Union of Concerned Scientists

The Hidden Cost of Fossil Fuels

Fossil fuels—coal, oil, and natural gas—are America's primary source of energy, accounting for 85 percent of current US fuel use. Some of the costs of using these fuels are obvious, such as the cost of labor to mine for coal or drill for oil, of labor and materials to build energy-generating plants, and of transportation of coal and oil to the plants. These costs are included in our electricity bills or in the purchase price of gasoline for cars.

But some energy costs are not included in consumer utility or gas bills, nor are they paid for by the companies that produce or sell the energy. These include human health problems caused by air pollution from the burning of coal and oil; damage to land from coal mining and to miners from black lung disease; environmental degradation caused by global warming, acid rain, and water pollution; and national security costs, such as protecting foreign sources of oil.

Since such costs are indirect and difficult to determine, they have traditionally remained external to the energy pricing system, and are thus often referred to as externalities. And since the producers and the users of energy do not pay for these costs, society as a whole must pay for them. But this pricing system masks the true costs of fossil fuels and results in damage to human health, the environment, and the economy.

Environmental Impacts of Fossil Fuel Use
Many of the environmental problems our country faces today result from our fossil fuel dependence. These impacts include global warming, air quality deterioration, oil spills, and acid rain.

Global Warming
Among the gases emitted when fossil fuels are burned, one of the most significant is carbon dioxide, a gas that traps heat in the earth's atmosphere. Over the last 150 years, burning fossil fuels has resulted in more than a 25 percent increase in the amount of carbon dioxide in our atmosphere. Fossil fuels are also implicated in increased levels of atmospheric methane and nitrous oxide, although they are not the major source of these gases.

Since reliable records began in the late 1800s, the global average surface temperature has risen 0.5-1.1 degrees Fahrenheit (0.3-0.6 degrees Celsius). Scientists with the Intergovernmental Panel on Climate Change concluded in a 1995 report that the observed increase

in global average temperature over the last century "is unlikely to be entirely natural in origin" and that "the balance of evidence suggests that there is a discernible human influence on global climate."

Climate scientists predict that if carbon dioxide levels continue to increase, the planet will become warmer in the next century. Projected temperature increases will most likely result in a variety of impacts. In coastal areas, sea-level rise due to the warming of the oceans and the melting of glaciers may lead to the inundation of wetlands, river deltas, and even populated areas. Altered weather patterns may result in more extreme weather events. And inland agricultural zones could suffer an increase in the frequency of droughts.

Air Pollution

Clean air is essential to life and good health. Several important pollutants are produced by fossil fuel combustion: carbon monoxide, nitrogen oxides, sulfur oxides, and hydrocarbons. In addition, total suspended particulates contribute to air pollution, and nitrogen oxides and hydrocarbons can combine in the atmosphere to form tropospheric ozone, the major constituent of smog.

Carbon monoxide is a gas formed as a by-product during the incomplete combustion of all fossil fuels. Exposure to carbon monoxide can cause headaches and place additional stress on people with heart disease. Cars and trucks are the primary source of carbon monoxide emissions.

Two oxides of nitrogen--nitrogen dioxide and nitric oxide--are formed in combustion. Nitrogen oxides appear as yellowish-brown clouds over many city skylines. They can irritate the lungs, cause bronchitis and pneumonia, and decrease resistance to respiratory infections. They also lead to the formation of smog. The transportation sector is responsible for close to half of the US emissions of nitrogen oxides; power plants produce most of the rest.

Sulfur oxides are produced by the oxidization of the available sulfur in a fuel. Utilities that use coal to generate electricity produce two-thirds of the nation's sulfur dioxide emissions. Nitrogen oxides and sulfur oxides are important constituents of acid rain. These gases combine with water vapor in clouds to form sulfuric and nitric acids, which become part of rain and snow. As the acids accumulate, lakes and rivers become too acidic for plant and animal life. Acid rain also affects crops and buildings.

Hydrocarbons are a broad class of pollutants made up of hundreds of specific compounds containing carbon and hydrogen. The simplest hydrocarbon, methane, does not readily react with nitrogen oxides to form smog, but most other hydrocarbons do. Hydrocarbons are emitted from human-made sources such as auto and truck exhaust, evaporation of gasoline and solvents, and petroleum refining.

The white haze that can be seen over many cities is tropospheric ozone, or smog. This gas is not emitted directly into the air; rather, it is formed when ozone precursors mainly nonmethane hydrocarbons and nitrogen oxides react in the presence of heat and sunlight. Human exposure to ozone can produce shortness of breath and, over time, permanent lung damage. Research shows that ozone may be harmful at levels even lower than the current federal air standard. In addition, it can reduce crop yields.

Finally, fossil fuel use also produces particulates, including dust, soot, smoke, and other suspended matter, which are respiratory irritants. In addition, particulates may contribute to acid rain formation.

Water and Land Pollution

Production, transportation, and use of oil can cause water pollution. Oil spills, for example, leave waterways and their surrounding shores uninhabitable for some time. Such spills often result in the loss of plant and animal life. Coal mining also contributes to water pollution. Coal contains pyrite, a sulfur compound; as water washes through mines, this compound forms a dilute acid, which is then washed into nearby rivers and streams.

Coal mining, especially strip mining, affects the area that is being mined. Characteristically, the material closest to the coal is acidic. After the mining is completed, the land will remain barren unless special precautions are taken to ensure that proper topsoil is used when the area is replanted. Materials other than coal are also brought to the surface in the coal mining process, and these are left as solid wastes. As the coal itself is washed, more waste material is left. Finally, as the coal is burned, the remaining ash is left as a waste product.

Thermal Pollution

During the electricity-generation process, burning fossil fuels produce heat energy, some of which is used to generate electricity. Because the process is inefficient, much of the heat is released to the atmosphere or to water that is used as a coolant. Heated air is not a problem, but heated water, once returned to rivers or lakes, can upset the aquatic ecosystem.

National Security Impacts of Fossil Fuel Use

Our nation's fossil fuel dependence means that, to ensure our supply, we may be forced to protect foreign sources of oil. The Persian Gulf War is a perfect example: US troops were sent to the Gulf in part to guard against a possible cutoff of our oil supply. Although the war is over, through taxes we are continuing to pay for protecting oil supplies with our armed forces. Not only were billions of dollars spent in protecting the oil, but lives were lost as well.

Reliance on Middle East oil also creates a danger of fuel price shocks or shortages if supply is disrupted. Today, about one-third of our oil comes from the Middle East. By 2030, if we do not change our energy

policy, we may be relying on Middle East oil for two-thirds of our supply.

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