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Issues: Nuclear Energy & Waste: Nuclear Energy Fact SheetMore follow-up, Anna. Read this through, and see if you still feel the same way.

John Galbraith.

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Issues Nuclear Energy & Waste Nuclear Energy - Fact Sheet

Introduction to Nuclear Energy for Civilian Purposes

a.. Most early atomic research focused on developing an effective weapon for use in World War II. After the war, the United States government encouraged the development of nuclear energy for peaceful civilian purposes while continuing to develop, test, and deploy new nuclear weapons.

b.. The Experimental Breeder Reactor I at a site in Idaho generated the first electricity from nuclear energy on December 20, 1951.

c.. 16% of the world's electricity now comes from nuclear energy, 85% of which is concentrated in industrialized countries. A total of 441 nuclear power plants were operating as of February 2003. There were also 32 nuclear reactors under construction (Nuclear Energy Institute).

d.. In the United States alone, there are 103 nuclear power plants, which provide about 20% of the nation's electricity.

e.. A new nuclear power plant has not been ordered in the U.S. since 1973.

f.. Today, President George W. Bush's energy policies call for a $15 billion federal subsidy to build six or seven new nuclear power plants.

1. How It Works - The Scientific Process Behind Nuclear Energy

a.. Nuclear energy relies on the fact that some elements can be split (in a process called fission) and will release part of their energy as heat.

a.. Because it fissions easily, Uranium-235 (U-235) is one of the elements most commonly used to produce nuclear energy. It is generally used in a mixture with Uranium-238, and produces Plutonium-239 (Pu-239) as waste in the process.

a.. A nuclear power plant generates electricity like any other steam-electric power plant. Water is heated, and steam from the boiling water turns turbines and generates electricity.

a.. The main difference in the various types of steam-electric plants is the heat source. Coal, oil, or gas is burned in other power plants to heat the water. Heat from a chain reaction of fissioning Uranium-235 boils the water in a nuclear power plant. Some have compared this process to using a canon to kill a fly.

2. How It Doesn't Work - Risks and Dangers of Nuclear Energy

a.. Proliferation Risks

a.. Plutonium is a man-made waste product of nuclear fission, which can be used either for fuel in nuclear power plants or for bombs.

b.. In the year 2000, an estimated 310 tons (620,000 pounds) of civilian, weapons-usable plutonium had been produced.

c.. Less than 8 kilograms (about 18 pounds) of plutonium is enough for one Nagasaki-type bomb. Thus, in the year 2000 alone, enough plutonium was created to make more than 34,000 nuclear

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weapons.

d.. The technology for producing nuclear energy that is shared among nations, particularly the process that turns raw uranium into lowly-enriched uranium, can also be used to produce highly-enriched, weapons-grade uranium.

e.. The International Atomic Energy Agency (IAEA) is responsible for monitoring the world's nuclear facilities and for preventing weapons proliferation, but their safeguards have serious shortcomings. Though the IAEA is promoting additional safeguards agreements to increase the effectiveness of their inspections, the agency acknowledges that, due to measurement uncertainties, it cannot detect all possible diversions of nuclear material. (Nuclear Control Institute)

b.. Risk of Accident

a.. On April 26, 1986 the No. 4 reactor at the Chernobyl power plant (in the former U.S.S.R., present-day Ukraine) exploded, causing the worst nuclear accident ever.

a.. 30 people were killed instantly, including 28 from radiation exposure, and a further 209 on site were treated for acute radiation poisoning.

b.. The World Health Organization found that the fallout from the explosion was incredibly far-reaching. For a time, radiation levels in Scotland, over 1400 miles (about 2300 km) away, were 10,000 times the norm.

c.. Thousands of cancer deaths were a direct result of the accident.

d.. The accident cost the former Soviet Union more than three times the economical benefits accrued from the operation of every other Soviet nuclear power plant operated between 1954 and 1990.

b.. In March of 1979 equipment failures and human error contributed to an accident at the Three Mile Island nuclear reactor at Harrisburg, Pennsylvania, the worst such accident in U.S. history. Consequences of the incident include radiation contamination of surrounding areas, increased cases of thyroid cancer, and plant mutations.

c.. According to the US House of Representatives, Subcommittee on Oversight & Investigations, "Calculation of Reactor Accident Consequences (CRAC2) for US Nuclear Power Plants" (1982, 1997), an accident at a US nuclear power plant could kill more people than were killed by the atomic bomb dropped on Nagasaki.

c.. Environmental Degradation

a.. All the steps in the complex process of creating nuclear energy entail environmental hazards.

b.. The mining of uranium, as well as its refining and enrichment, and the production of plutonium produce radioactive isotopes that contaminate the surrounding area, including the groundwater, air, land, plants, and equipment. As a result, humans and the entire ecosystem are adversely and profoundly affected.

c.. Some of these radioactive isotopes are extraordinarily long-lived, remaining toxic for hundreds of thousands of years. Presently, we are only beginning to observe and experience the consequences of producing nuclear energy

d.. Nuclear Waste

a.. Nuclear waste is produced in many different ways. There are wastes produced in the reactor core, wastes created as a result of radioactive contamination, and wastes produced as a byproduct of uranium mining, refining, and enrichment. The vast majority of radiation in nuclear waste is given off from spent fuel rods.

b.. A typical reactor will generate 20 to 30 tons of high-level nuclear waste annually. There is no known way to safely dispose of this waste, which remains dangerously radioactive until it naturally decays.

c.. The rate of decay of a radioactive isotope is called its half-life, the time in which half the initial amount of atoms present takes to decay. The half-life of Plutonium-239, one particularly lethal component of nuclear waste, is 24,000 years.

d.. The hazardous life of a radioactive element (the length of time that must elapse before the material is considered safe) is at least 10 half-lives. Therefore, Plutonium-239 will remain hazardous for at least 240,000 years.

e.. There is a current proposal to dump nuclear waste at Yucca Mountain, Nevada.

a.. The plan is for Yucca Mountain to hold all of the high level nuclear waste ever produced from every nuclear power plant in the US. However, that would completely fill up the site and not account for future waste.

b.. Transporting the wastes by truck and rail would be extremely dangerous.

c.. For a more detailed analysis of the problems of and risks incurred by the plan, see Top Ten Reasons to Oppose the DoE's Yucca Mountain Plan

f.. Repository sites in Australia, Argentina, China, southern Africa, and Russia have also been considered.

g.. Though some countries reprocess nuclear waste (in essence, preparing it to send through the cycle again to create more energy), this process is banned in the U.S. due to increased proliferation risks, as the reprocessed materials can also be used for making bombs. Reprocessing is also not a solution because it just creates additional nuclear waste.

h.. The best action would be to cease producing nuclear energy (and waste), to leave the existing waste where it is, and to immobilize it. There are a few different methods of waste immobilization. In the vitrification process, waste is combined with glass-forming materials and melted. Once the materials solidify, the waste is trapped inside and can't easily be released.

3. Sustainable Energy Alternatives

There are many alternative energy sources that are sustainable and do not pose the accident risks inherent in nuclear energy production. These sources include:

a.. Bioenergy: biomass, such as plant matter and animal waste, can yield power, heat, steam, and fuel.

b.. Geothermal: renewable heat energy can be harnessed from deep within the earth.

c.. Wind: turbines turning in the air convert kinetic energy in the wind into electricity.

d.. Solar: the sun's energy can be captured and used to produce heat and electricity.

e.. Hydrogen: if produced by renewable sources, it can power fuel cells to convert chemical energy directly into electricity, with useful heat and water as the only byproducts.

f.. Tidal: using the movement of the ocean to power turbines and generate electricity.

g.. Many more sustainable resources could be found and current resources improved if better technology were available and if the government and utilities actively promoted their development.

h.. Sustainable energy links:

a.. Renewable Energy Policy Project (a CREST site)

b.. Sustainable Energy Coalition

c.. Renewable Energy

4. Additional Online Resources on Nuclear Energy

1.. History of Nuclear Energy

2.. Institute for Energy and Environmental Research (IEER)

3.. Nuclear Energy Information Service (NEIS)

4.. Nuclearfiles, Nuclear Energy

5.. Nuclear Information and Resource Service (NIRS)

6.. Nuclear Control Institute (NCI)

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