

LOW-LEVEL WASTE

GAO: Huge sums spent, but nothing to show

IT SEEMS TO be a common problem in the nuclear industry when it comes to waste management: Vast amounts of money are spent, but progress is ploddingly slow. In the case of low-level radioactive waste disposal in the United States, the compacts under the law that was passed in 1980 and amended in 1985 to develop an "equitable" system for LLW disposal have essentially spun their wheels for close to 20 years.

Sen. Frank Murkowski (R., Alaska), chairman of the Senate Committee on Energy and Natural Resources, in September 1998 requested that the General Accounting Office report on the status of the low-level radioactive waste management situation in the United States. Included was a request that the GAO also examine the Department of Ener-

GAO's report on the commercial LLW situation examines the history of the compact system, the status quo, and alternatives, but offers no clear recommendations as to what should happen next.

gy's efforts to evaluate potential use of private disposal facilities to dispose of defense-related radioactive wastes. In a February 3, 1999, letter to the GAO, Murkowski further requested an assessment of the possibility of sending commercial LLW to disposal facilities used by the DOE. This alternative would turn responsibility for commercial LLW from the states over to the DOE.

The report from the GAO, *Low-Level Radioactive Wastes: States Are Not Developing Disposal Facilities* (GAO/RCED-99-238), was released in September 1999. The executive summary begins: "States, acting alone or within compacts of two or more, have collectively spent almost \$600 million over the last 18 years attempting to find and develop about 10 sites for disposing of commercially generated low-level radioactive wastes." (See table.) Later appears the disheartening statement: "However, none of these efforts have been successful. . . . At this time, the efforts by states to develop new disposal facilities have essentially stopped."

The current situation

GAO looked at the resources currently available to LLW generators nationwide. The 11 states in the Northwest and Rocky Mountain compacts send their LLW to a disposal facility at Richland, Wash., operated by American Ecology's US Ecology subsidiary. All other states, with the exception of North Carolina, have access to the Barnwell, S.C., LLW disposal site, which, notes the report, has limited capacity. Barnwell could also be required to limit acceptance of LLW from other states if the South Carolina legislature votes for such a change in the existing law or if the state should decide to join another compact. All states except those in the Northwest compact region can use a facility operated by Envirocare of Utah, Inc., but it accepts only mixed and radioactive wastes that are only slightly contaminated with radioactivity. The existing situation is volatile, and could change at almost any time.

The question that has arisen, and part of the basis for this report, is whether the current LLW compact system should be retained, or abandoned in favor of some other approach, such as, perhaps, one based on private enterprise, which "could stimulate competition to meet the disposal needs of both commercial waste generators and DOE." Considering the potential problems connected to any LLW

Waste Management Briefs

ROCKY FLATS SAND, SLAG, AND CRUCIBLE PLUTONIUM RESIDUES

will be disposed of at the Waste Isolation Pilot near Carlsbad, N.M., instead of being shipped to the Savannah River Site in Aiken, S.C., for Pu separation processing. The Department of Energy released an Amended Record of Decision in early September, revising an earlier decision made in a Record of Decision issued on December 1, 1998. The materials, which are currently stored at the Rocky Flats Environmental Technology Site, are intermediate products resulting from the past manufacture of Pu components for the U.S. defense program. Until a schedule for shipment is developed, the materials will remain in storage at Rocky Flats. "This step," said Carolyn L. Huntoon, the DOE's assistant secretary for environmental management, "maintains our commitment to accelerate the cleanup of the Rocky Flats site in Colorado," which is to be completed by 2006.

A DEMONSTRATION OF THE "CAN-IN-CANISTER" TECHNOLOGY

for surplus Pu disposal has been successfully carried out by a team of scientists and engineers from Clemson University and the Department of Energy's Savannah River Site (SRS), with support from DOE's Lawrence Livermore National Laboratory. The demonstration took place at the Clemson Environmental Technologies Laboratory, a 60 000-ft² laboratory supporting Clemson's research on disposal procedures for hazardous and radioactive waste. The technology involves immobilizing surplus plutonium into ceramic disks that are ultimately placed in small stainless steel cans. The cans are secured inside large stainless canisters that are subsequently filled with high-level waste glass, which will be generated by the Defense Waste Processing facility at SRS, the preferred site for the immobilization facility. The tests involved three pours of simulated HLW glass into actual canisters containing cans of simulated ceramic disks (no radioactive materials were used) to show that glass would fill all the spaces around the cans and their supports. This filling in of the spaces is important, said the DOE, because the HLW glass provides the radiation barrier needed to resist theft or diversion.

The DOE also announced that the start of the design of the Pu disposition immobilization facility has been moved to 2001, from 2000, which, noted the DOE, will support operation of an immobilization facility by 2008.

STATUS OF COMPACTS AND UNAFFILIATED STATES

Dollars in millions		
State compacts (Host state and state members)	Status of disposal siting efforts	Development costs
Appalachian compact (Pennsylvania, Delaware, Maryland, West Virginia)	Halted.	\$37.0
Central compact (Nebraska, Arkansas, Kansas, Louisiana, Oklahoma)	License application denied by Nebraska. Nebraska to withdraw from compact.	95.6
Central Midwest compact (Illinois, Kentucky)	Halted.	95.8
Midwest compact (No host state, Indiana, Iowa, Minnesota, Missouri, Ohio, Wisconsin)	Halted.	Not available
Northeast compact (Dual hosts: Connecticut, New Jersey)	Connecticut: halted disposal facility siting, considering storage for 100 years or longer. New Jersey: halted siting effort.	15.2 9.7
Northwest compact (Washington, Alaska, Hawaii, Idaho, Montana, Oregon, Utah, Wyoming)	Uses existing Richland disposal facility located on DOE's Hanford site.	Not applicable
Rocky Mountain compact (No host state, Colorado, Nevada, New Mexico)	Contracted with Northwest compact to use the Richland facility.	Not applicable

Dollars in millions		
State compacts (Host state and state members)	Status of disposal siting efforts	Development costs
Southeast compact (North Carolina, Alabama, Florida, Georgia, Mississippi, Tennessee, Virginia)	North Carolina halted licensing process for disposal facility, shut down its siting agency, and, on July 26, 1999, enacted legislation withdrawing from the compact.	112.0
Southwestern compact (California, Arizona, North Dakota, South Dakota)	Halted.	92.6
Texas compact (Texas, Maine, Vermont)	Halted, initial license application for original site denied by state's licensing authority.	52.0
Unaffiliated states		
District of Columbia	No plans to site a facility.	Not applicable
Massachusetts	Halted.	Not available
Michigan	No efforts under way.	12.6
New Hampshire	No plans to site a facility.	Not applicable
New York	Halted.	62.7
Puerto Rico	No plans to site a facility.	Not applicable
Rhode Island	No plans to site a facility.	Not applicable
South Carolina	Host state for Barnwell facility.	Not applicable
Totals		\$585.2

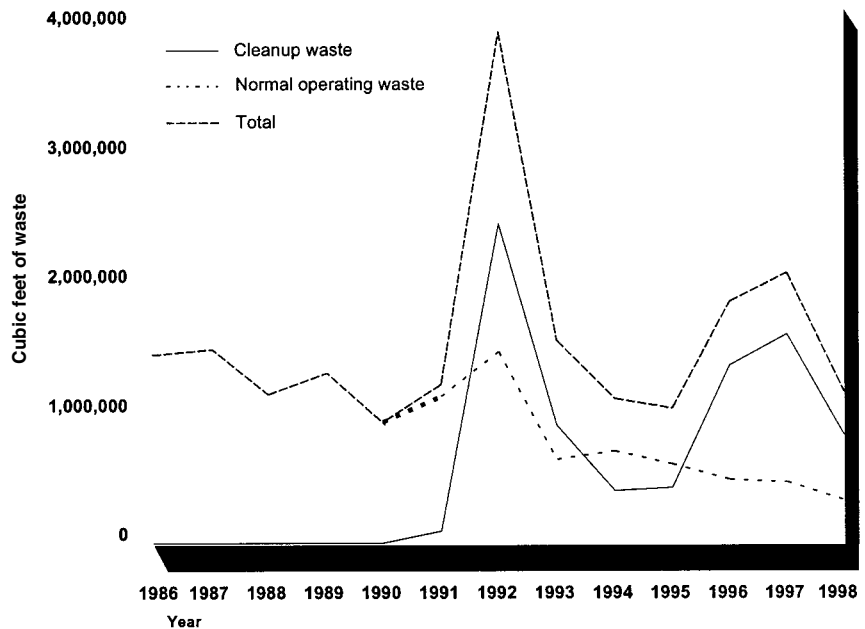
(Source: GAO)

plan, the GAO notes that "any approach to providing disposal capacity for commercial waste generators will have to address the willingness—or unwillingness—of any state or states to serve as host for a disposal facility."

The report cites several reasons that states and compacts have suspended or halted their LLW disposal facility siting efforts. Public and political opposition—which, the report says, "sometimes can be couched in environmental terms"—has been a major roadblock to facility development over the years. Without solid support from the host state at the outset, projects have tended to go nowhere.

Also, since virtually all states have access to one or more of the LLW facilities currently operating, a sense of urgency to move ahead on new disposal facilities has not materialized. According to a comment on this GAO report from Midwest Compact officials, "... unexpected events involving existing, privately operated disposal facilities in South Carolina, Utah, and possibly other locations, have created disincentives to develop new disposal capacity." Other states indicated that the closing of, for example, the Barnwell facility "would not necessarily constitute a waste management crisis because wastes could be stored [on site] temporarily."

Another reason states have not rushed to develop new LLW sites is that waste volumes have been dramatically reduced through the implementation of waste minimization, compaction, and incineration practices. Examples provided in the report include the Midwest Compact's decrease in LLW shipped for disposal from a high of 114 700 ft³ in 1989 to 20 000 ft³ in 1996—a reduction of about 83 percent—and Pennsylvania's reduction from a high of more than 225 000 ft³ in 1991 to less than 30 000 ft³ in 1997, an 87 percent reduction. The adjacent figure shows the levels of LLW disposed of from 1986 through 1998.



Low-level radioactive wastes disposed of from 1986 through 1998 (Source: GAO)

What's to be done?

Several approaches have been suggested by various groups involved in the LLW debate. The obvious one is to leave the existing compact legislation in place and allow the compacts to continue to address the issues of declining volume and the potential lack of access to disposal facilities that are currently operating.

The report notes that current legislation gives states a high level of control over LLW issues and flexibility in responding to changing circumstances. The compact system's history, however, "coupled with the declining volume of wastes, raises questions about whether compacts could economically provide new disposal facilities in the absence of

some merging and/or realignment of compacts," states the report.

On the other hand are those who support repeal of the compact legislation, which, according to the report, would allow private industry to "more readily develop and operate disposal facilities in response to market conditions." Some of the direct state control over the process of developing and operating disposal facilities would be removed with this approach, it is pointed out. "Successfully implementing this approach, however," states the report, "would still depend, to a large extent, on the willingness of prospective host states to accept these facilities."

The private approach to LLW disposal would be particularly lucrative if commercial



A TECHNICIAN IN THE CONTROL ROOM of the engineering test melter at GTS Duratek's headquarters, in Columbia, Md., monitors the vitrification process—encapsulation of radioactive waste in glass “gems”—and views computer data. A color video display (top right) shows real-time process changes and interior conditions in the melting furnace as transmitted from the solid-state FireSight video viewing system, made by Lenox Instrument Co., Inc., of Trevoise, Pa.

The FireSight system is enclosed in an air-cooled housing, or wallbox, which is the primary cooling shroud. A water-cooled furnace lens periscope within the wallbox penetrates the furnace wall, enclosing and protecting a radiation-resistant quartz objective lens at its tip, which is flush with the interior furnace wall. The water-cooling enables the system's two cameras, with a 90° field of view, to operate at test facility temperatures as high as 3500 °F. A series of achromatic relay lenses in the periscope carries images from within the furnace to a charged coupled device (CCD) camera, which is also within the furnace lens.

GTS Duratek—a processor of radioactive waste, including spent fuel rods and radioactive and mixed wastes from the nuclear power and other industries—uses the FireSight system to help detect fault conditions, verify processing rates, and detect abnormal wear on components that are visible to the camera.

and DOE markets were combined, but, says the report, it may risk the early closure of existing disposal capacity before replacement capacity would be in operation. According to the report, the state of Washington has said that it supports the compact approach and would likely close the Richland facility if, under the compact system, it could not exclude out-of-region LLW. South Carolina could take similar action regarding Barnwell.

Also, says the report, limiting states' roles to licensing and regulating new LLW facilities proposed by private companies “might erect administrative barriers to new disposal facilities within their borders.”

Let's give it to the DOE

Another alternative, notes the report, would be for the federal government—the DOE—to take over responsibility for LLW disposal.

Support for this approach comes from “those who believe that state governments would successfully frustrate attempts to develop new disposal facilities under the compact and free market approaches. . . .” Also, says the report, only a small volume of LLW would be added to the DOE's waste disposal operations. Existing facilities at the DOE's Hanford Site and at the Nevada Test Site currently accept LLW from other DOE facilities, and have large unused capacities.

The biggest drawback to this approach, according to the report, is, again, getting the states of Washington and Nevada to accept it. Also, points out the report, it could adversely affect negotiations the DOE has been carrying on with states and other interested parties on acceptable solutions to cleanup problems at DOE's nuclear facilities complex-wide.

“Assigning DOE the responsibility for disposing of commercially generated low-level radioactive wastes,” says the report, “would impose an additional burden on a federal department that has often been criticized . . . for . . . its poor performance in cleaning up its complex of nuclear facilities.” Also, since the DOE regulates its own disposal operations (the NRC or an agreement state regulates the disposal of commercially generated LLW), “questions about the responsibility for the regulation of waste disposal operations would, therefore, be essential to any effort to assign DOE the responsibility for disposing of commercially generated wastes.”

And the GAO recommends . . .

It should be noted that although this GAO report provides a comprehensive history of the low-level radioactive waste disposal situation and details on possible alternative approaches, it does not offer any recommendations concerning a “preferred” approach. In the section titled “Agency comments and GAO's evaluation,” the GAO reports on comments made by various agencies, including the DOE and the NRC, and by several of the compacts that responded. Nowhere, however, could any recommendations be found.

The first copy of each GAO report is free; additional copies are \$2 each (orders for 100 or more copies—to be mailed to one address—are discounted 25 percent). The report is available by mail from the U.S. General Accounting Office, P.O. Box 37050, Washington, D.C. 20013, or by phone 202/512-6000 or fax 202/512-6061, or for downloading through the GAO's Web site at <<http://www.gao.gov>>.—*Betsy Tompkins* **IN**