Nuclear Power Is the Problem, Not A Solution

By Dr. Helen Caldicott
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There is a huge propaganda push by the nuclear industry to justify nuclear power as a panacea for the reduction of global-warming gases.

In fact, Leslie Kemeny on these pages two weeks ago suggested that courses on nuclear science and engineering be included in tertiary level institutions in Australia.

I agree. But I would suggest that all the relevant facts be taught to students. Mandatory courses in medical schools should embrace the short and long-term biological, genetic and medical dangers associated with the nuclear fuel cycle. Business students should examine the true costs associated with the production of nuclear power. Engineering students should become familiar with the profound problems associated with the storage of long-lived radioactive waste, the human fallibilities that have created the most serious nuclear accidents in history and the ongoing history of near-misses and near-meltdowns in the industry.

At present there are 442 nuclear reactors in operation around the world. If, as the nuclear industry suggests, nuclear power were to replace fossil fuels on a large scale, it would be necessary to build 2,000 large, 1000-megawatt reactors. Considering that no new nuclear reactor has been ordered in the U.S. since 1978, this proposal is less than practical. Furthermore, even if we decided today to replace all fossil-fuel-generated electricity with nuclear power, there would only be enough economically viable uranium to fuel the reactors for three or four years.

The true economies of the nuclear industry are never fully accounted for. The cost of uranium enrichment is subsidized by the U.S. government. The true cost of the industry's liability in the case of an accident in the U.S. is estimated to be $560 billion, but the industry would only pay $9.1 billion — 98 percent of the insurance liability is covered by the U.S. federal government. The cost of decommissioning all the existing U.S. nuclear reactors is estimated to be $33 billion. These costs — plus the enormous expense involved in the storage of radioactive waste for a quarter of a million years — are not included in the economic assessments of nuclear electricity.

It is said that nuclear power is emission-free. The truth is very different.

In the U.S., where much of the world's uranium is enriched, including Australia's, the enrichment facility at Paducah, Kentucky, requires the electrical output of two 1000-megawatt coal-fired plants, which emit large quantities of carbon dioxide, the gas responsible for 50 percent of global warming.

Also, this enrichment facility and another at Portsmouth, Ohio, release from leaky pipes 93 percent of the chlorofluorocarbon gas emitted yearly in the U.S. The production and release of CFC gas is now banned internationally by the Montreal Protocol because it is the main culprit responsible for stratospheric ozone depletion. But CFC is also a global warmer, 10,000 to 20,000 times more potent than carbon dioxide.

In fact, the nuclear fuel cycle utilizes large quantities of fossil fuel at all of its stages — the mining and milling of uranium, the construction of the nuclear reactor and cooling towers, robotic decommissioning of the intensely radioactive reactor at the end of its 20 to 40-year operating lifetime, and transportation and long-term storage of massive quantities of radioactive waste.

In summary, nuclear power produces, according to a 2004 study by Jan Willem Storm van Leeuwen and Philip Smith, only three times fewer greenhouse gases than modern natural-gas power stations.

Contrary to the nuclear industry's propaganda, nuclear power is therefore not green and it is certainly not clean. Nuclear reactors consistently release millions of curies of radioactive isotopes into the air and water each year. These releases are unregulated because the nuclear industry considers these particular radioactive elements to be biologically inconsequential. This is not so.

These unregulated isotopes include the noble gases krypton, xenon and argon, which are fat-soluble and if inhaled by persons living near a nuclear reactor, are absorbed through the lungs, migrating to the fatty tissues of the body, including the abdominal fat pad and upper thighs, near the reproductive organs. These radioactive elements, which emit high-energy gamma radiation, can mutate the genes in the eggs and sperm and cause genetic disease.

Tritium, another biologically significant gas, is also routinely emitted from nuclear reactors. Tritium is composed of three atoms of hydrogen, which combine with oxygen, forming radioactive water, which is absorbed through the skin, lungs and digestive system. It is incorporated into the DNA molecule, where it is mutagenic.

The dire subject of massive quantities of radioactive waste accruing at the 442 nuclear reactors across the world is also rarely, if ever, addressed by the nuclear industry. Each typical 1000-megawatt nuclear reactor manufactures 33 tons of thermally hot, intensely radioactive waste per year.

Already more than 80,000 tons of highly radioactive waste sits in cooling pools next to the 103 U.S. nuclear power plants, awaiting transportation to a storage facility yet to be found. This dangerous material will be an attractive target for terrorist sabotage as it travels through 39 states on roads and railway lines for the next 25 years.

But the long-term storage of radioactive waste continues to pose a problem. The U.S. Congress in 1987 chose Yucca Mountain in Nevada, 150 km northwest of Las Vegas, as a repository for America's high-level waste. But Yucca Mountain has subsequently been found to be unsuitable for the long-term storage of high-level waste because it is a volcanic mountain made of permeable pumice stone and it is transected by 32 earthquake faults. Last week a congressional committee discovered fabricated data about water infiltration and cask corrosion in Yucca Mountain that had been produced by personnel in the U.S. Geological Survey. These startling revelations, according to most experts, have almost disqualified Yucca Mountain as a waste repository, meaning that the U.S. now has nowhere to deposit its expanding nuclear waste inventory.

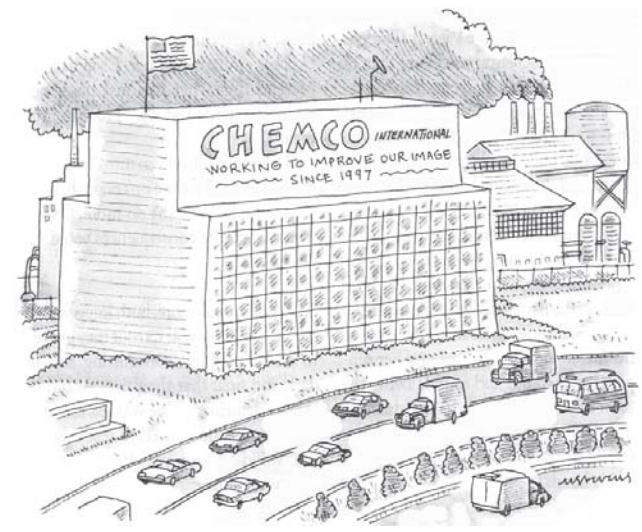
To make matters worse, a study released last week by the National Academy of Sciences shows that the cooling pools at nuclear reactors, which store 10 to 30 times more radioactive material than that contained in the reactor core, are subject to catastrophic attacks by terrorists, which could unleash an inferno and release massive quantities of deadly radiation — significantly worse than the radiation released by Chernobyl, according to some scientists.

This vulnerable high-level nuclear waste contained in the cooling pools at 103 nuclear power plants in the U.S. includes hundreds of radioactive elements that have different biological impacts in the human body, the most important being cancer and genetic diseases.

The incubation time for cancer is five to 50 years following exposure to radiation. It is important to note that children, old people and immuno-compromised individuals are many times more sensitive to the malignant effects of radiation than other people.

I will describe four of the most dangerous elements made in nuclear power plants.

Iodine-131, which was released at the nuclear accidents at Sellafield in Britain, Chernobyl in Ukraine and Three Mile Island in the U.S., is radioactive for only six weeks and it bio-concentrates in leafy vegetables and milk. When it enters the human body via the gut and the lung, it migrates to the thyroid gland in the neck, where it can later induce thyroid cancer. In Belarus more than 2,000 children have had their thyroids removed for thyroid cancer, a situation never before recorded in pediatric literature.



Strontium-90 lasts for 600 years. As a calcium analogue, it concentrates in cow and goat milk. It accumulates in the human breast during lactation, and in bone, where it can later induce breast cancer, bone cancer and leukemia.

Cesium-137, which also lasts for 600 years, concentrates in the food chain, particularly meat. On entering the human body, it locates in muscle, where it can induce a malignant muscle cancer called a sarcoma.

Plutonium-239, one of the most dangerous elements known to humans, is so toxic that one-millionth of a gram is carcinogenic. Plutonium is handled like iron in the body, and is therefore stored in the liver, where it causes liver cancer, and in the bone, where it can induce bone cancer and blood malignancies. On inhalation it causes lung cancer. It also crosses the placenta, where, like the drug thalidomide, it can cause severe congenital deformities. Plutonium has a predisposition for the testies, where it can cause testicular cancer and induce genetic diseases in future generations. Plutonium lasts for 500,000 years, living on to induce cancer and genetic diseases in future generations of plants, animals and humans.

Plutonium is also the fuel for nuclear weapons — only 5 kg is necessary to make a bomb and each reactor makes more than 200 kg per year. Therefore any country with a nuclear power plant can theoretically manufacture 40 bombs a year.

Because nuclear power leaves a toxic legacy to all future generations, because it produces global warming gases, because it is far more expensive than any other form of electricity generation, and because it can trigger proliferation of nuclear weapons, these topics need urgently to be introduced into the tertiary educational system of Australia, which is host to 30 percent to 40 percent of the world's richest uranium.

Dr. Helen Caldicott is an anti-nuclear campaigner and founder and president of the Nuclear Policy Research Institute, which warns of the danger of nuclear energy.

Reprocessing Revisited

In May, the House Energy and Water Appropriations Committee approved a $10 million proposal to consider moving highly radioactive used reactor fuel to "interim" storage sites in Idaho, Washington and Georgia. The proposal also directs the DOE to speed research on "recycling" technologies, indicating a possible return to the "reprocessing" of used reactor fuel, a dangerous, waste-generating extraction technique largely abandoned by the U.S. in the 70s. If passed by the Senate, "Mobile Chernobyl" shipments of the reactor waste to the three sites could begin as early as 2006.

Rep. David Hobson, R-Ohio, who led the proposal, said his purpose was to provide a cushion for the scandal-ridden Yucca Mountain dump which may never open. (See "Fear and Lying," p. 4) "It helps bridge the time until [Yucca Mountain] is open, and it helps underwriters," Hobson said. The underwriters Hobson refers to are the financial institutions which are hesitant to loan billions of dollars for the construction of new nuclear reactors in the face of uncertainty about how waste reactor fuel will be managed.

Rep. Hobson argued that it is "time to rethink our reluctance to reprocessing fuel." According to the subcommittee, the DOE will have to choose a process for "recycling" nuclear waste by 2007.

Reprocessing commercial irradiated nuclear fuel involves chemically separating uranium-235 and plutonium from the waste fuel. The uranium can then be reused as reactor fuel, and the plutonium for nuclear weapons. Reprocessing is not recycling — it's an extremely polluting process that produces millions of gallons of liquid high-level waste. The Savannah River Site in Georgia, where a reprocessing mill operated from the mid-1950s to the early 1990s, holds the most radioactive waste in the country — over 30 million gallons of high-level liquids and sludges containing caustic chemicals and a laundry list of radioactive isotopes created inside the reactors. The two other possible interim sites, the Idaho National Engineering Laboratory and the Hanford Reservation in eastern Washington, have also reprocessed reactor fuel to make H-bombs during the cold war, and are likewise saddled with millions of gallons of high-level waste.

Huge Leak at British Reprocessing Facility

A catastrophic leak of highly radioactive fuel dissolved in nitric acid was discovered at the Thorp reprocessing site at the Sellafield facility in Cumbria, England on May 8. The toxic mixture, containing about 20 tons of uranium and plutonium, is enough to fill half of an Olympic-size swimming pool. It was contained in a huge stainless steel chamber that is now impossible to enter. The facility is closed indefinitely.

The Thorp facility reprocesses hot waste fuel from reactors to provide plutonium for Britain's nuclear weapons and usable uranium for reactor fuel. Because of weapons proliferation risks and pollution created by the reprocessing, Thorp has been the subject of intense controversy. Critics claim the facility is a boondoggle because it has never operated to capacity since it opened 12 years ago.

A problem was first noticed on April 19 when operators could not account for all the waste fuel that had been dissolved in nitric acid. A broken pipe was discovered by cameras that scan the interior of the remotely controlled system. Thorp officials claim the leak is fully contained in a "clarification cell," a stainless steel-lined, 60 x 20-meter space, with concrete walls two to three meters thick. Recovering the liquids and fixing the pipes will take months and require special robots and highly developed engineering techniques.

Although most of the liquid is uranium, the mixture contains about 440 lbs of plutonium, enough to make 20 nuclear weapons.

The leak creates a financial disaster since income from Thorp is supposed to pay for the cleanup of closed nuclear facilities. About 25 percent of the £2.2 billion ($4 billion) cleanup budget for 2005-06 was to come from income of Thorp. The Nuclear Decommissioning Authority, owner of the facility, is now suggesting it wants to shut Thorp down for good. The cleanup budget would then become the taxpayers' burden. The accident comes at a time when Britain is debating the possibility of building new nuclear reactors.