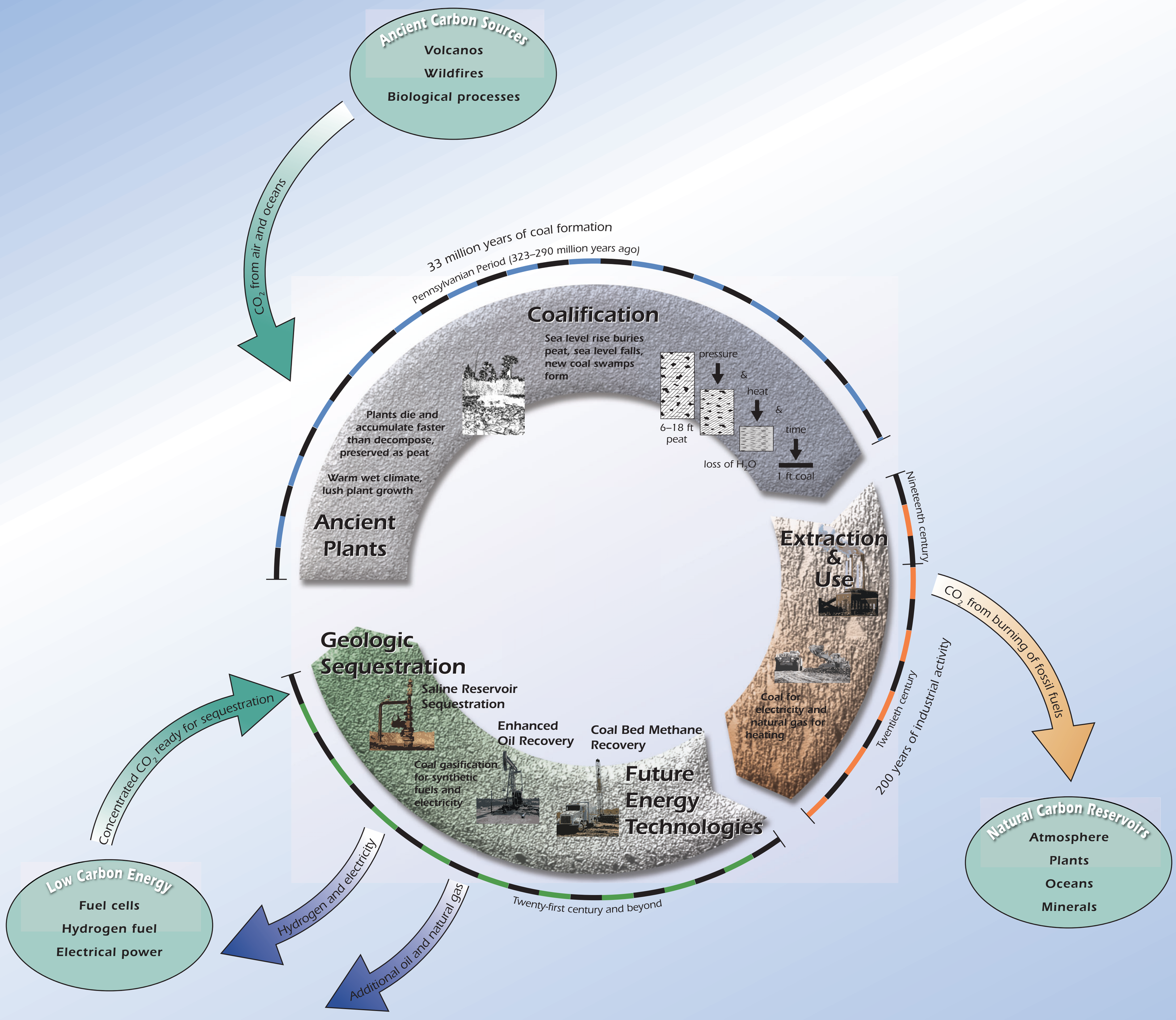
Energy from Coal in the Illinois Basin



The energy in our coal is really 300-million-year-old sunlight!

The story of coal in the Illinois Basin began 323–290 million years ago during the Pennsylvanian Period. At that time, the Illinois Basin lay at the equator and was the site of a muddy, delta swamp. The fertile delta was home to towering trees and many varieties of plants. The ancient plants used carbon dioxide (CO_2) from the atmosphere and sunlight during photosynthesis to produce food in the form of sugars called carbohydrates, which provided the energy necessary for them to grow. The cycle of plants growing, dying, and being buried in the delta continued for millions of years. Carbon from the dead and buried plants remained in the ground as the plants decayed. More and more plant material was deposited over the older layers of plants, and, over time and with added heat and pressure due to burial, the organic material turned into peat and, eventually, into the rock coal.

Throughout this and earlier periods, carbon dioxide was emitted into the atmosphere through natural processes such as volcanic eruptions, wildfires, and biological decay. Greenhouse gases, such as carbon dioxide, water vapor, and methane, help trap heat from the Sun's rays in the Earth's atmosphere. The Sun's rays enter the atmosphere and hit the Earth, where some of the energy is absorbed and some is reflected back into space. Greenhouse gases trap some of this radiated energy before it reaches space. Carbon dioxide is necessary to life on Earth. However, too much of a good thing can be harmful. As more greenhouse gases become present in the atmosphere, more radiated energy is trapped than in the past. This process heats the atmosphere and contributes to an overall warming of the planet.

Using Our Natural Resources

Fossil fuels, such as coal, natural gas, and oil are limited natural resources that provide energy we depend upon. When burned, coal gives off energy that heats water into steam that turns turbines, which creates electricity. We use coal to fuel our power plants and factories. Worldwide consumption of fossil fuels releases huge quantities of CO_2 into the atmosphere. Since the beginning of the Industrial Revolution in the early 1800s, the CO_2 concentration has risen by around 40%. Many scientists think that the more that CO_2 builds up in the atmosphere, the more the Earth might warm over time, creating substantial changes in our climate.

Burning coal creates CO_2 when carbon atoms in the coal combine with oxygen in the atmosphere. The majority of this ancient carbon is being put back into the atmosphere and at much greater rates than those during the millions of years it took for the plants to grow, die, get buried, and turn into coal. However, some of the CO_2 is removed from the atmosphere by plants during photosynthesis or dissolves into surface waters and the oceans.

Returning ancient carbon, as CO_2, to the atmosphere at our present rate may be contributing to global warming. The Earth's atmosphere is an environment that needs protecting just like wetlands, groundwater sources, and forests. Finding ways to decrease the amount of greenhouse gases we add to the atmosphere and still utilize our vast coal resources is an important environmental goal.

Developing New Energy Technologies and Geological Sequestration

The Illinois Basin, which includes Illinois, western Indiana, and western Kentucky, is home to industrial activity that releases more than 283 million metric tonnes of CO_2 annually from stationary sources like electric power plants, refineries, cement plants, and other industrial facilities. Combining alternative fuel sources, bridge technologies, and conservation becomes increasingly necessary as energy use in the Illinois Basin and throughout the world increases. Alternative energy resources are being explored, and research on new energy technologies, such as coal gasification, hydrogen fuel, and carbon sequestration is under way. However, cradle-to-grave carbon management technology will take time to develop and implement. Bridge technologies, such as geologic carbon sequestration, a process that stores CO_2 deep underground in rock formations, provide valuable time. Carbon sequestration may be an important factor in the future of the Illinois Basin because of our abundant coal resources. When viable methods of CO_2 sequestration are established, Illinois has enough coal to supply energy for approximately the next 250 years—enough time to develop alternative energy options.

Three types of geological carbon sequestration are being explored in the Illinois Basin: using CO_2 to produce coal bed methane, using CO_2 to enhance oil recovery, and using saline reservoirs for storage. Storing CO_2 in the earth provides a way of decreasing the amount of CO_2 we are putting into the atmosphere while helping to keep our Midwest regional economy strong by creating markets for the use of Illinois Basin fossil fuels.

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