

ARIZONA'S NEED FOR A LOW-LEVEL RADIOACTIVE WASTE DISPOSAL SITE

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ABSTRACT

Research in medicine and biomedical sciences, physical sciences, agriculture and other disciplines at the University of Arizona uses radioactive isotopes and accordingly generates low-level radioactive waste. The absence of a dedicated low-level waste disposal site has had adverse economic effects on the University. Under terms of the Southwestern Low-Level Radioactive Waste Disposal Compact, California accepted the obligation to provide a low-level waste disposal facility for the member states of the Compact (California, Arizona, North Dakota, and South Dakota) by January 1, 1993, but construction of a site has not begun. The Southwestern Compact constitutes a contract among the member states, and terms of the contract are not being met.

INTRODUCTION

The University of Arizona generates a significant volume of low-level radioactive waste from diverse sources. The University is a major research institution and home of the state's only medical school. It is also the state's land grant university. Sources of low-level waste include biomedical research, patient care activities at University Medical Center, agricultural research, and research in the physical sciences. At the present time the low-level waste generated by the University is being stored, rather than being shipped to a permanent disposal facility. Storage has had a significant, adverse economic impact on the University.

WASTE STREAM

Research in medicine and biology at the University of Arizona includes many different applications of radionuclides. Examples of these applications include tracer studies on biodistribution and metabolism of various radiolabeled biomolecules, studies of drug pharmacokinetics, studies of body composition, and studies of DNA sequence and gene expression. The radionuclides most commonly used for radiolabeling are tritium, carbon-14, and phosphorus-32. Other radionuclides used less commonly include iodine-125 and sulfur-35. The half-lives of the two most commonly used radionuclides make storage for decay impractical; H-3 has a physical half-life of 12.3 years, and C-14 has a half-life of 5730 years.

The waste stream from clinical nuclear medicine is considerably different from the waste stream that results from biomedical research. The most commonly used radionuclide for nuclear medicine imaging studies is technetium-99m, which has a 6-hour half-life. Tc-99m is used in different chemical forms for imaging the brain, heart, lungs, liver, kidneys and other organs, and it is used as a tracer for various physiologic functions. Although Tc-99, the daughter of Tc-99m, has a half-life of 213,000 years, the very low activity levels of Tc-99 that result from imaging studies using Tc-99m are essentially indistinguishable from background activity. There are waste disposal issues associated with production of Tc-99m, but these problems are faced by

radiopharmaceutical manufacturers rather than the end-users of Tc-99m. Tc-99m is the daughter of molybdenum-99, which is most commonly produced as a fission product of uranium, and there are other fission products that require disposal.

Most other radionuclides used in clinical nuclear medicine have half-lives of two weeks or less. These include phosphorus-32, gallium-67, indium-111, iodine-123, iodine-131, xenon-133, samarium-153, and thallium-201. Examples of the medical uses of these radionuclides include diagnosis of heart disease (Tl-201), diagnosis of cancer (Ga-67 and In-111), and treatment of cancer (P-32 and I-131). An exception to the two-week maximum half-life is strontium-89, which has a 50-day half-life; it is used for treatment of intractable pain from skeletal metastases, primarily from prostate cancer and breast cancer. Although storage for decay is practical for the radionuclides with shorter half-lives, Sr-89 requires much longer storage than the others.

DISPOSAL HISTORY

The University of Arizona has not shipped solid low-level waste to a commercial disposal facility since closure of the site at Beatty, Nevada in 1992. All solid waste has been either stored for decay or stored for future shipment to a permanent disposal facility since that time. Mixed waste (i.e., waste that is both chemically hazardous and radioactive) from liquid scintillation counting has been shipped to Quadrex in Florida for incineration. The University has elected not to ship to the site at Barnwell, South Carolina, primarily because of concerns that there may be future costs for environmental remediation under the Superfund law. Future access to Barnwell for waste generators outside South Carolina and the Southeastern Compact region is also in doubt.

The University and other low-level waste generators in Arizona are not eligible to ship to the disposal facility at Richland, Washington, which accepts waste only from low-level waste generators in the Pacific Northwest and Rocky Mountain Compact states. There are no other general-purpose, commercial low-level waste disposal sites besides Richland and Barnwell. The waste generated at the University does not meet the low-activity, high-volume criteria for disposal at Envirocare in Utah.

POLITICAL HISTORY

In 1978 the availability of commercial low-level radioactive waste disposal sites was in jeopardy. The governors of the three states with low-level waste sites (Nevada, Washington, and South Carolina) had threatened to close their sites and had indicated they wanted other states to take responsibility for their own low-level waste. In response, Congress in 1980 enacted the Low-Level Radioactive Waste Policy Act (Public Law 96-573), which encouraged states to form interstate compacts for regional low-level waste disposal. When plans for likely regional compacts for low-level waste disposal were first drawn up, the State of Arizona was provisionally designated as a member of the proposed Rocky Mountain compact region. A low-level disposal site was envisioned in Colorado, the projected host state. Such a site would have involved a circuitous transportation route from the major metropolitan areas of Phoenix and Tucson and also from the Palo Verde Nuclear Generating Facility west of Phoenix, however, and Arizona elected not to participate in the proposed Rocky Mountain compact.

Arizona and California entered extended discussions on a possible low-level waste compact. Both states anticipated significant volumes of low-level waste in the future from nuclear power plant decommissioning. Since the 1980 Policy Act implied that states which failed to enter low-level waste disposal compacts and which developed their own low-level sites would not be able to exclude out-of-state waste, there was an incentive for both California and Arizona to find another compact partner when initial discussions did not lead to a compact agreement.

The 1980 Policy Act allowed the states with disposal sites to exclude out-of-compact waste beginning on January 1, 1986. By 1985 it was evident that little progress had been made in forming compacts and siting new disposal facilities, and Congress passed the Low-Level Radioactive Waste Policy Amendments Act (Public Law 99-240), which deferred exclusion of out-of-compact waste until January 1, 1993. The Policy Amendments Act also provided incentives for states to develop new disposal facilities and penalties for states that did not.

In response to the Policy Act of 1980 and the Policy Amendments Act of 1985, Arizona entered into the Western Low-Level Waste Disposal Compact with South Dakota in 1986. North Dakota was also eligible to join the Compact, but its legislature did not meet during 1986. Arizona was designated as the host state for the Western Compact. In 1987 Arizona enacted legislation to develop a low-level waste disposal site for the Western Compact, and the Legislature provided an initial appropriation for this purpose. Later in 1987, California enacted the Southwestern Low-Level Radioactive Waste Disposal Compact, under which California was to serve as host state for the first 30 years. Arizona subsequently enacted the Southwestern Compact in the form previously adopted by California, and it repealed the Western Compact. Arizona also discontinued activities to develop a disposal site within the state, and instead relied upon California to meet its host state responsibilities under the Southwestern Compact. North Dakota and South Dakota also enacted the Southwestern Compact legislation. The U.S. Congress ratified the Southwestern Compact in 1988.

FINANCIAL IMPACT

At the present time the University of Arizona and University Medical Center together generate about 1,850 net cubic feet of low-level waste per year. A high-performance waste compacter is used to reduce gross volume. About 400 cubic feet per year, or 21% of the total, is stored for shipment to a permanent disposal facility when one becomes available. Approximately 24% of the total waste is classified as mixed waste, and it is incinerated at facilities licensed by the Environmental Protection Agency and U.S. Nuclear Regulatory Commission. The remaining 55% of the low-level waste is held for decay or, after decay, disposed of as deregulated waste.

Since no off-site disposal of solid low-level waste has been possible since the end of 1992, the University has had to construct an interim storage facility for the waste. The cost of the structure for interim storage was approximately \$500,000. Additional site improvements have increased the total cost to about \$765,000. The annual incremental operating expenses for the storage facility are about \$100,000. All of these costs have come out of the general operating budget of the University and represent funds that could otherwise have been spent on teaching, research, or other productive activities.

The Radiation Control Office at the University has worked with low-level waste generators to reduce the volume waste that is generated. Should it become necessary to curtail research using radionuclides because disposal or interim storage cannot be provided, that outcome would have a major impact on research activities and extramural financial support of the University.

LEGAL OPTIONS

Under terms of the Southwestern Compact, California was designated as the host state. California accepted the obligation to open a low-level waste disposal facility to serve the member states of the Compact by January 1, 1993. Arizona relied upon California's acceptance of that obligation when Arizona discontinued its own low-level waste-facility siting activities and joined the Southwestern Compact. Waste generators in Arizona, including but not limited to the University of Arizona, have suffered direct financial harm as a result of California's failure to meet its host-state obligation. The financial harm will grow as time passes without a low-level waste disposal facility.

The Southwestern Compact constitutes a contract among the member states. California's obligations under the contract are unambiguous. The terms of the contract are not just a matter of state law in the member states of the Compact. Congressional ratification transforms an interstate compact, within the compact clause of the U.S. Constitution, into a law of the United States. Arizona has the right to invoke the original jurisdiction of the U.S. Supreme Court in any breach-of-contract claim against California.

SUMMARY

The University of Arizona has incurred significant costs for low-level radioactive waste storage. Such costs will increase until a low-level waste disposal facility is available. California has the obligation to provide a low-level waste disposal facility for members of the Southwestern Compact, but construction of such a facility has not begun. The Compact constitutes a contract, and the terms of the contract are not being met.