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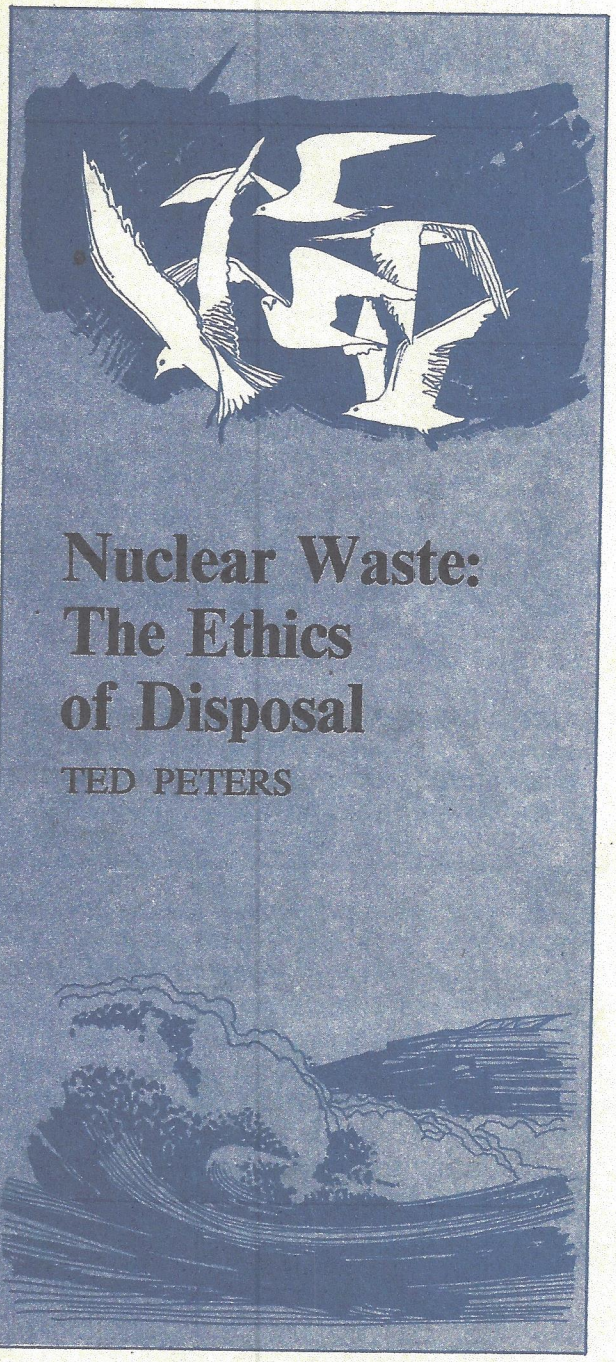

Nuclear Waste: The Ethics of Disposal

TED PETERS

The Future of Liberal Christianity

DONALD E. MILLER

An Openness to the Unexpected

JAMES M. WALL

A Chilling Political Film

BEA ROTHENBUECHER

The Ethics of Radwaste Disposal

TED PETERS

HIGH-LEVEL radioactive waste is piling up around our nuclear power generation plants. It is dangerous – and something needs to be done about it.

The U.S. government will take steps to do something about it within this decade. Most likely it will be disposed of through burial in deep mines or salt domes. The planning was set in motion by President Jimmy Carter's directive to Congress on February 12, 1980, wherein he said, "My paramount objective in managing nuclear wastes is to protect the health and safety of all Americans, both now and in the future." The Carter plan was to begin developing a safe and permanent technology so that terminal disposal of radwastes could begin in 1997. Now the Reagan administration wants to speed that process up by a decade.

It is commonly recognized that the radioactivity and extreme toxicity of nuclear reactor postfission effluent and spent fuel rods constitute a hazard to human health and safety. It is also *very* expensive to handle these materials. Will someone try to cut expenses for the sake of increased profit and thereby increase the danger? Even if the money needed to ensure safety is granted, will its expenditure guarantee security? If so, for how long? What about the people who will have to live near the disposal sites? And what about their great-great-grandchildren? *If radwastes must be disposed of, let us do it the right way.*

How does the question of reactor waste disposal relate to the overall issue of whether or not we should employ nuclear power generation at all? First, even if we were to impose an immediate moratorium on all nuclear reactor construction and cease operating all existing reactors, the problem of radwaste disposal would still be before us.

Waste already exists. At present 5,900 tons of high-level waste (HLW) in the form of spent fuel assemblies are sitting in pools next to operating reactors, together with 75 million gallons of radioactive liquid waste, plus 27 million cubic feet of transuranic waste (TRU). All of these by-products have a property of high-intensity, penetrating radioactivity. The TRUs are especially dangerous because they emit the highly carcinogenic alpha particles. Many of these materials will remain toxic for 10,000 or – in the case of plutonium – for 250,000 years. Whether or not we produce more waste, the present inventory will require careful placement.

In the attempt to put a stop to further reactor construction, the antinuclear movement may be tempted to constipate the system – to plug up the radwaste outlet for the nuclear industry – hoping thereby to force a shutdown of electrical power generation. Whether or not this tactic could be successful, it would contravene the stated goal of the antinuclear program: the protection of the public and the environment.

Current temporary storage facilities spread all across the land are more hazardous than long-term burial. Where they are now, sitting at ground surface, HLWs and TRUs are far more susceptible to natural disruptions like earthquakes and tornadoes. They are also more difficult to guard against sabotage, terrorism and theft. The fact that it takes only 8.8 pounds of plutonium to produce an atomic bomb in the one-kiloton range makes spent fuel rods an alluring target for sophisticated revolutionary groups. These risks would be reduced as the waste materials are collected into only three deep subterranean locations. It is in the long-range interest of both sides of the nuclear power debate to produce a safe permanent disposal program.

WHERE WILL the waste go? It will have to be buried in somebody's backyard. Will living in the vicinity of a high-level nuclear waste disposal site be hazardous to one's health? The solution to the safety question is not yet clear. The Department of Energy is confident that we either have the technology now or soon will have it to keep escaping radiation to a level "as low as is reasonably achievable."

Here we will mention three relevant considerations: the government's "multiple barrier" plan, quality control in implementation, and intergenerational ethics.

First, it is the stated intention of the Department of Energy (DOE) officials that the hazard be minimized through the use of the "multiple barrier"

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plan. The canister for containing radioactive waste will be carefully constructed. Sandia Laboratories has designed one that can withstand a broadside crash from a train traveling 60 miles per hour without releasing its contents. The DOE believes such a "canister of aluminum oxide with 100mm thick walls can conservatively withstand the action of groundwater for thousands of years." In saying this, the DOE is addressing concern about leaks into groundwater that might migrate back to the earth's surface and infect the biosphere. The container will be placed in a concrete sleeve or overpack for additional protection. It will then be buried 2,000 to 4,000 feet deep in a carefully chosen geological formation.

The host formation is very important. In the event of an underground leak, we want a surrounding rock that will impede travel of the toxic materials. Granite, tuff, basalt and salt domes are the likeliest candidates. The U.S. government plans to drill exploratory shafts in at least three locations by the mid-1980s. Rural sites are being studied in Mississippi, Louisiana, Texas, Nevada, Utah and Washington. The DOE will stake its claim that the program is safe on the combination of technical and natural barriers.

THE SECOND CONSIDERATION has to do with implementation. No matter how high the quality of engineering or how safe the design, unless the disposal program is carried out with care and thoroughness, it will be useless.

In 1960 considerable radwaste was dumped into the Pacific Ocean near the Farallon Islands just west of San Francisco. I interviewed one of the ship workers involved. The waste was in 55-gallon drums, along with a few concrete boxes or crates holding contaminated clothing and medical supplies.

"How many barrels did you dump?" I asked.

"Hmmm." He thought for a minute, calculating the number of barrels per boatload and the number of boatloads. "I'd say about 2,500 or 3,000."

"Some people say the barrels were already leaking when you dumped them. Is that true?"

"No," he said. "I don't remember any with leaks."

"Then why do you think California congressional committees are in an uproar? Do they have the wrong information?"

"I don't know," he said. "Maybe it's because we shot 'em."

"What do you mean?" I asked.

"Well," he went on, "some of the barrels wouldn't sink when we first dumped them overboard. So we took out our rifles and shot 'em full of holes until the water went in and sunk 'em."

Where will nuclear waste go?
It will have to be buried
in somebody's backyard.

I believe we can assume that shooting barrels full of holes was not part of the original disposal plan. This incident illustrates an enduring concern: quality control in implementation. The safety record of the industry and the U.S. government to this point is not without blemish. Some 430,000 gallons of nuclear waste effluent have gradually leaked from a dump site at Hanford, Washington, threatening the ecology of the Columbia River system. In 1979 an earthen dam operated by United Nuclear Corporation near Church Rock in New Mexico broke, releasing 94 million gallons of low-level radioactive waste into the Rio Puerco. The contaminated river has nearly destroyed the livestock-based economy of the Navajo Indians living downstream. The "best-laid plans" will be for naught unless we maintain unyielding vigilance throughout the disposal process. If we have the technical capacity to build safety into the design, then we must insist on the managerial power to perform it.

THEN THERE IS the question of intergenerational ethics. Our radioactive garbage will remain hazardous for 10,000 years or more; what is our responsibility to people as yet unborn?

I believe we have a moral obligation toward the future; I call it the *protect posterity* principle. The human community of which each one of us is a member is universal; we are united not only in space but over time.

The present generation should make three commitments. First, we should commit ourselves to employing *the best technology and management we have to reduce the degree of risk* to as low a level as possible. The DOE contends that present designs for engineered and natural barriers will keep HLW and TRU isolated despite water movement, earthquakes or impacts from giant meteors; and it will emit a minimum of radionuclides if accidentally drilled into. We should not compromise these designs to save money or personnel.

Second, we owe our grandchildren *knowledge of the hazard*. At every level of present discussion we should require candid sharing of information. This includes leaving a detailed message describing the location and nature of our radwaste grave. A stone monument on the site with warnings in multiple languages and with diagrams seems the least we can do.

There may be a third commitment we should make. Because it is our generation that will benefit from the wealth produced by nuclear fission reactors, all our heirs will receive is our radioactive garbage. Should they have to pay to protect themselves from our trash? I suggest that we *set aside an endowment fund from current profits, so as to share*

future management expenses and to provide accident insurance. Some people believe site monitoring may have to go on for 700 years. Who should pay for it? Suppose there should be a leak 300 years hence and an emergency situation is declared, requiring great effort and expense to protect the people then living. Who will be liable? A fund with compound interest and minimum withdrawal could build up a rather large sum over a century or two, providing considerable fiscal protection to future generations.

Already a handful of communities have been approached by industry and government officials seeking disposal sites. Final decisions will not be made until after tests are returned from an exploratory shaft and an agreement has been worked out with local residents.

Some community somewhere will have to play host. It will be doing the whole nation a favor. What the country owes that community is to carry out the disposal program correctly. The best technology must be employed. Safety must not be compromised. Candid information must be shared. Posterity must be protected.

Even if we accomplish all these aims, we still leave open the bigger question of whether we should allow contemporary affluence to become dependent on fission power. If we fail to come up with a satisfactory disposal program, the answer has to be No. ■