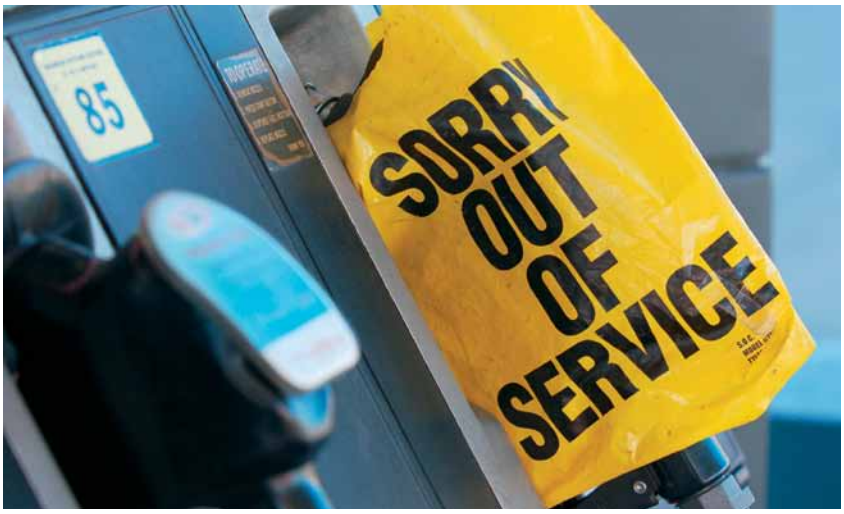
In the mid-1900s, petroleum (or oil) replaced coal as the world's leading fuel source.[9] Humans had been using oil that seeped up to the surface of the earth for thousands of years as adhesives, lubricants, and even medicine. As early as 347 C.E., people in China were using bamboo poles to dig oil wells 800 feet deep.[10] Over time, several historical events created a larger market for petroleum. First came the discovery of kerosene, a fuel made from petroleum. In 1849, a Canadian geologist named Abraham Gesner discovered how to make kerosene for lamp fuel.[11] Kerosene replaced whale oil (oil made from whale blubber), which had been the main energy source for lighting

electricity—A form of energy generated by the movement of charged particles; generally produced as a secondary form of energy by converting other forms of energy (such as coal or wind) into electricity.

CASE STUDY

The Oil Embargo of 1973

In 1973 on Yom Kippur, the holiest day of the year for the Jewish faith, Syria and Egypt attacked Israel in an effort to regain land taken by Israel during the 1967 war. In response, the United States decided to supply Israel with arms and the Soviet Union began supplying Egypt and Syria with arms. Arab members of Organization of the Petroleum Exporting Countries (OPEC) were against the U.S. decision to support Israel and announced an embargo, or ban, on trading oil with countries that supported Israel during the war.[12]



The Oil Embargo of 1973 limited the supply of oil and gas in the United States.

The Oil Embargo of 1973 caused global oil prices to spike and limited the supply of oil for a short time. In the United States, this ban—which was characterized by high oil and gas prices and shortages at the pump—prompted the federal government and citizens to adopt ways to conserve energy.[13] Even after the embargo was lifted, the price of gasoline and heating oil remained high and may have contributed to an economic recession in 1974 and 1975.[14]

Hiroshima, Japan experienced a nuclear bomb attack during World War II.

and whose supply was declining. In the early 20th century, the mass production of automobiles as well as the use of military transportation that ran on petroleum-based fuel helped to create a lasting market for oil products.

The Advent of Nuclear Energy

Beyond coal and oil, there have been significant advances in other sources of energy. Scientists knew at the beginning of the 1900s that atoms stored large amounts of energy. They learned that when an atom is split into smaller atoms (a process called **fission**), an incredible amount of heat and radiation is released. In the years leading up to World War II, scientists conducted research into nuclear energy with a focus on creating new weapons.[15]

On August 6, 1945, the United States dropped the first atomic bomb to ever be used in war on Hiroshima, Japan. Three days later the United States dropped a second bomb on Nagasaki, Japan. The official death toll from these bombs was over 200,000. Many of these deaths did not occur immediately; a large number of people died later from exposure to **radiation**.[16]

Approximately one year later, the U.S. government created the Atomic Energy Commission as an effort to encourage the development of peaceful uses of nuclear energy, primarily as an alternative to fossil fuels to produce electricity. Today several countries around the world use nuclear energy to generate electricity.[17]

fission—The process of splitting an atom into smaller parts; this releases a large amount of energy and one or more neutrons.

radiation—A type of energy given off by nuclear fission that can damage cells, cause cancer, and may lead to death.

CHECK FOR UNDERSTANDING

1. How has the consumption of energy by humans changed over time?
2. What are some recurring themes in the history of energy use?
3. What are some factors that influenced a group of people to transition from one main energy source to another?
4. How did the Oil Embaro of 1973 affect people in the United States?