Energy

One-fifth of the world's population now accounts for 70 percent of the world's energy use. A U.S. citizen uses as much as 330 citizens of Bangladesh.

Fossil fuels supply 88 percent of the world's purchased energy. The Middle East now holds two-thirds of the worlds reserves.

Oil is crucial for agriculture because it is the main feed stock for fertilizer and petrochemicals as well as the fuel for tractors and irrigation pumps.

The use of oil has serious environmental consequences. The Exxon Valdez accident off the Alaska coast in 1989 dramatized the damage to wildlife and coastal beauty that a single human error can perpetrate.

Auto air pollution adds 40 billion dollars to annual American medical bills.

Coal and the environment

There are considerable *environmental impacts* from the mining of coal. Deep mining wastes have depressed land values, polluted streams, and marred areas of great natural beauty around the world. The strip mining of surface coal has left large areas denuted and subject to rapid erosion.

Burning coal has even greater human environmental costs than mining at. Since late '60s the effects of acid rain on the forests and lakes of Europe and North America have been increasing.

In Greece, public monuments and statues had deteriorated more in the last 25 years than in the previous 2400 years.

Newer "clean coal technologies," such as fluidized bed combustion and multi-stage combustion, offer the prospect of cheaper control of both SO_2 and CO_2. The cost of the damage from the emissions clearly exceeds the cost of the control technology.

Global warming and the green hourse effect

Fossil fuels have increased to CO_2 content of the air by 25 percent in the past hundred years. At the present emission rate it will have doubled by 2030.

The five warmest years in the last century were all in the 1980s.

If at present emission rates the CO_2 concentration would double by 2030, and the average surface temperature would rise between 3 to 5.5° C (5 to 10° F). The potential consequences are so great that we must not only intensify research on the problem to initiate preventive policies.

Natural gas is more abundant globally than oil and more widely dispersed. The smaller amount of CO_2 released per unit of heat, means that only two-fifths as much CO_2 is emitted as a coal burning plant of equivalent capacity.

A carbon tax would be an effective way for industrial nations to reduced CO_2 emissions.

Nuclear power

In 1990, 421 nuclear plants were operating in 26 countries (with 96 more under construction), generating 17 percent of the worlds electricity.

Two major reactor accidents, Three Mile Island, and Chernobyl have caused concern. At Three Mile Island in 1979, a partial melt down occurred and 90 percent of the fuel rods burst, but very little radiation escaped from the containment vessel. At Chernobyl in 1986 an explosion and a fire in a graphite moderated reactor spread large quantities of radiation across Europe. Thirty-One workers at the plant died within a few weeks. It has been estimated that the radiation will result in the death 28,000 from delayed cancer over the next fifty years.

The *acceptability* of a risk involves many factors in addition to probability and consequences. Nuclear power is less acceptable than conventional risk analysts suggest. Risk analysis of nuclear plants assumes stable social conditions and leaves out the possibility of wars, civil conflicts, were deliberate acts of sabotage, terrorism, or threat.

Radioactive wastes and future generations

Many of the waste products must be isolated a 1000 years, and plutonium itself is still dangerous after 100,000 years.

Regional justice

Radioactive waste disposal is an extreme case of local risks for national benefits. Utilitarians may assert that the total benefits outweigh the total risks, but justice is violated if some people benefit and others sustain the risks. People recognize that the wastes must go somewhere, but they assert, "not in my backyard."

Inter-generational justice

Justice is violated when the current generation benefits from electricity and passes onto future generations some of the resulting risks. Radiation released from a nuclear waste depository should not cause more than 1000 deaths in 10,000 years.

Retrievable storage with tight security measures to guard against flooding, drilling, or sabotage would require a “nuclear priesthood” of highly disciplined technicians to maintain surveillance and guard the buried wastes. But it is unrealistic to count on the stability of social institutions on a time scale of 10,000 years. No social order in history has lasted more than a few centuries.

The future of nuclear power

If waste disposal problems can be solved, should nuclear power be reconsider now that coal seems to pose such a threat to the environment? *Passively stable* ("inherently safe") reactors rely on the laws of nature, rather than on human intervention of mechanical systems, to limit the effects of any malfunction's. If we learn from the mistakes of the past, we would develop a second generation of nuclear reactors only slowly and cautiously.

The United States rejected both breeders and reprocessing because they involve the transportation of plutonium. It takes only 20 pounds of plutonium to make a bomb. Plutonium can be handled with relative ease, and a theft during storage or shipment would be tempting to small nations or revolutionary groups.

Fusion

Fusion temperatures necessary for self-sustained reaction have proved so difficult to achieve even in the laboratory that commercial fusion remains at least fifty years away.