



# Coal

## What is Coal?

**Coal** is a **fossil fuel** formed from the remains of plants that lived and died millions of years ago, when parts of the Earth were covered with huge swampy forests. Coal is called a **nonrenewable** energy source because it takes millions of years to form.

The energy we get from coal today came from the energy that plants absorbed from the sun millions of years ago. All living plants store energy from the sun. After the plants die, this energy is usually released as the plants decay. Under certain conditions, however, the decay is interrupted, preventing the release of the stored solar energy.

Millions of years ago, dead plant matter fell into swampy water. For thousands of years, a thick layer of dead plants lay decaying at the bottom of the swamps. Over time, the surface and climate of the Earth changed, and more water and dirt washed in, halting the decay process.

The weight of the top layers of water and dirt packed down the lower layers of plant matter. Under heat and pressure, this plant matter underwent chemical and physical changes, pushing out oxygen and leaving rich hydrocarbon deposits. What once had been plants gradually turned into coal.

## History of Coal in America

Native Americans used coal long before the first settlers arrived in the New World. Hopi Indians used coal to bake the pottery they made from clay.

European settlers discovered coal in North America during the first half of the 1600s. They used very little coal at first. Instead, they relied on water wheels and burning wood to power colonial industries.

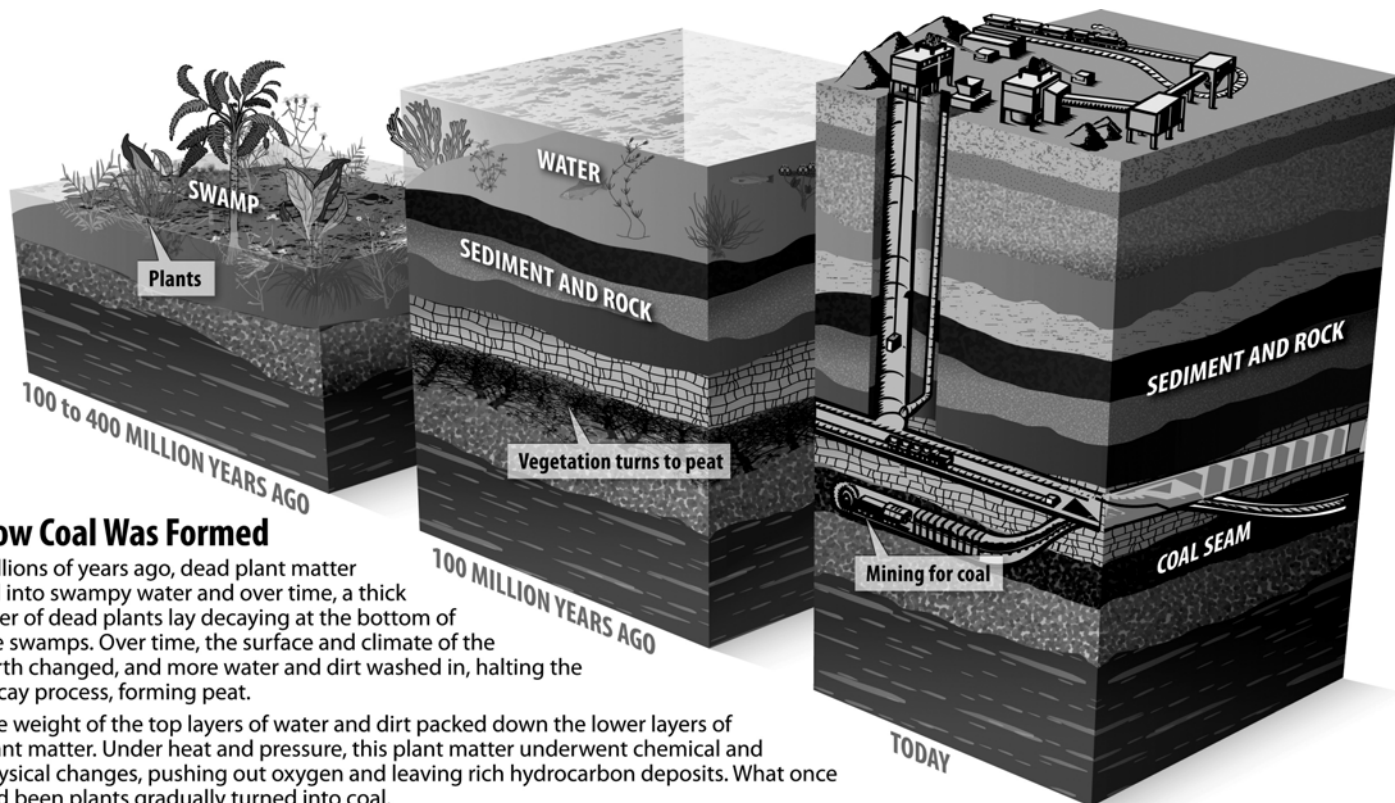
Coal became a powerhouse by the 1800s. People used coal to manufacture goods and to power steamships and railroad engines. By the time of the American Civil War, people also used coal to make iron and steel. And by the end of the 1800s, people began using coal to make electricity.

Today, coal provides one-fifth (20.9 percent) of America's energy needs. Almost half of our electricity comes from coal-fired plants.

## Coal Mining

Coal companies use two methods to mine coal: surface mining and underground mining.

**Surface mining** is used to extract about 70 percent of the coal in the



### How Coal Was Formed

Millions of years ago, dead plant matter fell into swampy water and over time, a thick layer of dead plants lay decaying at the bottom of the swamps. Over time, the surface and climate of the Earth changed, and more water and dirt washed in, halting the decay process, forming peat.

The weight of the top layers of water and dirt packed down the lower layers of plant matter. Under heat and pressure, this plant matter underwent chemical and physical changes, pushing out oxygen and leaving rich hydrocarbon deposits. What once had been plants gradually turned into coal.

Coal can be found deep underground (as shown in this graphic), or it can be found near the surface.

Note: not to scale

United States. Surface mining can be used when the coal is buried less than 200 feet underground. In surface mining, the topsoil and layers of rock are removed to expose large deposits of coal. The coal is then removed by huge machines. Once the mining is finished, the mined area is **reclaimed**. The dirt and rock are returned to the pit, the topsoil is replaced, and the area is seeded. The land can then be used for croplands, wildlife habitats, recreation, or offices and stores.

**Deep or underground mining** is used when the coal is buried deep within the Earth. Some underground mines are 1,000 feet deep! To remove coal from underground mines, miners are transported down mine shafts to run machines that dig out the coal.

## Processing and Transporting Coal

After coal comes out of the ground, it goes to a **preparation plant** for cleaning. The plant removes rock, ash, sulfur, and other impurities from the coal. Cleaning improves the heating value of coal.

After cleaning, the coal is ready to be shipped to market. Trains are used to transport most coal. Sometimes, river barges and trucks are used to ship coal. In one place, coal is crushed, mixed with water, and shipped through a pipeline. Deciding how to ship coal is very important because it can cost more to ship it than to mine it.

## Coal Reserves and Production

**Coal reserves** are beds of coal still in the ground that can be mined. The United States has the world's largest known coal reserves.

Depending on consumption rates, the U.S. has enough coal to last for 146 to 234 years.

**Coal production** is the amount of coal that is mined and sent to market. Coal is mined in 25 states. Wyoming mines the most, followed by West Virginia, Kentucky, Pennsylvania, and Montana.

## How Coal is Used

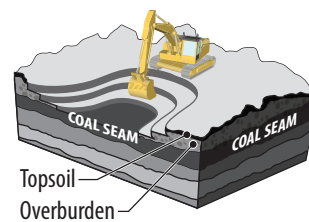
Over 93 percent of the coal mined in the U.S. today is used to make electricity. The steel and iron industries use coal for smelting metals. Other industries use coal, too. Paper, brick, limestone, and cement industries all use coal to make products. Very little coal is used for heating homes and buildings.

## Coal and the Environment

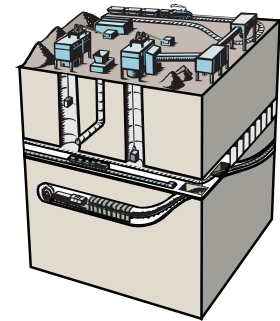
Burning coal produces emissions that can pollute the air. It also produces carbon dioxide, a greenhouse gas. When coal is burned, a chemical called sulfur may also be released. Sulfur mixes with oxygen to form sulfur dioxide, a chemical that can affect trees and water when it combines with moisture to produce **acid rain**.

Coal companies look for low-sulfur coal to mine. They work hard to remove sulfur and other impurities from the coal. Power plants are installing machines called **scrubbers** to remove most of the sulfur from coal smoke so it doesn't get into the air. Other by-products, like the ash that is left after coal is burned, once were sent to landfills. Now they are being used to build roads, make cement, and make ocean reefs for animal habitats.

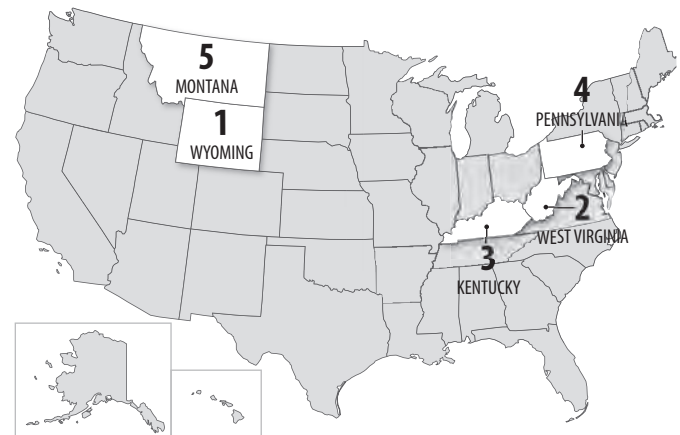
### Surface Mining



### Deep Mining

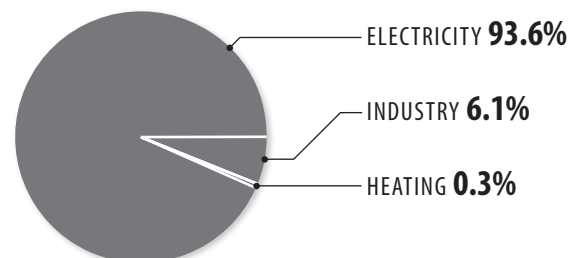


### Top Coal Producing States, 2009



Data: Energy Information Administration

### U.S. Coal Consumption by Sector, 2009



Data: Energy Information Administration

### COAL MINERS

