United States General Accounting Office

GAO

Report to the Chairman, Committee on Energy and Natural Resources, U.S. Senate

September 1999

LOW-LEVEL RADIOACTIVE WASTES

States Are Not Developing Disposal Facilities

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United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-283126

September 17, 1999

The Honorable Frank H. Murkowski
Chairman, Committee on Energy and
Natural Resources
United States Senate

Dear Mr. Chairman:

This report responds to your request that we review the status of the management and disposal of commercially generated low-level radioactive wastes, including the progress of states and compacts of states in developing new disposal facilities.

Unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies to the appropriate congressional committees; the Honorable Bill Richardson, Secretary of Energy; the Honorable Greta Jo Dicus, Chairman, Nuclear Regulatory Commission; and the Honorable Jacob J. Lew, Director, Office of Management and Budget. We will also make copies available to others upon request.

Please contact me at (202) 512-3841 if you or your staff have any questions about this report. Key contributors to this report are listed in Appendix VI.

Sincerely yours,

(Ms.) Gary L. Jones
Associate Director, Energy, Resources,
and Science Issues

Executive Summary

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. Commercial low-level radioactive wastes come from nuclear power plants, pharmaceutical companies, and institutions such as hospitals and universities that use radioactive materials for diagnosis, treatment, and research. Low-level wastes include such things as metal components, resins, filters, rags, paper, liquid, glass, and protective clothing, that have been exposed to radioactivity or contaminated with radioactive material. Most commercial low-level radioactive wastes are generated by over 100 nuclear power plants nationwide. In 1980 and 1985, the Congress enacted, then amended, legislation encouraging states to form compacts and provide regional disposal facilities by the end of 1992.

Concerned that no new facilities for disposing of low-level radioactive wastes have opened under the auspices of the Low-Level Radioactive Waste Policy Act of 1980, as amended, the Chairman, Senate Committee on Energy and Natural Resources, requested that GAO review

- the status of states' and compacts' efforts to establish new disposal facilities;
- the status of the management and disposal of commercially generated low-level radioactive wastes, including the continued availability of the three existing disposal facilities, the volume of wastes disposed of, and the wastes, if any, that are not authorized for disposal at the existing facilities; and
- alternative approaches to managing and disposing of commercially generated low-level radioactive wastes.

Background

The Low-Level Radioactive Waste Policy Act of 1980, as amended in 1985, established as federal policy that commercial low-level radioactive waste can be most safely and effectively managed by states on a regional basis. The objectives of these two acts were to provide for more disposal capacity on a regional basis and to more equitably distribute the responsibility for the management of low-level radioactive wastes among the states. In response to the acts, 44 states have entered into 10 compacts, varying in membership from 2 to 8 states. Eight compacts intended to develop new disposal facilities. The other two compacts share a disposal facility located on the Department of Energy's (DOE) Hanford nuclear site, near Richland, Washington. To encourage states to form compacts and develop new disposal facilities, congressionally approved compacts may

prohibit the disposal of wastes generated outside of their respective regions.

When the 1980 act was passed, there were three operating disposal facilities for commercial waste. The Richland, Washington, and the Barnwell, South Carolina, facilities continue to accept all types of commercial low-level wastes except (1) "mixed wastes"—wastes that contain both radioactive and chemically hazardous constituents—and (2) the most concentrated class of low-level radioactive wastes. Under the 1985 amendments, DOE is responsible for disposing of the most concentrated class of these wastes, but is not responsible for disposing of commercially generated mixed wastes. The third facility, at Beatty, Nevada, was permanently closed by order of that state's governor at the end of 1992. In the 1990s, Envirocare of Utah, Inc., developed a licensed disposal facility in Utah. This facility disposes of wastes, including mixed wastes, that are only slightly contaminated with radioactivity. Envirocare developed the facility outside the framework of the compact act but with the acceptance of the Northwest compact.

Results in Brief

By the end of 1998, states, acting alone or in compacts, had collectively spent almost $600 million attempting to develop new disposal facilities. However, none of these efforts have been successful. Only California successfully licensed a facility, but the federal government did not transfer to the state federal land on which the proposed site is located. In three other states, candidate sites were rejected by state regulatory agencies. North Carolina was considering a license application for a site when it shut down the project for what it characterized as budgetary reasons. At this time, the efforts by states to develop new disposal facilities have essentially stopped.

Most commercial generators of low-level radioactive wastes have access to waste disposal services. Waste generators in 11 states that make up the Northwest and Rocky Mountain compacts use the Richland facility. Waste generators in all states except North Carolina may use the Barnwell facility to dispose of their normal operating wastes.[1] The volume of these wastes disposed of in 1998 was less than half the amount disposed of each year in the late 1980s. Still, the Barnwell facility's remaining disposal capacity could be used up in 10 years. The Envirocare facility is available

[1]When South Carolina withdrew from a compact in 1995, the withdrawal legislation prohibited the disposal of wastes generated in North Carolina at the Barnwell facility. The stated reason for denying access was that North Carolina was not making enough progress in developing a new disposal facility for the compact.

to waste generators in all states except the Northwest compact region, which requires its waste generators to use the Richland facility. As the volume of wastes from routine operations has declined in the 1990s, hundreds of thousands of cubic feet of wastes from cleaning up commercial nuclear facilities have been disposed of at the Envirocare site. Three types of low-level radioactive wastes do not have access to disposal facilities and, therefore, must be stored. One waste type is mixed waste that does not meet license criteria for disposal at the Envirocare facility. A second waste type is waste generated in North Carolina that does not meet the criteria for disposal at the Envirocare facility and which, according to South Carolina's law, is not allowed to be disposed of at the Barnwell facility. The third waste type is the most concentrated class of low-level radioactive waste. DOE is responsible for disposing of this type of waste but does not anticipate being ready to do so for another 20 years.

The limited capacity of the Barnwell facility and the lack of the successful development of new facilities by compacts or states raise the question of whether to retain or abandon the compact approach. Retaining the present system would allow compacts and individual states to continue to exercise substantial control over the management and disposal of low-level radioactive wastes but would also maintain a system that has not provided an ample, assured supply of future disposal capacity. Abandoning the compact approach in favor of opening the disposal market to private industry could stimulate competition to meet the disposal needs of both commercial waste generators and DOE. However, states and opponents of new disposal sites could still oppose the private development of new disposal facilities, and Washington State might close the Richland facility rather than permit the facility to serve waste generators throughout the nation. Finally, DOE has sufficient disposal capacity to meet the needs of commercial waste generators; however, the most likely DOE facilities are located in Nevada and Washington, which appear to have little incentive to accept such an arrangement. Thus, 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.

Principal Findings

Status of Compacts

None of the states or compacts have successfully developed a new disposal facility. Although the specific reasons for the lack of success vary among compacts and states, there are several common threads. One thread is the controversial nature of nuclear waste disposal, which often manifests itself in the form of skepticism about and/or opposition to disposal facilities by members of the public and political leaders at all levels of government. Also, in recent years the declining volume of wastes, the high cost of developing new disposal facilities, and the continued availability of disposal services to most waste generators caused waste generators, compacts, and states to reassess their need for disposal facilities or to defer the development of facilities. For example, Midwest compact generators have reduced the volume of the wastes that the region disposes of by about 83 percent. Presently, no state or compact is trying to identify a site for a disposal facility. Furthermore, at least one state—Connecticut—is now exploring the feasibility of developing a facility for storing wastes for a period of 100 or more years before permanently disposing of the wastes.

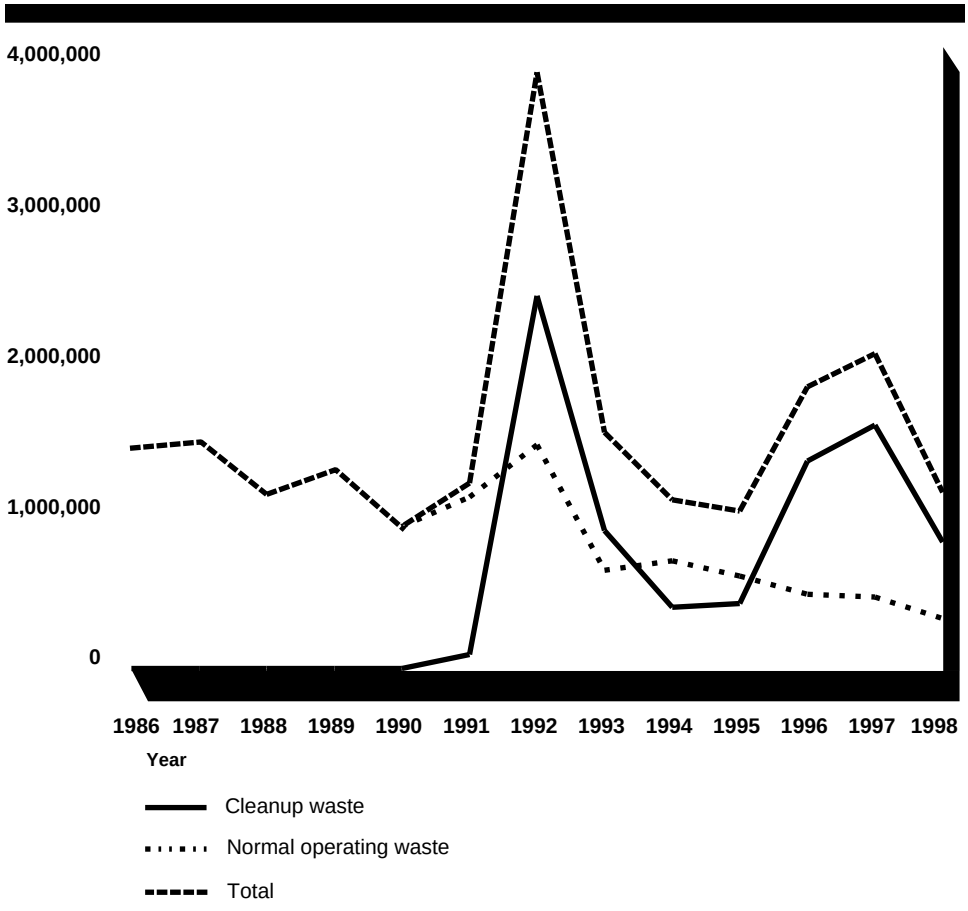
Current Disposal Situation

Commercial generators of low-level radioactive wastes throughout the nation generally have access to one or more of the three existing disposal facilities. Waste generators in the 11 states that make up the Northwest and Rocky Mountain compacts use the Richland facility. Since 1965, more than 13 million cubic feet of low-level radioactive wastes have been disposed of at this facility, which has an unused capacity of about 44 million cubic feet. Waste generators in all states (including the District of Columbia and Puerto Rico) except North Carolina have access to the Barnwell facility. The Barnwell facility has an estimated remaining capacity of about 3.2 million cubic feet, or about 10 years of remaining life at recent disposal rates. The Envirocare facility is available to waste generators in all states except those in the eight-state Northwest compact, which generally requires that its waste generators use the compact's Richland facility. To date, about 10 to 15 percent of the Envirocare facility's disposal capacity of about 247 million cubic feet has been used.

Since the 1985 amendments were enacted, the volume of wastes from normal operations disposed of each year has declined. This is due to reductions in the amount of wastes being generated and the use of

techniques, such as compaction and incineration, to further reduce the volume of the wastes that are actually generated. However, the decline has been partially offset by the emergence of bulk wastes produced from cleaning up nuclear facilities and sites.[2] (See fig. 1.) Cleanup wastes, which are characterized by their relatively high volumes and very low levels of radioactivity, are disposed of at the Envirocare facility. In 1998, for example, more than five times the volume of wastes was disposed of at the Envirocare facility than at the Barnwell facility, but the Envirocare wastes contained less than 1 percent of the radioactivity contained in the Barnwell wastes.

Figure 1: Low-Level Radioactive Wastes Disposed of From 1986 Through 1998



[2]Although the volume of wastes has declined, the radioactivity contained in the wastes has remained relatively stable.

Three types of low-level radioactive wastes do not have access to disposal facilities. First, neither the Richland nor the Barnwell facilities accept mixed wastes. The Envirocare facility accepts mixed waste within the limits of the disposal criteria contained in its operating license. Thus, mixed wastes that are not acceptable for disposal at the Envirocare facility cannot be disposed of.

Second, when South Carolina enacted legislation in 1995 to withdraw from a compact of states, the legislation prohibited wastes generated in North Carolina from being disposed of in the Barnwell facility. Officials in South Carolina acknowledge that this ban probably improperly restricts interstate commerce; however, the ban has not been challenged in the courts. As a result of the ban, waste generators in North Carolina must store these wastes unless the wastes meet the license criteria for disposal at the Envirocare facility. According to a survey by North Carolina, at the beginning of 1998, waste generators in the state were storing over 57,000 cubic feet of wastes.

Third, the 1985 amendments made DOE responsible for disposing of the most concentrated class of commercial low-level wastes. These wastes are generally internal components of the reactor vessels at nuclear power plants, filter materials, or sealed radioactive sources used for industrial purposes. The Nuclear Regulatory Commission (NRC) requires these wastes to be disposed of in a geologic repository unless it approves an alternative disposal arrangement. According to DOE, a disposal facility for these wastes may not be available for about 20 years. DOE has estimated that over 7,000 cubic feet of these wastes are in storage.

Alternative Approaches for Waste Management

The lack of new disposal facilities, the declining volume (but not radioactivity) of commercial wastes, and the Barnwell facility's limited capacity raise questions about whether a new approach to waste management is needed. States, compacts, and industry groups have discussed alternatives to alleviate current conditions. Possible alternatives include repealing the compact acts so that private industry can provide waste generators throughout the country with disposal services or using one or more of DOE's disposal facilities to dispose of commercial wastes. To be successful, any one of these approaches would have to address the willingness—or unwillingness—of any state or states to serve as host for a disposal facility. The compact approach, for example, emphasizes state-level control over low-level radioactive wastes. Compacts not only control the selection of facility sites, they also regulate the import and/or

export of wastes for treatment, storage, or disposal. Also, compacts have the flexibility to contract with other compacts and to realign themselves (with congressional approval) into new compacts as circumstances may warrant. The Northwest compact, for example, contracted with the Rocky Mountain compact to dispose of its wastes at the Richland, Washington, facility.

Because no state or compact has developed a new disposal facility, some parties argue for discarding the compact approach in favor of encouraging private industry to develop and operate disposal facilities in response to market conditions. They point out that the reduced volume of commercial wastes will support only a few disposal facilities. Also, DOE expects to use commercial facilities to dispose of 20 million to 40 million cubic feet of its low-level radioactive wastes over the next 70 years. Therefore, proponents argue, private industry—unencumbered by compact-imposed restrictions—could meet the needs of both the commercial sector and DOE. In the short run, however, this approach could lead to the early closure of the Richland and, perhaps, the Barnwell facilities. Washington State supports the compact approach and has said that it probably would close the Richland facility if it lost the right to exclude out-of-region wastes provided by the legislation establishing the compact. At a minimum, the state might decline to renew the facility operator's lease when it expires in 2005. South Carolina, which, according to its governor, wants to stop taking radioactive wastes from around the country, could take similar action regarding the Barnwell facility. Moreover, some believe that other states could erect administrative barriers to the development of new disposal facilities.

Another alternative would be to make DOE responsible for disposing of commercial low-level radioactive wastes at one or more of its existing disposal facilities. DOE's primary disposal facilities at its Hanford and Nevada sites have larger available capacities than DOE expects to use in cleaning up its nuclear facilities. Moreover, the capacity for disposing of mixed wastes at both of these locations could be expanded. Both of these sites, however, are located in states whose objections to bearing too large a disposal burden led to the compact acts. These states have also opposed the importation of wastes from other DOE facilities, and the states appear to have little inclination or incentive to accept commercial wastes at these sites. Nevada, for example, has firmly opposed the federal program to develop a geologic repository at Yucca Mountain for disposing of highly radioactive wastes. The state has opposed this program despite authorization to enter into an agreement with DOE that could provide the

state with hundreds of millions of dollars in benefits payments over several decades.

Agency Comments and GAO's Evaluation

GAO provided the Department of Energy (which uses commercial disposal facilities and could, as an alternative to the compact approach, dispose of commercial waste at its facilities), the Nuclear Regulatory Commission, and each of the 10 compacts with a draft of this report for review and comment. The Department provided a number of comments primarily directed at clarifying the definition of long-term storage and provided other clarifying or technical comments. GAO incorporated these clarifying comments as appropriate. (See app. V.) The Commission also provided clarifying comments, which have been incorporated as appropriate. (See app. IV.) The Northeast, Northwest, and Rocky Mountain compacts stated that GAO's report appears accurate and fairly portrays the current situation. (See app. III.) These compacts also provided comments to supplement, clarify, and correct certain points in the text, which GAO incorporated as appropriate. The Southwestern compact noted that GAO's report is factual and commented that repeal of the compact acts would return the nation to the inequitable conditions that led to passage of the 1980 act. The Appalachian, Southeast, and Texas compacts provided oral comments to supplement, clarify, and correct certain points in the text, which GAO incorporated as appropriate. The Central Interstate, Central Midwest, and Midwest Interstate compacts did not provide comments.

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Abbreviations

AEC	Atomic Energy Commission
DOE	Department of Energy
EPA	Environmental Protection Agency
GAO	General Accounting Office
NARM	naturally occurring and accelerator produced radioactive material
NRC	Nuclear Regulatory Commission

Introduction

Each year, over 100 utility-owned nuclear-powered electrical generating plants and thousands of commercial enterprises, such as pharmaceutical manufacturers, hospitals, universities, and industrial firms, generate various types of radioactive wastes. Some types of radioactive wastes, such as the used (spent) fuel from nuclear power plants, are classified as high-level wastes. Low-level radioactive wastes include such things as metal components, filters, rags, paper, liquid, glass, and protective clothing, as well as hardware, equipment, and resins exposed to radioactivity or contaminated with radioactive material at nuclear power plants.[1]

Since 1986, the Department of Energy (DOE) has collected information on the disposal of commercially generated low-level radioactive wastes. As shown in table 1.1, utilities that operate nuclear power plants dispose of the most wastes in terms of both volume and curies of radioactivity.[2] In addition to utilities, DOE collects and summarizes waste disposal information by other types of waste generators:

- Academic—including university hospitals and university medical and nonmedical research facilities.
- Government, consisting of state and federal agencies, such as the Army, that are licensed and regulated by the Nuclear Regulatory Commission (NRC).[3]
- Industry—including private research and development companies and manufacturers; nondestructive testing, mining, and fuel fabrication facilities; and radiopharmaceutical manufacturers.
- Medical—including hospitals and clinics, research facilities, and private medical offices.

[1]Low-level radioactive wastes also do not include waste products from processing uranium ore.

[2]A curie is a measure of the total radioactivity of a material.

[3]NRC licenses and regulates the government's "commercial" low-level radioactive wastes, which include all federally generated low-level radioactive wastes except those from DOE and the Navy's nuclear reactor propulsion program.

Table 1.1: Cumulative Volume and Radioactivity of Low-Level Radioactive Wastes Disposed of by Types of Generators From 1986 Through 1998

Cubic feet and curies of radioactivity in thousands

	Volume		Radioactivity	
Generator type	**Cubic feet**	**Percent**	**Curies**	**Percent**
Academic	420	3	9	0
Government	1,210	8	329	5
Industry	5,104	36	670	10
Medical	215	1	1	0
Utility	7,406	52	5,439	84
Total	**14,356**	**100**	**6,448**	**100**

Note: Numbers may not add because of rounding.

[a]The table does not include over 10 million cubic feet of commercially generated low-level radioactive wastes disposed of from 1992 through 1998 primarily at the Envirocare facility in Utah. These wastes, consisting of bulk materials resulting from cleaning up retired nuclear sites, are only slightly contaminated with radioactivity. Information on the types of generators of these wastes was not recorded.

The generation of significant amounts of nuclear wastes began during World War II as a result of federal efforts to develop atomic weapons. Beginning with the enactment of the Atomic Energy Act of 1954, the federal government permitted commercial entities to possess, own, and use radioactive materials. Until the 1960s, radioactive wastes produced by commercial organizations were disposed of by the Atomic Energy Commission (AEC), a predecessor of DOE, at AEC's nuclear facilities. A 1959 amendment to the Atomic Energy Act authorized qualified states to assume regulatory oversight for the possession, use, and disposal of many kinds of radioactive materials, including the disposal of commercially generated low-level wastes. A year later, AEC announced that it would phase out the use of its facilities for disposing of commercial low-level wastes. Instead, AEC or "agreement states" that had assumed regulatory authority from AEC would license privately operated disposal facilities for these wastes.[4]

From 1962 through 1971, six commercial disposal facilities located in Illinois, Kentucky, Nevada, New York, South Carolina, and Washington state were licensed to operate. Each of these facilities was initially designed to use a relatively simple approach called "shallow land burial," in which wastes are placed into excavated trenches. The objective of shallow land burial is to isolate radionuclides in the wastes from surface water and slow-moving groundwater long enough to allow the wastes to

[4]The privately owned disposal facilities would, however, be located on federal- or state-owned land.

undergo radioactive decay to a level approaching that of the earth's natural background. By March 1979, however, the disposal facilities in Illinois, Kentucky, and New York were permanently closed for a variety of reasons, including leakage at the sites. Only the sites in Nevada, South Carolina, and Washington remained open to serve commercial generators of low-level radioactive wastes.

In July 1979, the Governor of Nevada ordered the disposal facility for commercially generated low-level radioactive waste in that state, located near the town of Beatty, shut down temporarily because a number of shipments of wastes to the facility were found to have leaking containers. In October 1979, the Governor of Washington ordered that state's disposal facility, which is located about 20 miles from the city of Richland on DOE's Hanford site, to shut down after similar deficiencies were found in waste shipments bound for the facility. Also in 1979, the Governor of South Carolina said that the Barnwell disposal facility in that state was receiving up to 90 percent of all commercially generated low-level radioactive wastes and that decontamination of the disabled Three Mile Island nuclear power plant would generate wastes amounting to almost 50 percent of the total volume that the state had received in 1978. For this reason, the governor said that South Carolina would not accept wastes from the disabled plant.

Concerned about the potential loss of capacity for the disposal of commercially generated low-level wastes, congressional committees considered legislation in 1979 that would make the federal government responsible for the disposal of these wastes. The Governors of Nevada, South Carolina, and Washington opposed this approach, however, because they wanted states to have an opportunity to examine alternatives to federal disposal. By the end of that year, Washington and Nevada had allowed their disposal facilities to reopen, and the Congress had deferred consideration of legislation to the next year. Subsequently, a task force convened by the National Governors' Association recommended that the states be responsible for the development, as well as the regulation, of disposal facilities for commercially generated low-level radioactive wastes. Other state government organizations supported this approach.

Until concerns had emerged about the disposal capacity for commercially generated low-level wastes, DOE and its predecessor agencies had routinely disposed of low-level radioactive wastes (including "mixed" wastes, which are low-level radioactive wastes containing chemically hazardous constituents) at the commercial disposal facilities. However, to ensure

uninterrupted disposal capabilities for its needs, in 1979, DOE adopted a new policy of disposing of its low-level wastes, including mixed wastes, at its own sites and using commercial facilities only on a case-by-case basis.

Low-Level Waste Policy Act and Amendments

Late in 1980, the Congress enacted the Low-Level Radioactive Waste Policy Act of 1980. The act established as federal policy that commercial low-level radioactive wastes can be most safely and effectively managed by states on a regional basis. The Congress encouraged states to form regional compacts to meet their collective disposal needs, minimize the number of new disposal sites, and more equitably distribute the responsibility for the management of low-level radioactive wastes among the states. Congressional consent was required for a compact to become effective. As an inducement to states to form compacts and develop disposal facilities, the act stated that, beginning January 1, 1986, compacts could, under certain conditions, restrict the use of their disposal facilities to low-level radioactive wastes generated within their respective regions.

By the end of 1983, nearly 40 states had formed seven compacts but none of the compacts had been granted congressional consent. Also, it had become clear that no new disposal facilities would be ready for at least another 5 years. Therefore, the Congress passed and, on January 15, 1986, the President signed into law, the Low-Level Radioactive Waste Policy Amendments Act of 1985. At the same time, the Congress granted consent to the seven regional compacts. The 1995 act represented a compromise. Waste generators in states that were relying on the Barnwell, Beatty, and Richland disposal facilities got a 7-year extension (until the end of 1992) of the period during which they could ship wastes to those facilities. On the other hand, the three states hosting the existing disposal facilities—Nevada, South Carolina, and Washington—received additional assurances that other states or compacts would develop their own disposal facilities.

One key provision of the compact acts was that congressionally approved compacts could ban the disposal of commercial low-level wastes generated outside the compact's region. A second, stronger provision was a requirement that, if a state's disposal facility was not operational by January 1, 1996, the state and other states in a compact must begin taking title to, and possession of, their generators' wastes at the request of the generators. In 1992, however, the U.S. Supreme Court ruled that the "take title" provision of the compact act was unconstitutional on the grounds that the Congress could not compel the states to regulate the waste in a

particular way.[5] The Court held that the take-title provision could be considered separately from the remainder of the act, which is still valid.

In addition, the 1985 compact act clarified the responsibility for disposing of commercially generated low-level radioactive wastes between the states and compacts and DOE. Specifically, the Congress made states and compacts responsible for providing disposal facilities for all commercially generated low-level radioactive wastes except for the most hazardous class of wastes, as defined by NRC in its December 1982 regulations on the disposal of low-level radioactive wastes. The 1985 act made the federal government—in effect, DOE—responsible for disposing of the most hazardous class of wastes.

By 1983, NRC had issued regulations governing the selection of sites for, and the construction, operation, decommissioning, and long-term care of, new disposal facilities for low-level radioactive wastes. In these regulations, NRC divided commercially generated low-level radioactive wastes into the following four categories:

- Class A wastes have the lowest concentrations of specific radionuclides and can be disposed of with the least stringent requirements governing the waste's form and disposal packaging. This class of wastes must be segregated from other wastes at the disposal site unless the wastes meet specified stability requirements intended to prevent structural degradation of the disposal facility.
- Class B wastes contain higher concentrations of the shorter-lived radionuclides. To ensure the stability of these wastes after disposal, these types of wastes must maintain their physical dimensions and form, and be packaged more stringently than class A wastes.
- Class C wastes are wastes that must meet the form and stability requirements applicable to class B wastes and also measures taken at the disposal facility to protect against inadvertent human intrusion. Class C wastes must be protected by barriers to inadvertent human intrusion that would be expected to perform effectively for at least 500 years.
- Greater-than-class-C wastes must be disposed of in a geologic repository unless NRC approves a specific proposal to dispose of such wastes in a disposal facility licensed under NRC's regulations for disposing of low-level radioactive wastes.

[5] New York v. United States, 488 U.S. 1041 (1992).

Disposal Facilities Operating Since the 1985 Compact Act

The 1985 compact act permitted the states of Nevada, South Carolina, and Washington to restrict access to these facilities to waste generators within their respective compact states, beginning on January 1, 1993. Shortly before that date, the Governor of Nevada issued an executive order prohibiting the storage and/or disposal of additional low-level radioactive wastes on state-owned land (such as the Beatty facility) after December 31, 1992.

South Carolina, which was a member of the eight-state Southeast compact, agreed to permit waste generators located within and outside of that compact to continue shipping low-level radioactive wastes to the Barnwell disposal facility in that state until June 30, 1994. From then until mid-1995, access to the Barnwell facility was restricted to waste generators within the Southeast compact region. During this 1-year period, waste generators in 33 states did not have access to facilities for disposing of their low-level radioactive wastes.[6] In July 1995, however, South Carolina withdrew from the Southeast compact and reopened access to the Barnwell facility to waste generators in all states except North Carolina. South Carolina prohibited the disposal of low-level wastes generated in North Carolina because of what it regarded as the latter state's lack of satisfactory progress in developing a new disposal facility for the Southeast compact.

Washington continued to permit the Richland disposal facility to operate. The state, however, restricted the use of the facility to waste generators within the eight member states of the Northwest compact (of which Washington was a member) and, by contract, within the three states that comprised the Rocky Mountain compact.

In the early 1990s, a new facility for disposing of certain types of low-level radioactive wastes and mixed low-level wastes was licensed and developed in Utah. This facility, which is located about 80 miles west of Salt Lake City, is owned and operated by Envirocare of Utah. The facility treats and disposes of wastes that are lightly contaminated with radioactivity. Originally, DOE used what became the Envirocare site to dispose of waste products from the cleanup of a former uranium ore-processing facility at Salt Lake City. Then, in 1988, Envirocare obtained a state license authorizing the company to use the site to dispose of naturally occurring radioactive materials. Subsequently, in March 1991, Envirocare applied for and received a state license to dispose of class A low-level radioactive wastes limited to the specific radionuclides and

[6]Except slightly contaminated bulk wastes eligible for disposal at the new Envirocare disposal facility in Utah.

maximum concentrations of radioactivity stated in the license. In the allowable concentrations of radionuclides, the low-level radioactive wastes authorized for disposal at the Envirocare facility were only mildly contaminated compared to the wastes typically disposed of at the Barnwell and Richland facilities. Although Utah is a member of a congressionally approved compact, the Envirocare facility was not developed in response to the 1980 and 1985 compact acts and is not a regional disposal facility serving only waste generators within a compact region. Instead, the facility is permitted by the host compact to accept low-level radioactive wastes for disposal from waste generators located outside the host compact's region. The license for the Envirocare facility has been amended to authorize the disposal of most class A low-level radioactive wastes. Also, the Northwest compact has authorized Envirocare to accept operational wastes as well as cleanup wastes.

Currently, the Barnwell, Richland, and Envirocare disposal facilities collectively serve 10 compacts made up of 44 states as well as the 8 states (the compact acts define the District of Columbia and Puerto Rico as states) that are not affiliated with a compact. (See fig. 1.1 for the alignment of states into compacts.)

Figure 1.1: States' Memberships in Compacts

Note: Shaded states are not affiliated with a compact.

Source: Low-Level Waste Forum.

Objectives, Scope, and Methodology

Concerned that no new facilities for disposing of low-level radioactive wastes have opened under the auspices of the Low-Level Radioactive Waste Policy Act of 1980, as amended, the Chairman, Senate Committee on Energy and Natural Resources requested that we review

- the status of states' and compacts' efforts to establish new disposal facilities;
- the status of the management and disposal of commercially generated low-level radioactive wastes, including the continued availability of the three existing disposal facilities, the volume of wastes disposed of at these

facilities, and the wastes, if any, that are not authorized for disposal at the existing facilities; and

- alternative approaches to managing and disposing of commercially generated low-level radioactive wastes.

To determine the status of states' and compacts' efforts to establish new disposal facilities, we discussed states' and compacts' progress in developing disposal facilities with officials of the Appalachian, Central, Central Midwest, Northeast, Northwest, Southeast, and Texas compacts. We also had similar discussions with officials of the designated host states of California, Connecticut, Illinois, Michigan, Nebraska, New Jersey, North Carolina, Pennsylvania, South Carolina, Texas, Utah, and Washington. We also attended the fall 1998 and spring 1999 meetings of the Low-Level Radioactive Waste Forum, which is an association of representatives, appointed by governors and compact commissions, of each host state and compact. The Forum was established to facilitate states' and compacts' implementation of the 1980 and 1985 compact acts. In addition, we discussed the status of compacts' and states' efforts to develop new disposal facilities with officials of NRC; DOE's national low-level waste program; the Nuclear Energy Institute, which is the lobbying organization for the nuclear industry; and the Nuclear Information and Resources Service, which is an organization based in Washington, D.C., that is opposed to nuclear power.

To determine the status of the management and disposal of all low-level radioactive wastes, including the continued availability of existing disposal facilities, we obtained information and related documentation from many of the compacts and states listed above. In addition, we visited the Barnwell, Envirocare, and Richland disposal facilities and discussed this issue with officials responsible for operating these facilities (Chem-Nuclear Systems, LLC; Envirocare of Utah; and US Ecology, respectively). We also discussed this issue with the Vice President for Nuclear Power of the Commonwealth Edison Company. We did not evaluate the quality of either the management of wastes prior to their disposal or of the operation of disposal facilities.

To determine the volume of wastes disposed of, we met with officials in DOE's National Low-Level Radioactive Waste Program within its Idaho National Engineering and Environmental Laboratory. Using manifests for tracking and accounting for the transportation and disposal of low-level radioactive wastes, the national program office has, since 1986, routinely collected information on the disposal of commercially generated low-level

radioactive wastes in a "Manifest Information Management System." With the assistance of these officials, we extracted data from this system to analyze the volume and radioactivity of low-level radioactive wastes disposed of from 1986 through 1998. We also incorporated into our analyses disposal information recorded by Envirocare of Utah and reported to the Northwest Interstate compact from 1992 through 1997, when Envirocare's disposal records were not yet included within DOE's manifest information system. Beginning in January 1998, Envirocare's records were incorporated into DOE's information system. On a monthly basis, operators of the disposal facilities record information from shipping manifests that accompany wastes as they arrive at the disposal sites and then enter the information into DOE's manifest system. While we did not independently verify the reliability of the disposal data, facility operators sometimes spot-check incoming waste shipments to assure themselves that the volumes and curie information recorded on the manifests are accurate and that discrepancies are rare.

DOE's information management system collects information only on commercially generated low-level radioactive wastes that are disposed of at the three existing facilities. The system does not collect information on the amounts of wastes actually generated or the amounts of wastes that individual waste generators may be storing. Our discussions with officials of DOE, NRC, the Low-Level Radioactive Waste Forum, compacts and states, and operators of disposal facilities did not reveal the existence of any central collection system for information on stored low-level radioactive wastes. Therefore, we did not analyze the volume of wastes generated and stored, rather than disposed of, because to do so would have required that we identify and contact, if not visit, thousands of licensees to develop an accurate indication of the amounts and types of wastes generated and stored. During the course of our review, however, we did collect from a few states the results of their surveys of waste generators, including the amounts of wastes being stored by the generators.

To determine what wastes or waste generators, if any, are not authorized for disposal at the existing facilities, we discussed this issue with the parties mentioned above.

To identify and analyze alternative approaches to managing and disposing of commercially generated low-level radioactive wastes, we discussed this issue with many of the parties listed above. In addition, we attended a "national summit meeting" on low-level radioactive wastes, hosted by the

National Conference of State Legislatures in April 1999, at which this issue was discussed.

Our work was performed from September 1998 through August 1999 in accordance with generally accepted government auditing standards.

Agency Comments and Our Evaluation

We provided DOE (which uses commercial disposal facilities and could, as an alternative to the compact approach, dispose of commercial waste at its facilities), NRC, and each of the 10 compacts with a draft of this report for review and comment. DOE provided a number of comments primarily directed at clarifying the definition of long-term storage and provided other clarifying or technical comments. We incorporated these clarifying comments as appropriate. (See appendix V.) NRC also provided clarifying comments which have been incorporated as appropriate. (See appendix IV.) The Northeast, Northwest, and Rocky Mountain compacts provided letters commenting on our report, which appear in appendix III. The Southwestern compact provided comments in the form of an electronic message from the compact's executive director. The Appalachian, Southeast, and Texas compacts provided oral comments. The Central Interstate, Central Midwest, and Midwest Interstate compacts did not provide comments.

The Northeast compact stated that, overall, our report is a factual and complete presentation of the subject and correctly identifies the primary reasons—particularly the controversial nature of low-level waste disposal—for the current situation. The compact also stated that our report correctly notes that discarding the compact system could result in the loss of the Richland disposal facility. The compact also provided several comments to supplement the information in our report and clarify certain points in the text, which we incorporated as appropriate.

The Northwest and Rocky Mountain compacts stated that our report appears accurate and fairly portrays the current situation. Also, both compacts provided several comments to supplement the information in our report and clarify certain points in the text, which we incorporated as appropriate.

The Southwestern compact commented that the report is factual. The compact added that if the compact acts were to be repealed, then the nation would return to essentially the same conditions of inequity in the

disposal of low-level radioactive wastes that led to passing the compact acts 20 years ago.

Status of Compacts' and States' Efforts to Develop New Disposal Capacity

No compact or state has successfully developed a new disposal facility for low-level radioactive wastes under the auspices of the 1980 and 1985 compact acts. One state—California—successfully licensed a facility, but the Department of the Interior has not transferred the proposed site to the state. Other states have applied for licenses from their state regulatory agencies, but their applications were ultimately denied. By the end of 1998, such efforts to site new disposal facilities cost compacts and states almost $600 million. Yet, states' initiatives to develop new disposal facilities have now come to a standstill.

Public and political opposition continues to underlie the lack of progress. For example, states, such as Pennsylvania and New Jersey, that attempted to find communities willing to volunteer sites for disposal facilities were unsuccessful. Also, changes in the conditions affecting the disposal of low-level radioactive wastes have contributed to the current lack of efforts to develop new disposal facilities. For example, waste generators have reduced the volume of their normal operating wastes and almost all waste generators currently have access to disposal facilities. Moreover, states' efforts to develop new disposal facilities have been costly. As a result, at least one state that had been attempting to develop a disposal facility is now exploring the feasibility of developing a facility for safely storing low-level radioactive wastes for 100 to 300 years as an alternative to near-term disposal. (Appendix I provides details of the status of efforts of the 10 compacts and 8 unaffiliated states.)

Compacts and States Have Not Developed New Disposal Facilities

We found that states, acting alone or within compacts, have collectively spent about $600 million over the last 18 years attempting to locate and develop about 10 sites for disposing of commercially generated low-level radioactive wastes. None have been successful, and no state is now actively attempting to develop a disposal facility. In effect, the system of new regional disposal facilities envisioned when the 1980 and 1985 compact acts were enacted has not occurred. Table 2.1 summarizes the current status of state and compact projects to establish new disposal facilities.

Table 2.1: 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
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

(continued)

Dollars in millions

State compacts (Host state and state members)	Status of disposal siting efforts	Development costs
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, from various agency documents.

No state is actively attempting to develop a disposal facility. After years of effort and multi-million-dollar expenditures, all of the states that had started programs to identify candidate sites for facilities and to license and develop these sites have essentially stopped their programs. The Southwestern compact has come the closest to opening a disposal facility. The host state for the compact—California—licensed a facility. Efforts to find a site, investigate its suitability, and license the facility cost about $93 million. However, the site chosen is on federal land, and the Department of the Interior has not agreed to transfer the land to the state. Thus, California's activities are on hold indefinitely. In the early years of the legislation that created the compact, Illinois identified a candidate site, but the site was eventually rejected. Subsequently, that state decided, largely on the basis of reduced quantities of low-level radioactive wastes, to postpone the development of a disposal facility until around 2010. In Nebraska and Texas, host states for the Central compact and the Texas compact, respectively, state agencies denied license applications for disposal facilities. Efforts to site a facility in Nebraska cost $95.6 million and in Texas, $52 million. The Southeast compact spent the most money trying to site a disposal facility in North Carolina. It spent $112 million before efforts were shut down.

Of the unaffiliated states, New York spent about $62.7 million trying to site a facility before suspending its program. Michigan, which was once the state designated by the Midwest compact to develop a regional disposal facility, was expelled from the compact because members decided that Michigan had unreasonable criteria that essentially precluded the state from finding a suitable site. Massachusetts established a program to develop its own disposal facility, but the program did not progress to the point of identifying candidate sites. The other unaffiliated states have no plans to site a disposal facility.

Efforts Suspended for Several Reasons

Several factors have combined to affect the development of new low-level radioactive waste disposal facilities around the country. Initially, public and political resistance delayed the development of new facilities. In recent years, several states and compacts have suspended their siting efforts because of the (1) availability of disposal capacity both in and out of their compact regions, (2) declining volumes of wastes, and (3) rising costs of developing disposal facilities.

Public and Political Opposition

The underlying and recurring reason that no disposal facilities have been developed under the 1980 and 1985 acts is public and political opposition. We discussed this concern in our 1995 report on the status of compacts' and states' efforts to develop new disposal capacity.[1] In that report, we noted that in 1993, NRC's staff had reviewed the experiences of 13 states under the compact acts. Although NRC's staff had identified seven factors that, in their judgment, had affected states' progress, one of the factors—public and political concern over the development of new disposal facilities—predominated. More recently, a policy associate of the National Conference of State Legislatures, writing in that organization's legislative report, characterized the political and public concern factor as "[a] lack of financial and political will."[2] The author reasoned that strong political support at the state level must be garnered from the beginning, so that the siting process is not susceptible to being derailed in the later stages.

The experience in California is an example showing how political commitment at one level can move the process of developing a disposal facility forward and how the lack of commitment at another level can frustrate the goals of the 1980 and 1985 compact acts. California successfully completed its administrative and judicial procedures for licensing the construction and operation of a disposal facility for low-level radioactive wastes to be located on land in Ward Valley, California, that it had requested, in July 1992, to purchase from the federal government. The Department of the Interior, however, has not transferred the proposed site to the state so that the facility can be built. Although Interior officials had concluded, on the basis of a study by the National Academy of Sciences, that the proposed facility could be operated safely, in 1997, Interior called for additional testing of the safety and suitability of the site. Then, in

[1] Radioactive Waste: Status of Commercial Low-Level Waste Facilities (GAO/RCED-95-67, May 5, 1995).

[2] "The Challenge of Siting Low-Level Radioactive Waste Facilities," National Conference of State Legislatures, State Legislative Report (Vol. 24, No. 3).

March 1999, Interior proposed that the Department and the state explore alternatives to the proposed transfer of the land.

Recent voluntary siting efforts by states also demonstrate the effect of public and political opposition. For example, in March 1996, Pennsylvania began a voluntary siting process for the Appalachian compact. The volunteer process empowered municipalities in Pennsylvania to make their own choices about hosting a facility. From March 1996 through April 1998, staff of the contractor that the state selected traveled more than 90,000 miles statewide and participated in more than 340 outreach meetings. Yet, no municipality expressed an interest in hosting a low-level waste disposal facility. On December 31, 1998, the state's Department of Environmental Protection suspended the siting project after discussing the issue with the Department's low-level waste advisory committee and the Appalachian compact. Similarly, both Connecticut and New Jersey, dual hosts of the Northeast compact, developed voluntary siting plans. According to the Northeast compact, several potential volunteers discussed the concept of proposing a site for the state's disposal facility with the state's siting agency. No volunteers came forward, however, before Connecticut put its program on hold. New Jersey's siting board interacted with several communities interested in exploring the possibility of volunteering to host that state's disposal facility, according to the Northeast compact. These communities were eventually eliminated from consideration, however, either because of votes or other actions by the communities to withdraw from consideration or because the siting board eliminated the communities' potential sites.

Public and political opposition sometimes can be couched in environmental terms. For example, on April 16, 1999, the U.S. District Court issued a preliminary injunction against Nebraska and others, finding that there is good reason to think that Nebraska's denial, on safety and environmental grounds, of a license to construct and operate a disposal facility was "politically preordained."[3] Similarly, in Texas, a state licensing commission denied a license application for a proposed site on the basis of safety and socioeconomic questions even though its own staff found the site to be acceptable.

Access to Disposal Facilities

Almost all compacts and states currently have access to one or more of three low-level radioactive waste disposal facilities—Barnwell in South Carolina, Richland in Washington State, and Envirocare in Utah.

[3]Entergy Arkansas, Inc. v Nebraska, __ F Supp.2d—, 1999 WL 225849, (D. Neb. 1999) (p. 12).

Consequently, states and compacts have cited the adequate disposal capacity that currently exists as one of the reasons for suspending their disposal programs. For example, Illinois halted its siting efforts, in part, because of the continued availability of disposal capacity for Illinois waste generators. Similarly, in 1996, the Massachusetts low-level waste management board voted to cease all in-state siting efforts because of the renewed access to the Barnwell facility and the expanded availability of the Envirocare facility.

One of the reasons for suspending activities that the Midwest compact cited was that its generators have access to existing low-level radioactive waste disposal facilities that appear to have sufficient capacity to accept wastes for a lengthy period of time. They reasoned that unexpected events involving existing, privately operated disposal facilities in South Carolina, Utah, and possibly other locations, have created disincentives to develop new disposal capacity. Similarly, for the Appalachian compact, one of the factors cited by the Pennsylvania Department of Environmental Protection for suspending its program was that the current disposal capacity at the Barnwell and Envirocare disposal facilities is projected to be available to Pennsylvania generators for at least 25 years.

Furthermore, some states are not too concerned about possible closure of the current facilities. For example, Illinois noted that the loss of capacity at a site like Barnwell would not necessarily constitute a waste management crisis because wastes could be stored temporarily. Also, when New Jersey's siting board suspended its siting process, the board noted the continuing availability of out-of-state disposal capacity. The board also noted that in the event that the Barnwell facility is closed to waste generators in New Jersey, these generators should be able to store their wastes on-site for the short term.

Reduction in Waste Volume

The unanticipated reduction in the volume of low-level radioactive wastes has also contributed to the suspension of efforts to find sites for new disposal facilities. For example, low-level waste generators in the Midwest compact have successfully instituted waste management and treatment practices including waste minimization, compaction, and incineration. These practices continue to dramatically reduce the amount of wastes annually shipped to disposal facilities. Wastes in the region shipped for disposal were reduced about 83 percent—from a high of 114,700 cubic feet in 1989 to 20,000 in 1996. Similarly, the volume of low-level radioactive wastes disposed of from Pennsylvania has decreased from more than

225,000 cubic feet in 1991 to less than 30,000 in 1997, or about an 87-percent reduction. This reduction was one of the factors that led to the suspension of the search for a low-level waste disposal facility in Pennsylvania for the Appalachian compact.

The Northeast and Central Midwest compacts also noted reductions in the volume of disposed waste. For the Northeast compact, New Jersey's siting board suspended the siting process, noting the ongoing efforts of the state's low-level radioactive waste generators to minimize the volume of wastes requiring disposal. For the Central Midwest compact, Illinois noted the 75-percent decline in the waste volume shipped from Illinois from 1986 through 1997. Over 200,000 cubic feet was shipped in 1986, but less than 50,000 cubic feet was shipped in 1997.

High Cost of Disposal Facilities

The high cost of a disposal facility has also affected decisions to suspend low-level waste disposal programs in some states. The Midwest compact, in halting its disposal program, noted that the estimated cost of new disposal facilities had risen significantly. The compact estimated that the cost of developing a disposal facility would range from $105 million to $216 million, not counting the annual cost to operate the facility.

When the reduced volume of wastes is considered with the high cost of construction, a disposal facility is even more costly. For example, because of the decline in volume, Illinois developed an economic model to evaluate various development strategies. The model indicated that developing the disposal facility, given the reduced volumes, would yield a facility that was not economically viable (assuming that waste disposal charges would be based on waste volume). Furthermore, the facility would not become economically viable until waste generation rates increase due to the decommissioning of nuclear power stations—sometime around 2010.

Some States Have Expressed Interest in Long-Term Storage of Wastes

As a result of difficulties in developing disposal facilities and conditions such as relatively low volumes of low-level radioactive wastes, at least one state's siting agency—Connecticut's Hazardous Waste Management Service—is considering storing these wastes for 100 years or more using a concept called assured isolation storage. Unlike disposal facilities, where the emphasis is placed on the natural characteristics of a site, assured isolation primarily relies on engineered barriers and institutional controls, such as periodic inspection and maintenance, to ensure public safety over the prospective storage period (on the order of 100 to 300 years). Waste

management agencies in other states, such as North Carolina and Texas, have also explored various approaches to storing wastes on a long-term basis.

Long-term storage is an interim, rather than final, solution to the issue of the long-term management of commercial low-level radioactive wastes. Eventually, a permanent solution for longer-lived wastes—either permanent disposal or continued, monitored storage—would be required. Proponents of assured isolation maintain that the concept (1) preserves future management options including continued isolation, retrieval, recycling, or even potentially closure in place; (2) permits isolation facilities to be safely colocated with existing nuclear facilities; and (3) might permit states to postpone disposal decisions until more favorable conditions exist or until the need for disposal capacity becomes more urgent.

Critics of assured isolation question these asserted advantages. They also point out that it may also be difficult to make adequate arrangements to ensure that sufficient funds are available for this alternative followed by the recovery of some or all of the wastes from an isolation facility followed by the permanent disposal of these wastes in a disposal facility. In effect, the critics argue, long-term storage creates a burden on future generations. There are also legal concerns about whether a long-term storage facility, such as an assured isolation facility, developed by a compact would comply with the requirement for permanent disposal contained in the Low-Level Radioactive Waste Policy Amendments Act of 1985. Texas' low-level radioactive waste authority, having been denied a disposal license, is now considering new options for siting, including developing a facility for assured isolation, or long-term storage, of commercially generated low-level radioactive wastes. In response to a question on whether a law requiring the development of a facility for assured isolation of wastes would satisfy the state's compact obligations, the state's attorney general concluded that such a facility would comply with the state's obligations to "manage and provide for" the disposal of low-level radioactive wastes generated within the compact. However, the attorney general also concluded that a facility for the assured isolation of wastes would not currently satisfy the state's obligation to "permanently dispose of" these wastes.

Connecticut's Hazardous Waste Management Service has also decided to consider the assured isolation of low-level radioactive wastes generated within the state as an alternative to the disposal of these wastes. That

state's efforts to find a site for a disposal facility have been unsuccessful, and the accessibility of the Barnwell and Envirocare disposal facilities to the state's waste generators have reduced the perceived urgency of developing a disposal facility. According to a draft legal analysis prepared for the Service, an assured isolation facility could be established and maintained in accordance with the law if its development is carefully planned and legal issues are properly taken into account.[4]

Finally, in December 1997, North Carolina, whose waste generators do not have access to the Barnwell facility, shut down its project to develop a disposal facility for low-level radioactive wastes pending any changes in funding or direction. The state's siting authority asked the legislature to consider a plan for storing wastes as an alternative to the disposal project. The authority wanted to study the possibility of storing waste materials containing only relatively short-lived radionuclides separate from wastes contaminated with longer-lived radionuclides. By segregating wastes in this manner, the authority said, it might be possible to recycle the waste materials containing short-lived radionuclides or to dispose of these materials as normal trash following an appropriate storage period. Waste materials contaminated with longer-lived radionuclides could eventually be disposed of in a much smaller disposal facility than the state had planned to develop for the Southeast compact. Instead of accepting the authority's request, the legislature enacted, and on July 26, 1999, the governor signed, legislation withdrawing the state from the Southeast compact.[5] Among other things, the legislation essentially shut down the siting authority and forbade its licensing agency to issue a license for a disposal facility until further notice.

[4]The Connecticut Hazardous Waste Management Service commissioned the analysis of certain legal issues surrounding the concept of assured isolation for the management of low-level radioactive wastes in Connecticut.

[5]General Assembly of North Carolina Session Law 1999-357, July 26, 1999.

Most Waste Generators Currently Have Access to Disposal Capacity

Generally, commercial generators of low-level radioactive wastes throughout the nation currently have access to one or more of the three existing disposal facilities. The Barnwell facility in South Carolina opened in 1971. Currently, waste generators in all states except North Carolina have access to that facility. The Richland facility in Washington opened in 1965. Waste generators within the 11 states making up the Northwest and Rocky Mountain compacts have access to the facility. Finally, the Envirocare facility in Utah has been accepting low-level radioactive wastes since 1991 and at present primarily provides disposal to all states except those in the Northwest compact. Most low-level radioactive wastes disposed of at that facility are large-volume wastes that are slightly contaminated with very low concentrations of radioactivity. Because the volume of wastes from normal operations has declined dramatically, the Barnwell facility is large enough to accommodate waste generators for about 10 more years and the other two disposal facilities have enough remaining capacity to last longer.

The wastes that do not have access to disposal are (1) mixed low-level wastes that do not meet license criteria for disposal at the Envirocare facility, (2) most of the low-level radioactive wastes generated in North Carolina, and (3) the most concentrated class of low-level radioactive wastes—greater-than-class-C wastes—for which disposal is DOE's responsibility.

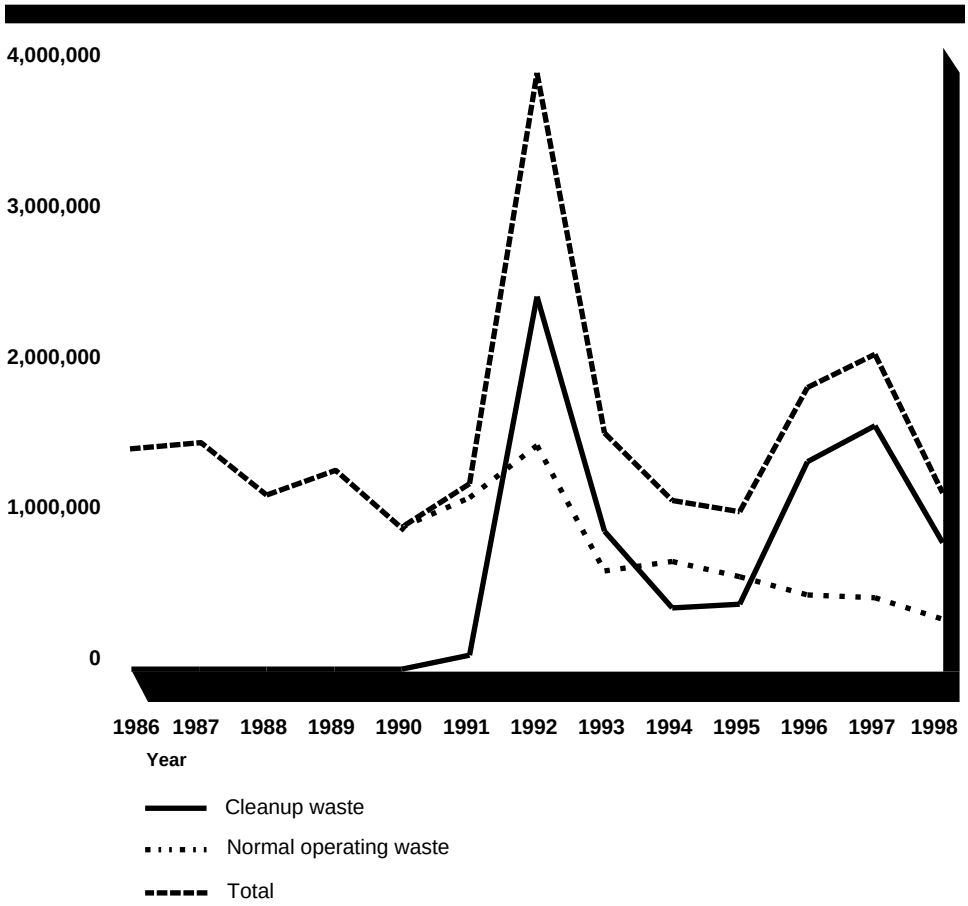
The Changing Low-Level Radioactive Waste Situation

Since 1986, the volume, if not the radioactivity, of low-level radioactive wastes produced from commercial nuclear operations and disposed of each year as normal operating wastes has declined. In the 1990s, however, the decline in operating waste has been offset, in part, by bulk wastes, such as contaminated soil, generated from dismantling and cleaning up nuclear facilities.

In 1986, the first year after the 1985 compact act was passed, commercial waste generators disposed of almost 1.8 million cubic feet of low-level radioactive wastes from normal operations. Since then, the volume, but not the radioactivity, of wastes from normal operations has steadily declined. By 1998, the amount was over 1 million cubic feet less than in 1986. (Fig. 3.1 shows the changing volume of wastes and fig. 3.2 shows the radioactivity in these wastes.) However, companies have also begun to

dispose of bulk materials generated from dismantling and/or cleaning up nuclear sites.[1]

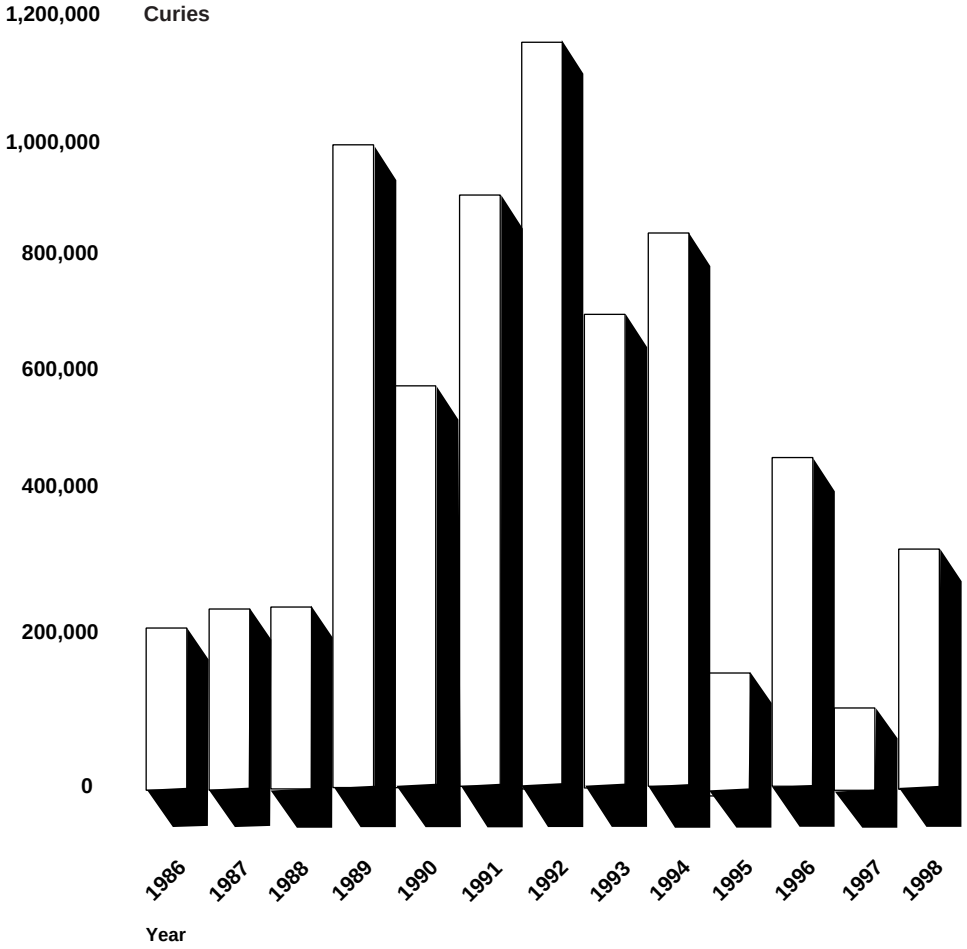
Figure 3.1: Volume of Low-Level Wastes Disposed of From 1986 Through 1998



Sources: GAO, from information obtained from DOE's manifest information management system for commercial low-level radioactive wastes and from Envirocare of Utah.

[1]The separation between operating wastes and cleanup wastes is not well defined. Operational wastes are generally defined as wastes that come from the nuclear power industry or from any entity that uses radioactive materials as part of an ongoing operation (even if that "operation" occurs only once every 2 years). Such wastes include materials like sludge and debris. In contrast, cleanup wastes are low-level radioactive wastes that have been contaminated by past activities; furthermore there is no longer any ongoing operation at the plant. Cleanup is a one-time event and, although the waste volume may be large, it is also very low in radioactivity.

Figure 3.2: Radioactivity in Low-Level Wastes Disposed of From 1986 Through 1998



Sources: GAO, from information obtained from DOE's manifest information management system for commercial low-level radioactive wastes and from Envirocare of Utah.

The cleanup wastes shown in figure 3.1, although comprising about 58 percent of the total volume of low-level radioactive wastes disposed of after 1990, contain just a few hundred curies of radioactivity. As discussed below, these wastes were disposed of at the Envirocare, Utah, disposal facility. In 1998, for example, more than 1 million cubic feet of commercially generated cleanup wastes were disposed of at the Envirocare facility; these wastes contained only about 127 curies of

radioactivity.[2] In contrast, the approximately 195,000 cubic feet of low-level radioactive wastes disposed of at Barnwell in the same year contained over 330,000 curies of radioactivity.

The decline in the estimated volume of low-level radioactive wastes is illustrated by the experience in Illinois. In 1991, the volume of wastes projected to be disposed of at a planned facility in that state over a 50-year period was about 9 million cubic feet, or 180,000 cubic feet per year. This projection did not include wastes from eventually dismantling and cleaning up the sites of the 14 nuclear power plants located in the state after the retirement of these plants. Seven years later, the state's nuclear safety department and other parties reanalyzed the projected volume of wastes. The new analysis estimated that the total volume of low-level radioactive wastes requiring disposal over the next 50 years is about 3.7 million cubic feet, or an average of 73,800 cubic feet per year—a nearly 60-percent reduction. This analysis included wastes from decommissioning nuclear power plants, which represent 5 to 10 times the volume of normal operating wastes.

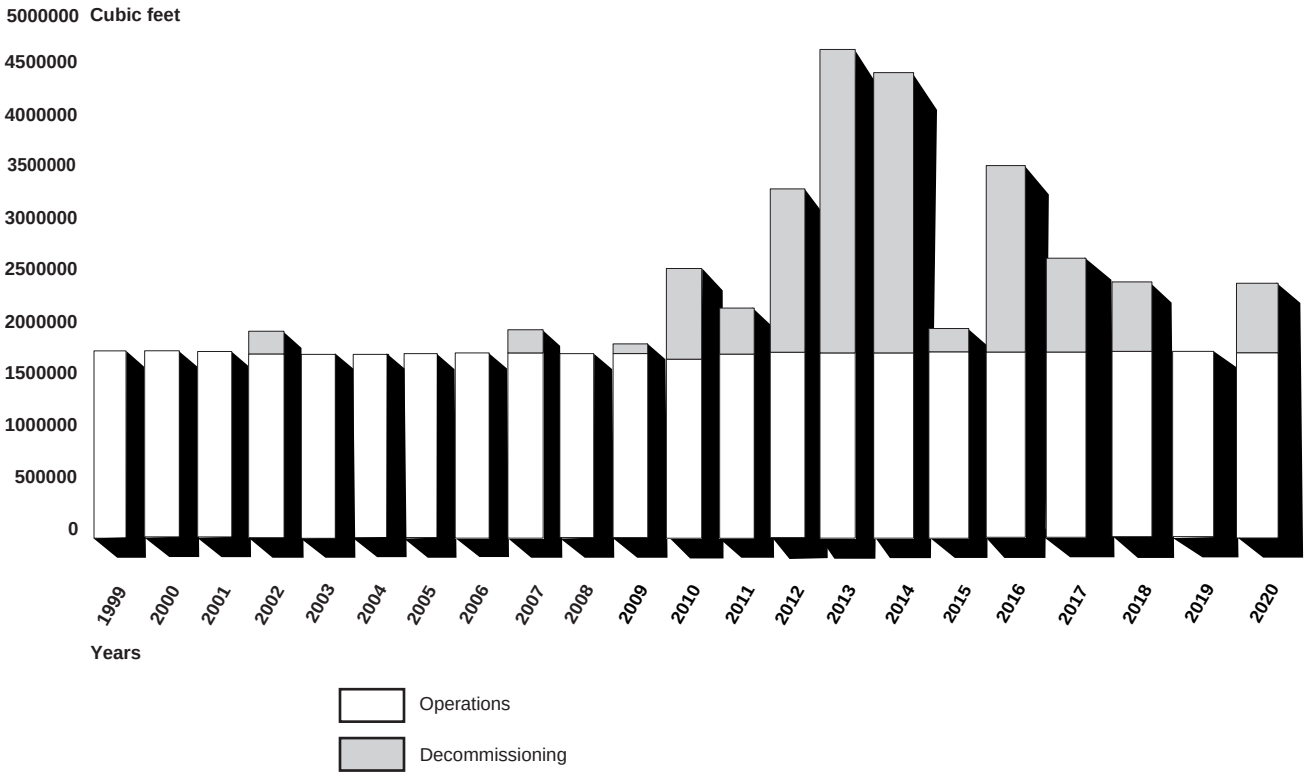
The decommissioning of nuclear power plants after they have been retired will eventually increase the volume of commercially generated low-level radioactive wastes. It is uncertain, however, just when and at what rate this will occur. By the end of 2010, the existing operating licenses for 8 of the 104 plants that are currently licensed to operate will expire. The operating licenses for another 51 plants will expire by the end of 2020. If these plants operate during their licensed periods and then are retired and immediately dismantled, the demand for disposal capacity could increase significantly after 2010. The Nuclear Energy Institute, for example, has estimated that each nuclear generating plant that is retired will generate about 250,000 cubic feet of low-level radioactive wastes.[3] On the basis of the Institute's estimates of when nuclear power plants might be retired

[2]Although DOE's manifest information management system recorded 127 curies of radioactivity in low-level radioactive wastes disposed of at the Envirocare facility in 1998, information that Envirocare of Utah provided to us showed that 290 curies worth of radioactivity were disposed of at the facility in that year. Because both amounts are relatively small, we did not reconcile the reason(s) for the difference. To provide consistency with volume and radioactivity amounts compiled by DOE for the Barnwell and Richland disposal facilities, we have used the amounts shown in DOE's manifest information management system for the Envirocare facility.

[3]The volume of low-level radioactive wastes from decommissioning nuclear power plants is illustrated by recent experience at two plants. The Fort St. Vrain plant in Colorado was retired in August 1989. This plant was relatively small and used a technology that is not typical in nuclear power plants. Over the next 7 years, a total of nearly 143,000 cubic feet of wastes was shipped to the Beatty and Richland disposal facilities. The Trojan plant in Oregon, which was a large, modern plant using a reactor technology similar to many nuclear power plants, was retired in November 1992. Since then, nearly 181,500 cubic feet of wastes has been shipped to the Richland disposal facility. Officials at that plant estimate that about 400,000 cubic feet of wastes will eventually be shipped to the Richland facility.

and then begin disposing of decommissioning wastes, nearly 25 million cubic feet of low-level radioactive wastes from decommissioning retired plants might be disposed of during the next 35 years. Figure 3.2 illustrates the increase in decommissioning wastes on the basis of the Institute's projections through 2020. The information in the figure assumes that (1) the amount of normal operating wastes disposed of each year will be equal to the annual average of the amount disposed of from 1993 through 1998 and (2) each plant will be decommissioned immediately after the end of its current licensed operating period.

Figure 3.3: Estimates of Future Increase in Wastes From Decommissioning



Source: GAO from information provided by the Nuclear Energy Institute.

There is, however, uncertainty in forecasting the amount of commercial low-level radioactive wastes from decommissioning nuclear power plants. For example, the economic deregulation of the electricity industry could make some nuclear power plants uneconomical, and therefore, subject to early retirement.[4] On the other hand, NRC permits utilities to seek extensions of plant licenses for up to 20 years. Two utilities have sought plant life extensions, for a total of five operating nuclear power plants, another utility has announced that it intends to apply for a license extension for one of its plants, and other utilities are considering life extensions. To the extent that utilities obtain extensions of the operating licenses for their plants and operate the plants for longer periods, the decommissioning of the plants would be postponed. Finally, there is uncertainty about how soon after retirement nuclear power plants would be decommissioned because NRC does not require immediate dismantling upon retirement. In fact, utilities may maintain their retired plants in a safe shutdown condition for decades before dismantling them.[5]

Almost All Waste Generators Currently Have Access to One or More Disposal Facilities

Collectively, the Barnwell, Richland, and Envirocare disposal facilities currently provide disposal capacity for almost all types of low-level radioactive wastes and almost all waste generators. (Appendix II provides additional information on these three facilities.) The Barnwell facility accepts class A, B, and C low-level radioactive wastes generated in all states except North Carolina. The Richland facility accepts class A, B, and C low-level radioactive wastes produced in the 11 states that make up the Northwest and Rocky Mountain compacts. The Envirocare of Utah facility accepts only class A low-level radioactive wastes and low-level mixed wastes; moreover, the facility may dispose of wastes that contain only specific radionuclides in concentrations within the terms of the facility's license. Within these limits, waste generators in 44 states—all states except the 8 states of the Northwest compact—may dispose of their wastes at this facility.

Table 3.1 shows, for 1998, the volume of low-level radioactive wastes disposed of at each of the three operating disposal facilities by compact and state. Although the Envirocare facility disposed of over five times as

[4]For more discussion, see Nuclear Regulation: Better Oversight Needed to Ensure Accumulation of Funds to Decommission Nuclear Power Plants (GAO/RCED-99-75, May 3, 1999).

[5]The National Research Council is preparing to study the sources, types, and volumes of commercial low-level radioactive wastes to be generated in the future, including wastes from decommissioning retired nuclear power plants.

much volume of wastes as the Barnwell facility, 99 percent of the radioactivity was disposed of at the Barnwell facility.

Table 3.1: Volume and Radioactivity of Low-Level Wastes Disposed of in 1998 by Compact, State, and Disposal Site

Volume in cubic feet

	Envirocare		Barnwell		Richland		Total	
Compact/State	**Volume**	**Curies**	**Volume**	**Curies**	**Volume**	**Curies**	**Volume**	**Curies**
Appalachian	**32,448**	**0**	**18,064**	**44,260**			**50,512**	**44,260**
Delaware			174	0			174	0
Maryland	5,600	0	2,004	531			7,605	532
Pennsylvania[a]	26,848	0	15,838	43,691			42,686	43,691
West Virginia			48	37			48	37
Central	**795**	**0**	**5,537**	**8,400**			**6,332**	**8,400**
Arkansas			366	7			366	7
Kansas			1,014	354			1,014	354
Louisiana			1,235	292			1,235	292
Nebraska[a]			2,922	7,747			2,922	7,747
Oklahoma	795	0	1	0			796	0
Central Midwest	**38,875**	**9**	**29,079**	**112,658**			**67,954**	**112,667**
Illinois[a]	35,995	8	28,952	112,654			64,947	112,662
Kentucky	2,880	1	126	4			3,006	5
Midwest	**144,582**	**2**	**6,024**	**1,543**			**150,605**	**1,545**
Indiana			74	45			74	45
Iowa			1,036	267			1,036	267
Minnesota			1,317	314			1,317	314
Missouri	15,629	0	499	811			16,128	812
Ohio	128,953	2	1,554	98			130,507	100
Wisconsin			1,544	8			1,544	8
Northwest			**16**	**725**	**142,569**	**692**	**142,586**	**1,417**
Alaska								
Hawaii			11	645	1,798	48	1,809	692
Idaho			2	22	4	0	6	22
Montana					9	0	9	0
Oregon			1	57	92,742	495	92,743	551
Utah					17,204	2	17,204	2
Washington[a]			2	2	30,808	148	30,810	150
Wyoming					4	0	4	0
Rocky Mountain			**3**	**23**	**2,199**	**964**	**2,202**	**987**
Colorado			2	11	1,747	964	1,749	975

(continued)

Volume in cubic feet

	Envirocare		Barnwell		Richland		Total	
Compact/State	**Volume**	**Curies**	**Volume**	**Curies**	**Volume**	**Curies**	**Volume**	**Curies**
Nevada					56	0	56	0
New Mexico			1	12	395	0	396	12
Northeast	**5,173**	**0**	**12,034**	**21,406**			**17,206**	**21,406**
Connecticut[a]	5,173	0	3,480	223			8,653	223
New Jersey[a]			8,553	21,183			8,553	21,183
Southeast	**451,993**	**40**	**73,202**	**27,506**			**525,196**	**27,546**
Alabama	558	0	6,994	3,583			7,552	3,583
Florida	14,889	5	24,642	2,084			39,531	2,089
Georgia			9,916	1,233			9,916	1,233
Mississippi			777	17,376			777	17,376
North Carolina[a]	7,390	4					7,390	4
Tennessee	413,034	28	22,242	695			435,271	723
Virginia	16,122	2	8,631	2,536			24,753	2,538
Southwestern	**8,826**	**0**	**7,313**	**837**			**16,139**	**838**
Arizona			3,886	246			3,886	246
California[a]	8,826	0	3,376	570			12,202	571
North Dakota			49	2			49	2
South Dakota			2	19			2	19
Texas	**10,583**	**8**	**6,636**	**2,946**			**17,218**	**2,954**
Maine			4,125	1,067			4,125	1,067
Texas[a]	10,583	8	2,485	1,880			13,067	1,887
Vermont			26	0			26	0
Unaffiliated	**386,476**	**68**	**36,608**	**112,474**			**423,084**	**112,542**
District of Columbia			245	26			245	26
Massachusetts	152,109	25	3,545	18,974			155,654	18,998
Michigan	71,495	0	10,206	37,423			81,701	37,424
New Hampshire			262	86			262	86
New York	2,313	0	11,521	54,757			13,834	54,757
Puerto Rico			11	0			11	0
Rhode Island			53	22			53	22
South Carolina	3,371	2	10,765	1,187			14,135	1,189
Unknown	157,188	40					157,188	40
Total	**1,079,750**	**127**	**194,516**	**332,779**	**144,768**	**1,656**	**1,419,034**	**334,563**
Percent	**76**	**0**	**14**	**99**	**10**	**0**	**100**	**100**

[a]Host state for compact.

Source: DOE's National low-level radioactive waste manifest information management system and Envirocare data from monthly reports submitted to the Northwest compact.

Barnwell Facility

Since the Barnwell disposal facility began operating in 1971 near DOE's Savannah River site, more than 25 million cubic feet of commercially generated low-level radioactive wastes containing nearly 8 million curies of radioactivity have been disposed of at the facility. One of the original six low-level waste disposal facilities developed in the 1960s and 1970s, the facility is authorized to dispose of all class A, B, and C low-level radioactive wastes. The facility is not, however, authorized to dispose of mixed low-level wastes. In addition, the facility is authorized by the state of South Carolina to dispose of naturally occurring and accelerator-produced radioactive material (NARM) from throughout the nation.

The Barnwell facility is currently the only disposal facility available to waste generators in 40 states that generate class B and C low-level radioactive wastes or that generate class A wastes that do not meet license criteria for disposal at the Envirocare facility. These 40 states include the District of Columbia and Puerto Rico but do not include North Carolina, the eight-state Northwest compact, and the three-state Rocky Mountain compact.

In 1998, about 99 percent of the curies of radioactivity disposed of in commercially generated low-level radioactive wastes were disposed of at the Barnwell facility. Also, about 60 percent of the low-level radioactive wastes disposed of at the Barnwell facility from 1986 through 1998 were from utilities that operate nuclear power plants. At present, 98 of the 104 nuclear power plants in the country that are licensed to operate are located in the 40 states that only have access to the Barnwell facility for disposal of their class B and class C wastes. (Five of the remaining six plants are located in North Carolina and the other plant is in Washington State.) In addition, 17 nuclear power plants that have been permanently shut down and are either being decommissioned or are in safe storage prior to being decommissioned only have access to the Barnwell facility to dispose of their low-level radioactive wastes that do not meet license criteria for disposal at the Envirocare facility.

Until 1999, Chem-Nuclear Services, LLC, which operates the Barnwell facility, estimated that the 34 acres of unused land at the facility had an available disposal capacity of over 6 million cubic feet of waste. At current disposal levels, the company estimated, the facility could operate for up to another 25 years. In 1999, however, South Carolina's Department Health and Environment reevaluated the unused portion of the facility and determined that slightly over half of the unused land is not suitable for

disposal because of shallow groundwater levels and other geohydrological conditions. This reevaluation reduced the estimated disposal capacity for the facility from over 6 million to about 3.2 million cubic feet. According to the department, this capacity would permit the continued use of the facility for about 10 years. Chem-Nuclear Services, LLC, concurs with the department's analysis.

Richland Facility

Located within DOE's Hanford site near Richland, Washington, the Richland facility, like the Barnwell facility, was one of the original six disposal facilities for commercially generated low-level radioactive wastes. Since the facility began operating in 1965, more than 13 million cubic feet of commercially generated low-level radioactive wastes, containing about 3 million curies of radioactivity, has been disposed of at the facility. The Richland facility has a remaining capacity of about 44 million cubic feet of low-level radioactive wastes.

The Richland facility provided disposal services for low-level radioactive waste generators throughout the nation until 1993, when it became the regional facility for the eight-state Northwest compact. In addition, a contract between the Northwest and the Rocky Mountain compacts permits commercial waste generators in the three states comprising the latter compact to dispose of their low-level radioactive wastes at the Richland facility. In addition, the facility is authorized to receive and dispose of NARM from throughout the nation. The facility is not licensed to dispose of mixed low-level radioactive wastes. The region covered by the two compacts contains one operating commercial nuclear power plant and one retired plant that is now being dismantled.

Envirocare Facility

Envirocare of Utah, Inc., located west of Salt Lake City within a 100-square-mile hazardous waste zone in Tooele County, has been operating as a disposal facility for various types of radioactive wastes since 1988. More than 10 million cubic feet of commercially generated low-level radioactive wastes, containing 416 curies of radioactivity, was disposed of at this facility from 1991 through 1998. The facility is authorized to dispose of certain class A low-level radioactive wastes and mixed low-level radioactive wastes under specified restrictions contained in the state's license for the facility. The license restrictions include limits on radionuclides, concentrations, and specifications on the physical and chemical properties of the wastes. The Envirocare facility is designed to treat and dispose of about 430 million cubic feet of wastes, including about

247 million cubic feet of low-level radioactive wastes from commercial and DOE sources. In addition, the Envirocare site has the capacity to dispose of about 26.5 million cubic feet of mixed low-level radioactive wastes. From 10 to 15 percent of the total disposal capacity for low-level radioactive and mixed low-level wastes has been used.

The state of Utah initially licensed the Envirocare facility in 1988 as a facility for naturally occurring radioactive wastes. In March 1991, under its NRC-agreement state authority, the state amended the license to permit the disposal of low-level radioactive wastes. Also, NRC has licensed the Envirocare facility to dispose of uranium and thorium mill tailings. In addition to commercial waste generators, the Environmental Protection Agency (EPA), DOE, and the Department of Defense have shipped wastes to Envirocare for treatment and disposal.

Beginning in 1993, the Northwest compact established a policy restricting the importation of low-level radioactive wastes into the compact region for disposal (except for the contract permitting the disposal of wastes generated in the Rocky Mountain compact). In 1995, Envirocare announced plans to expand its acceptance of some kinds of low-level radioactive wastes to waste generators in all states outside of the Northwest compact region. To do this, Envirocare sought and received an exception to the Northwest compact's restrictive policy. The exception exempted "large volume, very low concentration low-level radioactive wastes from cleanup operations" from the restriction. The exception to the general policy of the Northwest compact was intended to provide for certain types of low-level radioactive wastes that are generated during the dismantling of nuclear facilities and/or the cleanup of contaminated sites of these facilities.

In January 1996, Envirocare applied for a renewal of its license for the disposal facility. The state of Utah issued the renewed license in October 1998. Also, in November 1998, the Northwest compact removed the restriction that only "large volumes" of cleanup wastes could be disposed of at the Envirocare facility by authorizing Envirocare to accept waste shipments of less than 1,000 cubic feet from any one shipper. This change was made, according to officials of the state and the compact, so as not to penalize small waste generators that had limited space to store accumulating wastes.

The Envirocare facility is not licensed to accept any class B and class C low-level wastes. The facility may dispose of only class A wastes that

contain permissible concentrations of radionuclides specifically identified in the facility's license. According to officials of Envirocare, because their operation does not include the use of remote handling equipment for waste containers, they have chosen not to try to expand their operation to include other classes of low-level radioactive wastes. Before the company could begin to dispose of additional class A wastes or any class B or C wastes, these officials stated, they would have to address any concerns of the Northwest compact, the state of Utah, and Tooele County. Also, according to officials of Utah's Department of Environmental Quality, state law requires the approval of the state's governor and legislature to expand the types of wastes that the facility could accept for disposal. In addition, the disposal of class B and/or C wastes at the Envirocare facility would require a fundamental change in the way the facility is operated. As discussed earlier, the disposal of class B and C wastes requires more stable waste forms and tougher packaging requirements. Also, the disposal of class C wastes requires that measures be taken at the disposal facility to protect against inadvertent human intrusion. Meeting these requirements would not be possible at the Envirocare facility under the existing operating methods. Much of the wastes disposed of at the Envirocare facility are contaminated soil or soil-like materials. Other types of waste materials are dumped from their shipping containers and mixed with dirt before being spread out in layers in the disposal area. Because of the more stringent packaging and structural requirements for class B and class C wastes and the related worker exposure issues that would be involved, the disposal approach employed at the Envirocare facility precludes the disposal of class B and class C wastes as well as some radionuclides and/or concentrations of radionuclides that are classified as class A low-level radioactive wastes.

Some Wastes Do Not Have Access to Disposal Facilities

Although most waste generators currently have access to one or more disposal facilities for low-level radioactive wastes, there are three basic exceptions. The exceptions are (1) mixed low-level wastes that do not meet the license criteria for disposal at the Envirocare of Utah facility, (2) wastes generated in North Carolina that do not meet Envirocare's disposal criteria, and (3) greater-than-class-C wastes for which disposal is DOE's responsibility.

Mixed Low-Level Wastes

The Envirocare facility is the only existing disposal facility that is authorized to dispose of mixed low-level wastes. The facility is authorized to accept both low-level radioactive wastes and mixed low-level wastes

from waste generators in all states outside of the Northwest compact. However, the state of Utah's license for this facility specifies the average concentration of each radionuclide authorized for disposal and limitations on the hazardous constituent(s) of the mixed low-level wastes. Collectively, the radionuclides and concentration limits make up a large, but incomplete, subset of what NRC defines as class A wastes. Thus, any mixed low-level wastes that contain radionuclides and/or hazardous constituents that either are not listed on the facility's license or exceed limits specified in the license may not be disposed of at the facility.

Neither DOE nor NRC routinely compiles information on the amounts of mixed low-level wastes generated in the United States each year. Moreover, we were unable to identify any other source of comprehensive information on the types and quantities of mixed wastes that are currently being generated and stored by commercial users of radioactive materials. However, at least one state—Illinois—surveyed its licensees in 1997 and found that about 2,300 cubic feet of mixed low-level wastes was being stored at waste generators' sites in that state. Also in 1997, a working group of the Low-Level Waste Forum representing seven states surveyed generators of mixed low-level wastes within their states. Although the working group found it difficult to calculate the volume of mixed low-level wastes that was in storage, consultation with processors of mixed low-level wastes indicated that waste generators' reports of untreatable mixed wastes were generally accurate.

In commenting on our report, NRC stated that in 1992, the Commission and EPA published a report compiling a national profile on the volumes, characteristics, and ability to treat commercially generated mixed low-level wastes for 1990.[6] NRC added that other reports were subsequently issued by others, including DOE.[7] Generally, according to NRC, these reports have found that the amount of mixed wastes generated each year is relatively small and that most of it can be treated to remove its hazardous constituents or characteristics.

Most Waste Generated in North Carolina

Waste generators in North Carolina currently have access only to the Envirocare facility for disposing of slightly contaminated class A wastes that meet that facility's license criteria. When South Carolina withdrew from the Southeast compact in 1995, its withdrawal legislation denied waste generators in North Carolina access to the Barnwell facility because

[6]National Profile on Commercially Generated Low-Level Radioactive Mixed Waste (NUREG/CR-5938).

[7]Mixed Waste Management Options: 1995 Update (DOE/LLW-219).

the state of North Carolina was allegedly not making sufficient progress toward developing a new disposal facility. That state had been selected by the Southeast Compact Commission as the host state for the compact's next—after the Barnwell facility—disposal facility. According to the Executive Director of the Southeast Compact Commission, South Carolina's action to deny North Carolina waste generators access to the Barnwell facility violates the commerce clause of the U.S. Constitution as an unwarranted state restraint on interstate commerce. However, she added, the denial has not been challenged in the courts. The reason may be related to the fact that the largest waste generators in North Carolina—Carolina Power and Light, Duke Power, and General Electric—own and operate nuclear facilities in both states.

An official in South Carolina's Department of Health and Environmental Protection agreed that denying waste generators in North Carolina access to the Barnwell facility probably violates the Constitution's commerce clause. He pointed out that the basic purpose of the compact legislation was to provide states with incentives to form compacts and develop new disposal capacity by, among other things, granting compacts relief from the constitutional prohibition on restraining interstate commerce.

According to North Carolina's Department of Environment and Natural Resources, at the beginning of 1998, generators of low-level radioactive wastes located in the state were storing over 57,000 cubic feet of wastes containing over 500 curies of radioactivity. Also, according to the department, there are waste generators within the state that are maintaining their existing licenses to use radioactive materials solely to enable them to store their low-level radioactive wastes. About 11,700 cubic feet of these wastes was, according to the department, being stored while the radioactivity in the wastes decayed. These wastes, which usually have a half-life of less than 110 days, can be disposed of as nonradioactive wastes after a sufficient period of decay.

Wastes That DOE Is Responsible for Disposing

DOE is responsible for disposing of commercially generated wastes that are classified, under NRC's regulations on low-level radioactive wastes, as "greater-than-class-C" wastes. NRC requires that greater-than-class-C low-level radioactive wastes be disposed of in a geologic repository unless a proposal for disposing of these wastes in a facility licensed under NRC's regulations for low-level radioactive waste disposal facilities has been approved by NRC's Commissioners. According to DOE, a disposal facility for

this type of low-level radioactive waste may not be available for 20 years or more.

Greater-than-class-C wastes consist of materials and equipment such as control rods from nuclear power plants, hardware used to disassemble bundles of spent (used) nuclear fuel, and sealed radioactive sources that are used in medical and industrial applications. The largest volume of this class of commercially generated waste is produced by the operation and the decommissioning of nuclear power plants. In 1996, DOE estimated that over 7,000 cubic feet of this type of waste—containing over 4 million curies of radioactivity—is being stored and the amount of greater-than-class-C wastes generated through 2035, when the current licenses for operating nuclear power plants will have expired, will amount to about 86,000 cubic feet of wastes containing about 37 million curies of radioactivity. This projected volume is small when compared to the quantities of class A, B, and C low-level radioactive wastes disposed of each year.

DOE is addressing—through an environmental impact statement—the environmental effects of disposing of greater-than-class-C waste in a potential geologic repository for spent fuel and high-level radioactive waste at Yucca Mountain, Nevada. This environmental impact statement will primarily address the effects of disposing of 70,000 metric tons of spent fuel and high-level radioactive wastes owned and/or generated by both electric utilities and the federal government.[8] Secondarily, DOE is analyzing the effects of also disposing of (1) the total projected amount—almost 120,000 metric tons—of spent fuel and high-level radioactive wastes from both commercial generators and DOE and (2) the projected inventory of commercially generated greater-than-class-C wastes and similar wastes generated by DOE. In August 1999, DOE released a draft of its environmental impact statement for public comment. Among other things, DOE concluded that there would be little additional impact on the environment from disposing of greater-than-class-C waste and DOE's similar wastes at Yucca Mountain. DOE did not state in this environmental statement, however, that it would dispose of these wastes at a repository at Yucca Mountain. In this regard, DOE noted that disposing of these wastes at Yucca Mountain could require either legislative action or a decision by NRC to reclassify these wastes as high-level radioactive wastes.

[8]The Nuclear Waste Policy Act of 1982, as amended, limits the amount of wastes that DOE could dispose of in the repository, if developed, to 70,000 metric tons.

Future Access Concerns Raise Questions About the Appropriate Approach for Managing Wastes

States and compacts are not actively developing new disposal capacity for commercially generated low-level radioactive wastes in part because waste generators in all states except North Carolina have access to the Barnwell disposal facility. That facility, however, may reach its disposal capacity in about 10 years—just when a significant number of nuclear power plants may be retired and decommissioned, generating additional wastes. Moreover, access to the Barnwell facility could be curtailed as early as 2000 by the government of South Carolina or Chem-Nuclear Systems, LLC, could decide to close the facility on economic grounds. Also, recent initiatives by private companies to license and develop new waste disposal facilities have not been successful. Thus, within 10 years, waste generators in the 41 states that do not have access to the Richland disposal facility may once again be without access to disposal capacity for much of their low-level radioactive wastes.

The conditions discussed above raise the following question: "What, if anything, could be done to ensure that adequate, reliable disposal capacity remains available to meet commercial needs for the foreseeable future?" Among the alternatives available for consideration are (1) retaining the current compact approach, (2) repealing the compact act in favor of a free-market approach to waste disposal services, or (3) designating one or more of DOE's disposal facilities for the disposal of commercially generated waste.

Continued Access to the Barnwell Facility Is Not Assured

Although generators of low-level radioactive wastes in all states except North Carolina currently have access to the Barnwell disposal facility, that facility may run out of available disposal capacity around 2010. As noted earlier, the operating licenses for 51 nuclear power plants will expire from 2011 through 2020 (unless extended by NRC), and the operators of 49 of these plants currently rely on the Barnwell facility for the disposal of low-level radioactive wastes.[1] Moreover, waste generators in at least 44 states could lose their access to the Barnwell facility earlier than 2010 if South Carolina takes action to join an existing compact or to close its border to wastes outside of the state, as it is considering, or if Chem-Nuclear Systems closes the facility as an unprofitable operation.

South Carolina Considers Rejoining Compact

South Carolina is considering whether to join an existing compact or take other steps to restrict access to the Barnwell facility. If South Carolina

[1]The other two plants are located in North Carolina.

joins a compact, waste generators in states outside that compact could lose access to the Barnwell facility.

The Governor of South Carolina stated, in his January 20, 1999, "State of the State" address, that the state's withdrawal from the Southeast compact had been a mistake and that the state needed to explore the possibility of rejoining the compact. He added, however, that he would insist on two conditions for reentering the compact. First, an agreement would have to be made on a specific date after which South Carolina would no longer be the national and regional landfill for nuclear wastes. Second, the compact would have to be prepared to insist that North Carolina (the designated host state for a new compact disposal facility) meet its obligations to the compact. Then, in June 1999, the governor created a task force to examine the Barnwell issue. The governor's stated goal is to get the state to stop taking radioactive wastes from around the country by some means such as limiting access to the Barnwell facility to waste generators within South Carolina, rejoining the Southeast compact, or joining another compact.

In January of this year, South Carolina's legislature began considering legislation that would, if implemented, enable the state to reenter the Southeast compact and restrict access to the Barnwell facility to waste generators within the compact region. The consideration of this proposed legislation has been suspended until the legislature reconvenes in January 2000. If South Carolina eventually rejoins the compact and restricts access to the Barnwell facility, then waste generators in the 33 states (including the District of Columbia and Puerto Rico) outside of the Southeast, Northwest, and Rocky Mountain compacts would have access only to the Envirocare facility. In 1998, these 33 states disposed of over 110,000 cubic feet of low-level radioactive wastes at the Barnwell facility.

The Barnwell Facility Might Be Uneconomical to Operate

In addition to the potential effect of direct state action that could affect the accessibility of the Barnwell facility to waste generators in most states, the facility operator is concerned that existing state taxes on the operation of the facility could make the facility's continued operation uneconomical.

When South Carolina reopened access to the Barnwell disposal facility in 1995 to all states except North Carolina, it imposed a state tax of $235 per cubic foot on all wastes disposed of at the facility. Tax proceeds were earmarked for higher education grants (28.5 percent), other education assistance (66.5 percent), and Barnwell County (5 percent). The addition

of this tax has contributed to general efforts by utilities and other users of nuclear materials to reduce their disposal costs by reducing the volume of low-level radioactive wastes that they generate and dispose of at the Barnwell facility. As a result of the nuclear industry's volume-reduction initiatives, the volume of wastes disposed of at the Barnwell facility has continued to decline, resulting in less tax revenue than the state had expected.

Subsequently, South Carolina amended the method for computing the disposal tax by, in effect, requiring Chem-Nuclear Systems to deposit at least $24 million annually into the state's higher education fund regardless of the number of cubic feet of wastes disposed of at the Barnwell facility. To collect sufficient taxes on disposal services to cover the minimum contribution to the higher education fund in the state's fiscal year (July 1 through June 30), Chem-Nuclear Systems would have to dispose of about 360,000 cubic feet of waste. Chem-Nuclear Systems had estimated, however, that it would sell only about 160,000 cubic feet of disposal services in South Carolina's fiscal year ending on June 30, 1999. This amount of disposal service, the company estimated, would leave a shortfall in the minimum tax for the higher education fund amounting to about $13.3 million. In the short term, therefore, Chem-Nuclear Systems had to use its own funds to make up this shortfall.

Officials of Chem-Nuclear Systems have indicated that if they are unable to raise sufficient funds in the future to pay the state's license and disposal services tax on the operation of the Barnwell facility, then the company will have to either increase disposal fees or, perhaps, close the facility.

Companies' Efforts to Develop New Disposal Facilities Have Not Been Successful

During the 1990s, several companies have shown interest in obtaining licenses for and developing new disposal facilities for radioactive wastes generated by DOE. But these initiatives have thus far not been successful. Had they succeeded, they would have resulted in new, licensed and regulated disposal capacity that, if future conditions warranted, could have served the disposal needs of commercial generators of low-level radioactive wastes.

In March 1999, DOE estimated that it may generate and dispose of over 300 million cubic feet of low-level radioactive wastes (including mixed low-level wastes) over about the next 70 years as it cleans up its complex of nuclear facilities. Although DOE would dispose of most of these wastes at its own disposal facilities, it estimated that 20 million to 40 million cubic

feet of the wastes could be disposed of in commercial facilities. Because of the potential market for disposing of DOE's radioactive and hazardous wastes, including low-level radioactive wastes, commercial waste management companies have expressed an interest in developing treatment, storage, and disposal facilities to serve DOE's needs. However, DOE's policy is that a commercially owned and operated disposal facility must be licensed and regulated by either NRC or an agreement state[2] before DOE will consider disposing of its radioactive wastes at the company's facility. At present, Envirocare of Utah is essentially the only private company that operates a licensed facility that DOE can use to dispose of qualifying low-level radioactive wastes, mixed low-level wastes, and wastes from uranium and/or thorium mills.[3] Since 1992, DOE has disposed of over 3 million cubic feet of low-level radioactive wastes and over 1.1 million cubic feet of mixed low-level wastes at the Envirocare facility. DOE intends, however, to promote competition for its disposal services within the private sector by, among other things, offering incentive payments or minimum volume guarantees for new facilities that obtain NRC or state licenses within a short period of time.

Waste Control Specialists, Inc., is one private company that wanted to obtain a license from the state of Texas (Texas is an agreement state under the Atomic Energy Act, as amended) to permit the company to compete for DOE contracts for treating, storing, and disposing of DOE's wastes, including low-level radioactive wastes and mixed low-level wastes. The company operates a hazardous waste treatment, storage, and disposal facility on a 16,000-acre site located northwest of the Midland-Odessa area in Andrews County, Texas. (Most of the site is in Texas, but a part of it is in New Mexico.) Waste Control Specialists is also authorized to treat and store, but not dispose of, mixed wastes at the facility. Under Texas law, only the state's radioactive waste authority may obtain a license for a disposal facility for commercially generated low-level radioactive wastes. Waste Control Specialists sought state legislation that would have permitted the company to seek a state license to (1) construct and operate a disposal facility for low-level wastes generated in the three-state Texas compact and (2) dispose of wastes generated by DOE, including low-level radioactive wastes and mixed low-level wastes. According to company officials, the company's primary interest was in meeting the conditions that are necessary for it to compete for DOE's waste management

[2]An agreement state is a state that has entered into a formal agreement with NRC providing for the transfer from NRC to the state of the authority to regulate the commercial possession, use, and disposal of radioactive materials.

[3]DOE has access to the Barnwell facility but seldom uses it because of the high disposal charges at the facility.

contracts. Without authority to compete for DOE's business, according to these officials, the company was not interested in becoming the host facility for waste generators in the Texas compact.

A second company—Envirocare of Texas—also wants to establish a treatment and storage facility for hazardous and radioactive wastes in Andrews County, Texas, and, depending on studies of a site it purchased, a disposal facility that could serve both commercial waste generators and DOE. Unlike Waste Control Specialists, Envirocare does not have a developed waste management facility at its site in Andrews County. Officials of Envirocare publicly stated that the company would be willing to serve as the host for the Texas compact or in any other way that will meet the needs of the state and waste generators.

Neither of the initiatives in Texas was successful because in May 1999, the state did not enact proposed legislation that would have authorized private companies to seek a state license. The siting authority in Texas was abolished by legislation that did pass, and the authority's functions were transferred to the state's licensing agency.

Safety Kleen was interested in disposing of DOE's radioactive wastes at the site of a hazardous waste facility that it operates in eastern Colorado. The company wanted to obtain a license from the state to treat, store, and dispose of certain low-level radioactive wastes and mixed low-level wastes generated by DOE at its Rocky Flats Environmental Technology Site near Denver. However, in May 1999, Safety Kleen announced that it would not pursue this initiative because of local opposition as well as opposition from the Governor of Colorado. This proposal, had it succeeded, would not have had an immediate direct effect on commercial waste generators' access to disposal facilities for low-level radioactive wastes and mixed low-level wastes. It could, however, have resulted in a new, state-regulated disposal facility for low-level radioactive and mixed low-level wastes that could, under the right circumstances, have been made available to commercial waste generators.

Also, on April 24, 1997, Safety Kleen announced its intent to seek a license to dispose of low-activity, low-level radioactive wastes and naturally occurring radioactive material, including wastes from commercial generators, at its Grassy Mountain facility in Tooele County, Utah. The facility is currently permitted to accept industrial and hazardous wastes and polychlorinated biphenyls, referred to as PCBs. If successful, the company would dispose of NORM and low-level radioactive wastes with

limited concentrations of specific radionuclides at the facility in a synthetically lined trench initially planned for hazardous wastes. Safety Kleen submitted a siting plan application to the state of Utah and applied for local planning and zoning authorization. In December 1998, the Tooele County Planning Commission rejected Safety Kleen's application for local planning and zoning authorization. The company has appealed the decision to the County Commission. Under Utah law, the approval of the proposed facility by the governor and state legislature would also be required.

Alternative Approaches to Managing Low-Level Radioactive Wastes

The lack of new disposal facilities, the declining volume of commercially generated low-level radioactive wastes disposed of each year, and the possible loss of access to the Barnwell facility raise questions about whether a new approach to the waste disposal issue is needed. Although siting agencies in several states have shown an interest in storing low-level radioactive wastes for 100 or more years as an alternative to the permanent disposal of these wastes in the near future, such an approach postpones, but does not replace, the need for disposal. States, compacts, and industry groups have discussed several alternatives to alleviate the current conditions. Among the disposal alternatives available to the Congress are (1) retaining the compact approach, (2) repealing the compact act to remove the compacts' authority to impose restrictions on the import and export of low-level radioactive wastes, or (3) making DOE responsible for disposing of both its own and commercially generated low-level radioactive wastes. Many factors have contributed to this lack of success, but the key factor appears to be the willingness—or unwillingness—of states to vigorously pursue their development programs. To be successful, any one of these approaches would have to address the willingness of any state or states to serve as host for a disposal facility.

Retain the Compact Approach

One course of action is to leave the existing compact legislation in place and let the compacts and states address issues such as declining volume and the potential lack of access to current disposal facilities.

Compact advocates emphasize the degree of control that states exercise over low-level radioactive waste issues and the flexibility that the compact legislation provides for responding to changing circumstances. For example, compacts are free to regulate the import and/or export of low-level radioactive wastes within their region for treatment, storage, or

disposal and to realign themselves as circumstances, such as the declining volume of wastes, may warrant. The Northwest compact illustrates these features of compacts. The Northwest compact entered into a contract with the Rocky Mountain compact to dispose of low-level radioactive wastes generated in the latter region at the Richland facility. The Northwest compact also acquiesced in the development and operation of the Envirocare of Utah disposal facility. The compact recognized that the Envirocare facility had the support of the state of Utah—a member of the compact—and that the facility fulfilled a need for disposal services for high-volume, low-activity radioactive wastes. Thus, supporters of this approach point out, the compact system does not preclude private development of new disposal facilities.

As discussed earlier, however, after collectively spending about $600 million, not one of the compacts has successfully developed a new disposal facility for low-level radioactive wastes. This history, 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. Others, on the other hand, point out that pending legal action against designated host states, such as Nebraska, that have not developed new disposal facilities, may prove, in the long run, the best means to ensure that these states discharge their responsibilities under the compact acts.

Repeal the Compact Legislation

Because none of the compacts have developed, or are attempting to develop, new disposal facilities, some argue for repealing the compact acts so that private industry could more readily develop and operate disposal facilities in response to market conditions. This approach would remove some of the direct control that the compact approach provides states over the process of developing and operating disposal facilities for low-level radioactive wastes. Successfully implementing this approach, however, would still depend, to a large extent, on the willingness of prospective host states to accept these facilities.

Proponents of a market-driven approach point out that 10 regional compacts are too many to address the amount of commercially generated low-level radioactive wastes that is now being disposed of. Abolishing the compacts would result in a single national market open to commercial disposal firms. Moreover, the market for disposal services would be larger when considering DOE's estimated need for commercial disposal services. In this regard, the recent initiatives by Waste Control Specialists,

Envirocare, and Safety Kleen in developing licensed facilities for disposing of low-level radioactive wastes demonstrate commercial interest in the combined commercial and DOE markets for disposal services.

This approach, however, appears to risk the early loss of existing disposal capacity before replacement disposal capacity comes on line. For example, the state of Washington supports the compact approach and has stated that it probably would close the Richland facility if it lost the right to exclude out-of-region wastes provided by the compact legislation. At a minimum, the state could decline to renew US Ecology's lease on the Richland disposal site when the lease expires in mid-2005. Also, South Carolina, which now wants to exercise greater control over the Barnwell facility's disposal operations, could take similar action regarding that facility.

Finally, if states' roles in developing new disposal facilities are limited to licensing and regulating new facilities proposed by private companies, states dissatisfied with this more limited role might erect administrative barriers to new disposal facilities within their borders. This phenomenon is illustrated in the recent experiences in Colorado, Texas, and Utah, in which commercial waste management companies were unsuccessful in obtaining political and/or regulatory approvals from state and/or local governments for their proposed new disposal facilities.

Make DOE Responsible for Disposing of Commercial Waste

Another alternative approach to disposing of commercially generated low-level radioactive waste is directing DOE to dispose of commercially generated wastes. This approach is supported by those who believe that state governments would successfully frustrate attempts to develop new disposal facilities under the compact and free market approaches discussed above. They also point to the relatively small volume that would be added to DOE's waste disposal operations. Over the 10-year period ending in 1998, for example, DOE estimates that it disposed of over 2.3 million cubic feet of low-level radioactive wastes per year at its six operating disposal sites. In contrast, a total of less than 350,000 cubic feet of wastes was disposed of at the Barnwell and Richland facilities in 1998, and a little more than 1 million cubic feet of slightly contaminated wastes was disposed of in that year at the Envirocare of Utah facility.

Two of DOE's six disposal facilities for low-level radioactive wastes—facilities that are located on the Hanford site and the Nevada Test Site—currently accept low-level radioactive wastes from other DOE

facilities.[4] Both facilities have large unused capacities. At Hanford, the existing disposal facility is expected to be capable of disposing of about 71 million cubic feet of these wastes, or about seven times the amount that DOE expects to dispose of at that facility over approximately the next 70 years. The disposal facility on DOE's Nevada Test Site has over 100 million cubic feet of disposal capacity, and DOE expects to use only about 17 million cubic feet of this capacity for the disposal of its own low-level radioactive wastes. Both of these disposal facilities are also capable of disposing of mixed low-level wastes. Moreover, disposal capabilities can be expanded at both locations. It is clear, therefore, that these two disposal facilities have the capacity to accept commercial low-level radioactive wastes in addition to DOE's own wastes. Also, there is precedent for making DOE responsible for disposing of commercial radioactive wastes. For example, the 1985 compact act made DOE responsible for disposing of greater-than-class-C low-level radioactive wastes. In addition, the Nuclear Waste Policy Act of 1982, as amended in 1987, made DOE responsible for disposing of spent fuel from commercial nuclear power plants in a geologic repository.

There are, however, drawbacks associated with this approach. In particular, there does not appear to be any incentive for the most likely affected states—Nevada and Washington—to accept this approach. These two states host DOE's Nevada Test Site and Hanford Site, respectively, which contain the only two of DOE's six disposal facilities that generally dispose of low-level radioactive wastes generated at other DOE facilities. The objections of the (then) governors of these two states (and South Carolina) to bearing what they viewed as an unfair burden for disposing of commercial low-level radioactive wastes led to the compact acts. At both sites, moreover, DOE and the respective state governments are addressing numerous issues pertaining to cleaning up the environmental legacy of the nuclear weapons program. For example, Nevada officials anticipate that, as DOE continues to clean up these facilities, the Department will rely more and more on the Nevada Test Site to dispose of various radiological and hazardous wastes. A major objective of Nevada's cleanup negotiations with DOE, therefore, is to ensure that the Department does not transport wastes through the greater Las Vegas Valley en route to the Nevada Test Site.

In general, these states have been opposed to the disposal of wastes from other DOE nuclear facilities and can be expected to oppose the disposal of commercially generated low-level radioactive wastes at these sites.

[4]DOE's Savannah River site accepts low-level radioactive wastes from the Navy's nuclear operations.

Neither state, for example, has authorized DOE to dispose of mixed low-level wastes generated outside of their respective state at either the Nevada Test Site or the Hanford site. DOE appeared to have recognized the sensitivity of the issue of state acceptance of the additional disposal of radioactive wastes when it declined a request by an organization of users of radioactive materials in California to dispose of their low-level radioactive wastes at DOE's Nevada and Hanford facilities. The users organization had requested access to these disposal facilities on behalf of California's generators of low-level radioactive wastes, pending resolution of the state of California's request to purchase the federally owned site in Ward Valley for use as a waste disposal facility. DOE denied the users organization's request on the basis of equity considerations in Nevada and Washington.

For at least 10 years, the state of Nevada has also vigorously opposed the possible use of Yucca Mountain for a repository for spent fuel and other highly radioactive wastes. The 1987 amendments to the nuclear waste act authorized the Secretary of Energy to enter into an agreement with Nevada concerning a repository under which the state could receive (1) an initial payment of $10 million upon the execution of the agreement, (2) subsequent payments of $10 million each year prior to DOE's first receipt of spent fuel at Yucca Mountain, and (3) annual payments of $20 million thereafter until the repository's closure. In return, Nevada would, among other things, be required to waive its right, under the 1982 waste act, to disapprove of (subject to a congressional override) a formal recommendation by the federal government that Yucca Mountain be designated as a site for a geologic repository. The state, however, did not pursue such an agreement. In fact, in 1989, the state enacted legislation, subsequently overturned in federal court, making it illegal to store high-level radioactive wastes in Nevada. In that same year, the Nevada legislature enacted, and the governor approved, resolutions (1) opposing the placement of a high-level radioactive waste repository anywhere in the state and (2) prohibiting the establishment of a repository at Yucca Mountain.

Moreover, having DOE dispose of commercially generated low-level radioactive wastes could adversely affect the Department's negotiations with states and other interested parties on acceptable solutions to cleanup problems throughout DOE's complex of nuclear facilities. DOE has invested substantial time and resources in negotiating acceptable arrangements for the management of its wastes with the states that host DOE's nuclear facilities. These efforts have been in response to the requirements of the

Federal Facility Compliance Act and commitments made to governors, including environmental impact analyses at each site. Also included in these efforts have been substantial negotiations with many publics ranging from local citizen advisory boards to the National Governors' Association. Imposing the additional requirement that DOE dispose of commercially generated low-level radioactive wastes at one or more of these DOE facilities could negatively affect DOE's progress in negotiating cleanup arrangements with states and other interested parties.

Assigning DOE the responsibility for disposing of commercially generated low-level radioactive wastes would impose an additional burden on a federal Department that has often been criticized by states and other interested parties for what they have characterized as its poor performance in cleaning up its complex of nuclear facilities. And finally, DOE self-regulates its own disposal operations, whereas either NRC or an agreement state regulates the disposal of commercially generated low-level radioactive wastes. Resolving 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.

State Compacts' and Unaffiliated States' Experiences Under the Compact Acts

Appalachian Compact

The Appalachian States Low-Level Waste Compact Act of 1985 permitted Pennsylvania to establish a regional low-level radioactive waste disposal site for the Appalachian compact states of Delaware, Maryland, Pennsylvania, and West Virginia. Pennsylvania was selected as the host state because it generates the largest amount of wastes within the compact. In 1990, Chem-Nuclear Systems, LLC signed an agreement, called the "Main Agreement," with the Pennsylvania Department of Environmental Protection to site, design, construct, operate, close, and decommission a regional low-level waste disposal facility for the compact. In March 1996, Pennsylvania began a voluntary siting process. The volunteer process empowered municipalities in Pennsylvania to make their own choices about hosting a facility. From March 1996 through April 1998, staff of the contractor that the state selected traveled more than 90,000 miles statewide and participated in more than 340 outreach meetings. Yet, no municipality expressed interest in hosting a low-level waste disposal facility. On December 31, 1998, Pennsylvania's Department of Environmental Protection suspended the low-level radioactive waste disposal facility-siting project.[1]

According to the department, two factors that drove the need for a low-level waste disposal facility had changed dramatically. First, as of the end of 1998, it appeared that existing disposal capacity at the Barnwell and Envirocare disposal facilities could be available to low-level waste generators in Pennsylvania for at least 25 years. In addition, volumes of low-level radioactive wastes generated in Pennsylvania have decreased from more than 225,000 cubic feet in 1991 to less than 30,000 cubic feet in 1997. According to the department, the Main Agreement between Chem-Nuclear Systems and the state will be amended so that the project can be resumed, if needed. Additionally, the Appalachian compact commission approved a $200,000 "restart fund" for the commission in the event that the siting process begins again.

Central Interstate Compact

In 1982, Arkansas, Kansas, Louisiana, Oklahoma, and Nebraska formed the Central Interstate Low-Level Radioactive Waste Commission to provide for low-level radioactive waste disposal within their borders. In 1987, the Commission chose Nebraska as its host state and US Ecology as the developer of the compact's low-level radioactive waste disposal facility. Nebraska's governor at that time expressed reservations about the state's role but committed the state to honoring its commitment under the

[1]The Department of Environmental Protection suspended the project after discussing the issue with the Low-Level Waste Advisory Committee and the Appalachian compact commission.

compact agreement. US Ecology submitted a license application to Nebraska in 1990. Since then, efforts to license a site in Nebraska have been challenged and delayed.

From 1993 through 1998, Nebraska, or a closely related political subdivision, brought five lawsuits against the Commission or US Ecology. Nebraska lost all five cases, whereby the courts found that, in general, all the suits lacked merit. In one case, for example, the court concluded that "Governor Nelson, the State of Nebraska and Plaintiffs in this case were 'closely related,' that there appeared to be a 'coordinated litigation strategy,' and the State of Nebraska and its constituent political bodies. . .are not entitled to wage what might be characterized as hit-and-run guerilla warfare by filing multiple lawsuits on the same claim in order to frustrate performance of the Compact."[2]

In January 1993, Nebraska's regulatory agency announced its intent to deny a license for the proposed disposal facility because the site contained wetlands. In October 1993, after the developer redesigned the boundaries of the site and eliminated the disputed wetlands area, the regulatory agency notified the developer that the agency would withdraw its intent to deny the license.

In December 1998, Nebraska denied US Ecology's application to construct a disposal facility for commercial low-level radioactive wastes on a site in Boyd County, Nebraska. The state based its decision on groundwater issues, the need for continuing active maintenance after the site's closure, and US Ecology's financial qualifications. On January 15, 1999, US Ecology filed a petition with the state to reverse Nebraska's license denial. According to the petition, the denial is arbitrary and capricious, is based on an unreasonable interpretation of statutes and regulations, and is an abuse of discretion that precludes any site from being licensed in Nebraska. The company alleged that the decision to deny the license application was based on erroneous interpretations of data and regulations and was politically influenced by the former state governor.

Prior to the petition, five utilities filed suit in the U.S. district court challenging actions taken by Nebraska and its officials in reviewing US Ecology's license application.[3] The suit alleged, among other things, that Nebraska regulators violated a statutory and contractual obligation to

[2]County of Boyd v US Ecology, 858 F Supp. 960 (D. Neb. 1994).

[3]Later, the Central Compact Commission, which was originally named as a defendant in the suit, filed a motion realigning itself as a plaintiff. Also, US Ecology became a plaintiff in the lawsuit.

exercise "good faith" in their review of the license application and that they exhibited bias or prejudice in their review. The plaintiffs sought, among other things, the removal of Nebraska from the licensing process, damages, and a declaration that Nebraska violated the compact agreement.

On April 16, 1999, the US district court issued a preliminary injunction against Nebraska and others, finding that there is good reason to think that Nebraska's license denial was "politically preordained." The court concluded that the Commission will likely win on the merits of the case and that Nebraska had acted in bad faith and therefore violated the compact agreement The court ruled that there is strong evidence of bad faith from Nebraska in the licensing process. The following is some of the evidence of Nebraska's bad faith cited by the court:

- The former governor's campaign promise to kill the disposal facility and questionable behavior by his subordinates in an apparent effort to ensure that his political promise be carried out.
- The refusal of the former governor's regulator to adopt a budget and timetable, potentially resulting in the waste of 8 years of work and $74 million.
- Nebraska's 1993 and 1998 decisions to deny the license application.
- Repeated litigation without merit in the district court.[4]

On May 6, 1999, Nebraska's legislature passed a bill to remove the state from the Central Interstate compact, and on May 12, 1999, the governor signed the bill into law. The new law takes effect on August 29, 1999. The law authorizes Nebraska's governor to notify the governors of the other states belonging to the compact that Nebraska is withdrawing from the compact. Under the terms of the compact agreement, withdrawals generally do not take effect until 5 years from the date of such notification.

Central Midwest Compact

In 1984, Illinois and Kentucky formed the Central Midwest compact to develop and implement a solution to low-level radioactive waste disposal issues. In 1987, the compact designated Illinois as the host state for the compact's disposal facility because Illinois produced 98 percent of the region's low-level radioactive wastes. By the early 1990s, a site for the development of a low-level waste disposal facility had been selected near Martinsville, the site was studied, a facility had been designed, and the license application was under review by the state. However, in 1989,

[4]Entergy Arkansas, Inc. v Nebraska, __ F Supp.2d—, 1999 WL 225849, at 18 (D. Neb. 1999).

because of questions about the process for selecting a new site for a disposal facility and concerns about the suitability of a proposed site, the Governor of Illinois and the state's legislature created an independent commission to examine the safety of the proposed site. In 1992, the commission found the site unacceptable, rejecting the conclusions of the state agency that had spent 8 years and about $85 million in selecting and studying the site.

Since then, the state established a new siting process for developing a regional disposal facility in Illinois. The land for a disposal facility site must be volunteered by both its owner and the appropriate municipality or county government. According to the director of Illinois' Department of Nuclear Safety, however, the state has "abated but not suspended or halted" its siting efforts because of (1) the continued availability of disposal capacity for the generators of low-level radioactive wastes in Illinois, (2) uncertainties inherent in the national low-level radioactive waste situation, and (3) concerns over the decline in waste volume and its effect on disposal costs. Waste generators in the state are able to dispose of wastes in South Carolina and Utah, and if, when, and how this will change is uncertain.

The state is also concerned that a disposal facility is not economical, considering today's waste volumes. The Illinois Department of Nuclear Safety, the state's low-level waste generators, and Chem-Nuclear Systems LLC (the state's disposal facility developer) recognized that the decline in waste volumes might influence the economic viability of the planned regional disposal facility. For example, wastes generated in Illinois declined from over 200,000 cubic feet shipped in 1986 to less than 50,000 cubic feet in 1997. As a result, the state and Chem-Nuclear developed an economic model as a tool to evaluate various development strategies.[5] The analyses using this model indicated that developing the planned disposal facility would not be economically viable because of the expected lower volume of wastes. The analyses also showed that the facility would not become economically viable until the decommissioning of nuclear power plants in the state increases the amount of low-level wastes generated for disposal. According to the Commonwealth Edison Company—Illinois' major low-level radioactive waste generator—developing a disposal facility in the 2010 time frame makes sense because that is when an

[5]The model included parameters such as waste-volume projections, capital construction costs, the period of recouping capital investment, annual operating expense, interest rates, and profit that could be varied, depending on the development scenario being considered.

extensive decommissioning period will begin for some of its 13 nuclear power plants.[6]

The loss of access to disposal capacity at existing facilities would influence how the state manages its low-level radioactive wastes. According to a state official, however, the loss of capacity does not mean that the state would accelerate the siting and development of a disposal facility in Illinois. Absent large waste volumes from decommissioning the nuclear power stations, the development of a facility in the state remains cost prohibitive.

In summary, the state of Illinois believes that the changes that have occurred over the past several years strongly suggest that the need to develop a disposal facility for commercially generated low-level radioactive wastes in Illinois should be reevaluated. These changes included (1) the continued availability of disposal capacity outside of Illinois, (2) a significant reduction in the volume of low-level radioactive wastes being generated in Illinois, (3) the nuclear utilities' decisions not to seek an extension to the life of their nuclear plants nor to delay decommissioning following the termination of the plants' operating licenses, and (4) the desire to improve the site selection process.

Midwest Interstate Compact

In October 1982, a document outlining the formal provisions of the Midwest compact was completed. After the document's enactment by the legislatures and approval by the governors of Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin, the Congress consented to the compact in 1985. The seven states agreed that each state would take its turn in hosting a disposal facility. The states decided that the host state was responsible for locating, designing, constructing, and operating the facility. In 1987, Michigan was chosen to host the first low-level waste disposal facility because it was projected to generate the most low-level wastes during the 20-year operating period of the first disposal facility. Ohio was projected to be the second largest generator and was chosen as the first alternate host state.

The Midwest Compact agreement made the selected host responsible for choosing possible locations for a low-level radioactive waste disposal facility within the state's borders. The Michigan low-level radioactive waste authority began a facility-siting process in 1987. By October 1989, the authority had designated three areas as potentially suitable for siting a

[6]Commonwealth Edison shipped about 92 percent of Illinois' low-level radioactive waste in 1997.

disposal facility. Less than 1 year later, however, the authority had eliminated all three areas from consideration. The Midwest compact decided that Michigan had unreasonable criteria that essentially precluded the state from finding a suitable site. In July 1991, the compact voted to expel Michigan for not acting in good faith to honor a binding contractual obligation to find a waste disposal site in Michigan. As a first alternate, Ohio became the selected host state for the compact's first regional disposal facility for low-level radioactive wastes.

On June 26, 1997, the Midwest Interstate Compact Commission noted that it was at a critical point immediately prior to committing considerable funds to a site selection process in Ohio. At that time, the Commission halted development activities for a regional low-level radioactive waste disposal facility. The Commission also relieved Ohio of its host state designation and obligation to find a location for a regional disposal facility and develop it. The commission cited several reasons for its decision. First, low-level waste generators in the compact region had successfully instituted waste management and treatment practices (e.g., waste minimization, compaction, incineration, and evaporation) that continue to dramatically reduce the amount of wastes annually shipped to disposal facilities. For example, wastes decreased from a high of 114,700 cubic feet in 1989, to 20,000 cubic feet in 1996. Second, the estimated cost of new disposal facilities has risen significantly and has ranged from $105 million to $216 million, exclusive of operating costs. Third, Midwest compact generators had access to existing low-level radioactive waste disposal facilities that appear to have sufficient capacity to accept wastes for a lengthy period of time. Unexpected events involving existing, privately operated disposal facilities in South Carolina, Utah, and possibly other locations have created disincentives to develop new disposal capacity.

Northeast Interstate Compact

The Congress ratified the Northeast Interstate Compact in 1985. Soon thereafter, two of the original four member states—Delaware and West Virginia—joined the Appalachian compact, and the remaining member states—Connecticut and New Jersey—were designated as dual host states. As dual hosts, each state is responsible for establishing the capacity to manage the low-level radioactive wastes generated within its borders. Both Connecticut and New Jersey developed voluntary siting plans in which towns or regional groups are asked to host the state's low-level radioactive waste disposal facility.

Connecticut carried out a statewide screening effort in the early 1990s to identify candidate sites for a disposal facility. Although this effort led to the identification of three candidate sites, vehement public and political protest over the selection of these candidate sites in 1992 led the state's legislature to pass and the governor to sign legislation terminating this siting effort. Connecticut has placed its voluntary siting process on hold. According to the Northeast Interstate Compact's regional management plan, the reopening of the Barnwell, South Carolina, facility and the availability of the Envirocare facility in Utah for some types of low-level radioactive wastes made disposal possible for waste generators in Connecticut. This availability of out-of-state disposal reduced the urgency for the development of in-state capacity and gave the state's siting agency—the Connecticut Hazardous Waste Management Service—an opportunity to consider a long-term storage concept, called "assured isolation," as an alternative to developing a disposal facility.

Proponents of the assured isolation concept believe that the concept can be a solution to the issue of the long-term management of commercially generated low-level radioactive wastes. In their view, assured isolation facilities could be safely operated at more locations than traditional disposal sites and allow them to be located at existing nuclear facilities. They also believe that the ability to continually inspect the structural integrity of the facilities might help reduce public concerns over the facilities' long-term performance. Assured isolation for the foreseeable future might have the added benefit of permitting the relatively short-lived low-level radioactive wastes to decay during their isolation and then be recycled or disposed of as normal trash.

Although storage in an assured isolation facility is not prohibited by law, there are legal concerns about whether storage for a period of 100 to 300 years complies with the requirement for permanent isolation in the Low-Level Radioactive Waste Policy Amendments Act of 1985. According to a draft legal study prepared for Connecticut's Hazardous Waste Management Service,[7] compliance with the 1985 act depends on, among other things, an interpretation of the act's requirement that compacts "provide for" the disposal of low-level radioactive wastes generated within their respective regions. According to the study, there is no known case law that speaks to this precise issue. The study also concludes that the compact probably provides an independent source of authority for the

[7]The Connecticut Hazardous Waste Management Service commissioned the analysis of certain legal issues surrounding the concept of assured isolation for the management of low-level radioactive wastes in Connecticut.

management of the low-level radioactive wastes, including the use of an assured isolation facility.

Nevertheless, long-term storage is an interim, rather than final, solution to the issue of the management of commercial low-level radioactive wastes. Eventually, a permanent solution for longer-lived wastes—either permanent disposal or continued, monitored storage—would be required. Also, critics of the concept are uncomfortable with the extensive reliance on human maintenance required to ensure the successful isolation of the waste for 100 or more years and doubt that the proposal would alleviate public concerns over the management and disposal of low-level radioactive wastes.

Moreover, critics argue that it may be difficult to make adequate arrangements to ensure that sufficient funds are available for assured isolation followed by the recovery and permanent disposal of some or all of the wastes in a disposal facility. The director of Connecticut's low-level radioactive waste program, however, disagrees with this view. In the director's opinion, uncertainty over funds for institutional control and long-term liability for 100 or more years into the future would be no higher for storage facilities than for disposal facilities. In addition, the director said, licenses for long-term storage facilities would not be issued unless the license applicants satisfactorily demonstrated that adequate arrangements had been made to ensure that sufficient funds would be available.

In 1998, the New Jersey siting board suspended the siting process in New Jersey. In taking this action, the board noted the ongoing efforts of low-level radioactive waste generators in the state to minimize the volume of wastes requiring disposal, the continuing availability of out-of-state disposal, and the capacity for on-site storage over the short term, should the Barnwell facility be closed to out-of-state wastes. According to the Northeast compact, New Jersey's siting board remains active and is working with the compact and Connecticut to monitor the national situation. If necessary, according to the compact, the siting board is ready to restart the siting process.

Northwest Compact

The eight-member Northwest compact, comprising the states of Alaska, Hawaii, Idaho, Oregon, Montana, Utah, Washington, and Wyoming, was established in 1981 and ratified by the Congress in 1985. The compact's regional disposal facility is located on the Department of Energy's (DOE)

Hanford site on 100 acres of land subleased by US Ecology from the state of Washington. US Ecology's contract with Washington expires on July 29, 2005.

Rocky Mountain Compact

The Rocky Mountain compact—consisting of Colorado, Nevada, and New Mexico—was established in 1983 and ratified by the Congress in 1985. The Rocky Mountain Low-Level Radioactive Waste Board, which governs the compact, has a contract with the Northwest compact and the state of Washington to dispose of the compact's wastes at the Northwest compact's Richland regional disposal facility.

Southeast Compact

In 1983, the eight states of Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia entered into a cooperative agreement to form the Southeast compact. The compact, which was ratified by the Congress in 1985, allows its member states to exclude out-of-region wastes from disposal at in-region facilities. South Carolina was to serve as the compact's first host state, and the facility at Barnwell was scheduled to close at the end of 1992.

In 1986, the compact selected North Carolina as the second host state, which obligated the state to develop a facility for the region's low-level wastes for a period of 20 years. The compact required that the facility be developed no later than 1991 and gave North Carolina the responsibility for financing, siting, and licensing the facility. North Carolina put a siting process in place, and, in late 1992, the state authority submitted a license application to the North Carolina Division of Radiation Protection for a site in Wake County. However, the state has not issued a license to construct and operate the planned facility.

Barnwell served as the original disposal facility for waste generators in all of the compact's original eight states until 1995, when South Carolina withdrew from the compact. South Carolina prohibited the generators of low-level wastes in North Carolina from disposing of their wastes at the Barnwell facility because, in South Carolina's view, North Carolina was not acting in good faith to develop a new facility. The prohibition has not been challenged in court and remains in force.

The Southeast compact agreement provides that each host state must pay to develop its facility and that the compact commission is not responsible for these costs. However, much of the cost of selecting and licensing the

proposed site in North Carolina was provided voluntarily by the compact commission. The funds were collected by the compact in the form of fees on the wastes disposed of at the Barnwell facility through 1995. However, after South Carolina withdrew from the compact, the Southeast compact was left without this source of funding. North Carolina reduced, and eventually stopped, its licensing effort because of what it characterized as a lack of funds. According to the Southeast Compact Commission, the commission was not willing to provide more funds unless North Carolina would commit to building a disposal facility. Such a commitment was requested but never provided.

In 1997, a group composed of most of the compact region's utilities made a proposal under which the compact and regional waste generators would provide necessary funding in exchange for certain conditions and guarantees. The compact agreed to the proposal in concept and made further funding by the compact contingent on North Carolina's agreement in principle to the proposal or to an alternative proposal acceptable to the group. North Carolina did not support the proposal because, among other things, the proposal would require that the state assume the responsibility for paying the debt that would be created by accepting funds from the compact and regional waste generators to develop the proposed disposal facility.

In December 1997, North Carolina shut down its low-level waste-siting project, pending the Southeast compact's reversal of its funding position or receipt of other instructions from the state legislature. Instead, the state's siting authority sought the legislature's approval to begin reviewing a long-term storage option as a possible alternative for developing the previously planned disposal facility. This storage approach would permit the disposal of waste materials contaminated with relatively short-lived radionuclides as normal trash following a storage period. Waste materials contaminated with longer-lived radionuclides would eventually be disposed of in a much smaller disposal facility than the state had planned to develop for the Southeast compact.

On April 28, 1999, the Southeast compact's commission notified officials of North Carolina that the state was in violation of compact laws and requested a written plan and schedule from the state that would provide a disposal facility for the region and would return the state to compliance with the law. As of June 1999, North Carolina had not responded. Therefore, compact commissioners from Florida and Tennessee filed a complaint against North Carolina for not fulfilling its obligations to the

compact, as a designated host state, to provide a disposal facility for the Southeast compact. The complaint recommended that the commission impose several sanctions, including requiring the return of almost $80 million, plus interest, in funds provided by the commission to the state and requiring North Carolina to store all waste from the region until a new regional facility is provided.

On July 27, 1999, the "sanctions committee" of the Southeast compact voted unanimously to recommend to the compact's commission the initiation of a formal inquiry to determine if a violation of commission law had occurred and, if so, what sanctions should be applied. The commission addressed this issue at its August 19, 1999, meeting. One day prior to the sanctions committee's recommendation, the State of North Carolina enacted legislation withdrawing the state from the Southeast compact.[8] The legislation also repealed related statutes and, among other things, directed the state's Radiation Protection Commission to (1) review the availability and adequacy of facilities for the management of low-level radioactive wastes produced by waste generators in North Carolina and (2) formulate, by May 15, 2000, a recommended plan for complying with the state's responsibilities under the compact acts.

Southwestern Compact

In 1985, California named US Ecology its license designee and authorized the company to (1) screen potential sites for a disposal facility for waste generators within the state, (2) identify a candidate site, (3) investigate the site's suitability, and (4) construct and operate the facility as licensed and regulated by the state. In 1987, California entered into a compact with Arizona, North Dakota, and South Dakota in which California agreed to develop and operate a disposal facility that would serve the needs of waste generators in those four states. After US Ecology evaluated potential sites, a 1,000-acre site in Ward Valley, California, was selected for a disposal facility. However, the construction of the facility depends on the Department of the Interior's transfer of the land to the state because the site is on federally owned land in the Mojave Desert.

To date, Interior has not transferred the land. A December 1995 electronic message from a member of the White House's Council on Environmental Quality illustrates that while Interior believed the Ward Valley site to be safe, political considerations may have prevented transferring the land to California. The message states, in part, that California's position that low-level radioactive wastes were piling up in universities, hospitals, and

[8]General Assembly of North Carolina Session Law 1999-0357, July 26, 1999.

other places unfit for storage was "mostly legitimate." In addition, the message continues, Interior officials, relying on a National Academy of Sciences analysis[9] believed that the site can be operated and used with complete safety and that Interior would like to move ahead with the land transfer. The message goes on to state, however, that "they [Interior] believe that, as a political matter, the Administration simply cannot of its own volition agree to hand the site over in exchange for a check and an unpopular governor's promise to do the right thing."

In July 1997, we reported on Interior's actions on California's request to purchase the Ward Valley site so that the state could build the facility.[10] We concluded that Interior had been unwilling to accept California's explicit authority and findings concerning radiological safety as adequate to permit the Department to decide on the proposed land transfer. Instead, Interior decided that it must independently determine if the site is suitable for a disposal facility. California and US Ecology argue that these issues are outside Interior's authority and expertise and that Interior does not have the authority to independently determine if Ward Valley is suitable. Their position is that the regulation of radiological safety issues is the state's responsibility because of the state's agreement with the Nuclear Regulatory Commission (NRC) under the Atomic Energy Act.

In addition, as we reported in 1997, most of the substantive issues that the public raised to Interior for its consideration had already been addressed by California and Interior's Bureau of Land Management. Subsequent new information, such as the National Academy of Sciences' report, generally favors the proposed facility.

At that time, actions concerning the Ward Valley transfer were pending before two separate federal courts. On March 31, 1999, the U.S. District Court for the District of Columbia issued an order in favor of the federal government in consolidated lawsuits concerning the proposed Ward Valley site.[11] The actions, which were filed by the state of California and US Ecology in January 1997, sought to compel Interior to transfer to the state the federal land on which the site is located. The court, however, declined to order the Secretary to proceed with the transfer because he is not

[9]The National Academy of Sciences issued a report on Ward Valley issues in May 1995.

[10]Radioactive Waste: Interior's Continuing Review of the Proposed Transfer of the Ward Valley Waste Site (GAO/RCED-97-184, July 15, 1997).

[11]California Department of Health Services v. Babbitt, __ F. Supp.2d __, 1999 U.S. Dist. Lexis 5899 (D. DC, 1999).

required to do so under federal law.[12] On June 2, 1999, the Governor of California announced that the state would not appeal the Ward Valley decision. In addition, separate lawsuits concerning the site remain pending before the U.S. Court of Federal Claims. In these suits, California and US Ecology are pursuing financial relief for breach of contract claims related to the land transfer request.

In March 1999, the Secretary of the Interior wrote to the Governor of California to explore alternatives to the proposed land transfer, which would resolve the situation and potentially settle pending litigation. The Secretary said that the steps necessary to conclude the action would be substantial. Some of the necessary actions include (1) an extensive testing and analysis of tritium and related substances at the site, (2) a comprehensive supplemental environmental impact statement, and (3) a resolution of whether the California state agency seeking to purchase the Ward Valley land has the authority to do so. On June 2, 1999, the Governor announced that he had proposed that the president of the University of California chair an advisory group charged with exploring ways to find workable alternatives for California's low-level radioactive waste disposal. As of November 1998, almost $93 million had been spent to develop a low-level radioactive waste disposal site in California.

Texas Compact

In September 1998, the Congress passed, and the President signed, legislation approving the Texas compact, which includes the states of Maine, Texas, and Vermont. The compact legislation designated Texas as the host state. However, the search for a low-level waste disposal facility site began in 1981 when the Texas legislature created a disposal authority to finance, construct, operate, and decommission a waste disposal facility for low-level radioactive wastes produced in Texas.

By 1987, the authority had identified several possible sites in Hudspeth County, Texas. In 1992, the authority selected a site within the county and submitted an application to a state licensing commission. However, the Texas licensing commission subsequently denied the license application for the candidate site. The commission cited uncertainties about a geologic fault beneath the site and socioeconomic concerns, despite the fact that the commission's staff had recommended approval on the basis of its environmental and safety analysis. The analysis had found that "issuance of a license for the proposed project will not pose an

[12]Under the Federal Land Policy and Management Act, a tract of public lands may be sold where the Secretary determines that the sale of the tract will serve important public objectives.

unacceptable risk to public health and safety or cause a long-term detrimental impact on the environment." The program authority filed a motion for rehearing, but the motion was overruled in December 1998.

Texas' low-level radioactive waste authority, having been denied a disposal license, began considering new options for siting, including developing an assured isolation facility for the long-term storage of commercially generated low-level radioactive wastes. In response to a question on whether a law requiring the development of a facility for assured isolation of wastes would satisfy the state's compact obligations, the state's attorney general concluded that such a facility would comply with the state's obligations to "manage and provide for" the disposal of low-level radioactive wastes generated within the compact. However, the attorney general also concluded that a facility for the assured isolation of wastes would not currently satisfy the state's obligation to "permanently dispose of" these wastes. In late 1998, the disposal authority estimated that about 61,000 cubic feet of radioactive waste is currently stored in that state, of which, about 58,000 cubic feet was generated by and is stored by 18 industrial users of radioactive materials.

Legislation authorizing assured isolation in Texas failed to pass in 1999, and the siting authority was abolished and its functions passed to the licensing commission. Because of these actions, according to an official of the former siting authority, prospects for significant progress in Texas are uncertain.

Unaffiliated States

Several states have either not joined compacts or have been ousted or withdrawn from compacts. Unaffiliated states include Michigan, South Carolina, Massachusetts, New York, the District of Columbia, New Hampshire, Puerto Rico, and Rhode Island.[13] Like those states affiliated with compacts, these states have made little progress in siting low-level radioactive waste disposal facilities.

Michigan was expelled from the Midwest compact in 1991. In 1995, a policy advisory board issued a series of recommendations to Michigan regarding the conduct of a voluntary host community process, revisions to the state's siting criteria, and consideration of options to join a compact. Amendments to Michigan state law must be enacted before these

[13]The Low-Level Radioactive Waste Policy Act of 1980, as amended, included the District of Columbia and Puerto Rico as states.

recommendations can be implemented and a new siting process is begun. However, there is currently no effort under way to enact the amendments.

In 1995, South Carolina enacted legislation that withdrew the state from the Southeast compact. In promoting the state's withdrawal from the compact, the governor expressed impatience with North Carolina's lack of progress in developing a new regional disposal facility. The legislation also reopened the Barnwell facility to out-of-region wastes, excluded wastes from North Carolina until the state issues a license for a low-level waste facility, and imposed a tax of $235 per cubic foot. The tax provides revenue for the South Carolina Educational Assistance Endowment Fund, although revenues from the Barnwell facility have been substantially less than predicted because of lower-than-expected waste volumes. The governor and the state legislature are considering proposals on the future of the Barnwell facility, including the possibility that the state might rejoin the Southeast Compact or some other compact, or that the state might restrict the acceptance of wastes at the facility to wastes generated within the state.

In 1995, Massachusetts hired a contractor to plan and conduct a statewide mapping and screening program to exclude areas unsuitable for a disposal facility. However, in 1996, the Massachusetts low-level waste management board voted to cease all in-state siting efforts because of the renewed access to the Barnwell disposal site and the expanded availability of the Envirocare facility. The board also agreed to complete some site-planning tasks in case in-state siting becomes necessary in the future. The board's action was viewed by most users of radioactive materials as justified to provide time to assess the long-range impact of the reopening of the Barnwell facility and other developments before incurring significant additional expenses associated with siting a facility.

In 1986, New York enacted its Low-Level Radioactive Waste Management Act and created an independent commission to select a site and disposal method for a low-level waste disposal facility. Beginning in 1988, the commission conducted a multistep screening process that identified five potential sites for on-site investigations by September 1989. The commission had intended to conduct initial on-site technical investigations of the site and then select at least two sites for a more intensive characterization process. However, the governor suspended site investigation activities after strong local protest over the candidate disposal locations. During the 1995 state legislative session, the state legislature declined to approve funding for the siting commission, and the

commission's activities were subsequently phased out. To date, a revised siting process has not been determined.

The District of Columbia is not planning to site a low-level waste disposal facility because of its dense population and the small amount of low-level wastes generated within its borders. Similarly, New Hampshire is not planning to build a facility because of the small amounts of wastes generated. Finally, neither Puerto Rico nor Rhode Island is planning to site a low-level radioactive waste disposal facility.

Current Facilities for Disposing of Low-Level Radioactive Wastes

Barnwell Facility

The Barnwell Waste Management facility is located on 235 acres of state-owned land in Barnwell County, South Carolina, near DOE's Savannah River Site. The Barnwell facility is operated by Chem-Nuclear Systems, LLC, on land that is owned by the state of South Carolina and leased to the company.

Figure II.1: A Disposal Trench at the Barnwell Facility

As an NRC agreement state, South Carolina regulates low-level radioactive waste disposal operations at the Barnwell facility. Wastes are shipped to the landfill in prepackaged containers. Waste containers are placed in concrete vaults located in disposal cells excavated up to 30 feet below grade. Barnwell is located in an area of clay and sandy soil. A sand layer covers the bottom of the trench. When a vault is full, its concrete lid is put in place. One or two additional vaults may be placed on top until the vaults are stacked two or three high. Backfill around and over the filled concrete vaults consists of sand and soil. A sand, clay, high-density polyethylene, and topsoil cap covers the disposal trenches to provide a barrier to the infiltration of rainwater. Air, surface water, groundwater, vegetation, and soil samples are monitored regularly. Each sample is analyzed in

Chem-Nuclear's laboratory under the auspices of the state. There are 92 monitoring wells on site, 28 wells at the site's boundary, 57 wells off site, and 275 sumps in waste burial trenches.

As can be seen in table II.1, over the years, the Barnwell site has accepted all classes of low-level radioactive wastes from 1986 through 1998. By far, the predominant amount of wastes was from class A wastes, which have dropped dramatically in volume over the last 13 years.

Table II.1: Volume of Wastes Disposed of at Barnwell by Class of Wastes From 1986 Through 1998

Cubic feet

	Waste classification						
	A		B		C		
Year	Volume	Percent	Volume	Percent	Volume	Percent	Brokered[a]
1986	969,673	95	43,693	4	6,399	1	26,090
1987	780,591	95	30,731	4	7,063	1	137,392
1988	675,622	94	33,030	5	9,428	1	213,894
1989	626,014	94	29,316	4	12,034	2	435,936
1990	455,886	94	23,103	5	6,206	1	302,877
1991	462,956	93	24,803	5	7,686	2	294,198
1992	433,476	92	28,192	6	10,437	2	356,552
1993	280,936	89	25,257	8	10,627	3	285,467
1994	233,138	89	18,659	7	9,222	4	472,356
1995	178,394	91	13,649	7	5,031	3	287,921
1996	113,501	81	19,722	14	7,052	5	185,290
1997	195,440	86	23,831	10	8,764	4	
1998	160,885	83	21,276	11	12,355	6	
Total	**5,566,512**		**335,262**		**112,304**		**2,997,973**

[a]The "Brokered" classification is used because prior to the use of the Uniform Manifest reporting system, brokers were not required to report the activity/concentration of the waste shipments from individual generators. This reporting oversight was corrected in 1997 for Barnwell.

Richland Facility

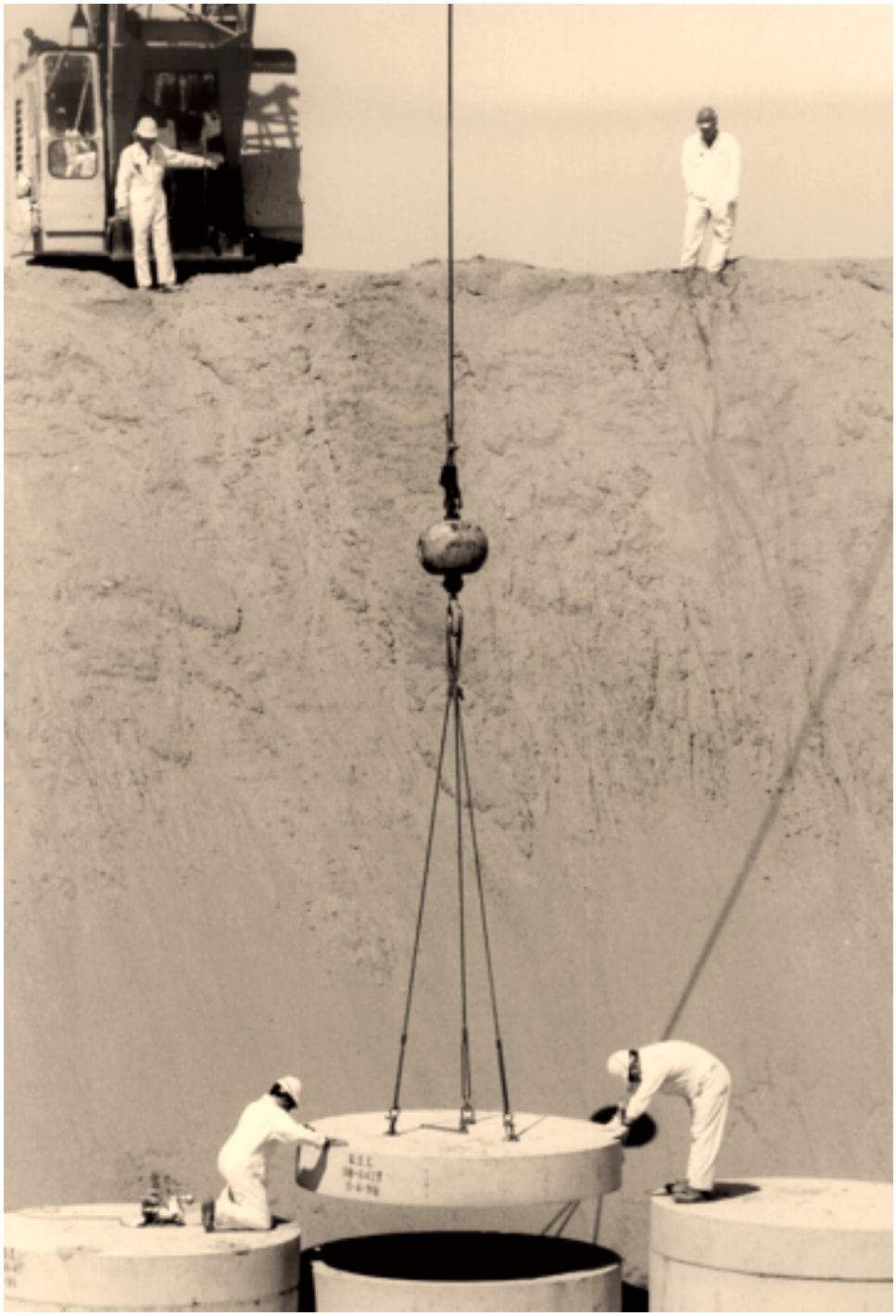
The Richland facility is located on a 100-acre site contained within DOE's Hanford site—about 25 miles northwest of Richland, Washington. The site is leased to the state of Washington by DOE and subleased to US Ecology, the facility's operator, by the state. The current sublease to US Ecology expires on July 29, 2005.

Figure II.2: Overview of the Richland Disposal Facility Showing Various Available Trenches

Source: US Ecology

For the Richland disposal facility, the state of Washington regulates the types of low-level radioactive wastes authorized for receipt and disposal, the transportation and handling of these wastes, and the methods of disposing of the wastes. All wastes are received in packaged shipments, as bulk wastes are not accepted. Packages include metal drums, metal boxes, land-sea containers, et cetera. Class A wastes are placed in disposal trenches about 50 feet deep and 800 to 1,000 feet long. Once a portion of the trench is filled, the trench is backfilled around the waste material, and an interim cap of 6 inches of rock is put in place. Class B and class C wastes are placed in concrete engineered barriers and then placed in a disposal trench. The site is scheduled for closure in 2056, at which time, a permanent cap will be emplaced over burial trenches. The arid climate and geology of the area create a desert-like environment. The nearest aquifer is over 300 feet below the ground surface. Periodic air, soil, water, and vegetation samples are taken from locations on and around the Washington facility. An independent laboratory analyzes the samples and results are submitted to the state. Seven groundwater-monitoring wells and three monitoring wells in the unsaturated zone above the water table have been installed at the facility, and a work plan for sampling the soil in the disposal area has been proposed. Air quality is continuously monitored during site operations.

Figure II.3: Putting the Finishing Touches on Disposed Wastes at the Richland Facility



(Figure notes on next page)

Source: US Ecology

US Ecology charges its disposal customers a fee for each cubic foot of wastes received. Disposal rates (fees) since 1993 have been regulated by the Washington Utilities and Transportation Commission. As a state-regulated utility, US Ecology is guaranteed both reimbursement of its fixed costs and a rate of return on its fixed costs. Operational revenue for the Washington facility is currently funded from charges based on customers' annual projections for waste volume, exposure, number of containers, number of shipments, and site availability. As the volume of wastes disposed of at the facility has declined over the years, disposal fees have increased to cover the fixed costs of disposal operations.

In addition to these regulated charges, disposal fees include an assessment for the perpetual care and maintenance of the facility. These funds are put into dedicated trust funds by the state of Washington. Over $26 million is available for the closing of the Richland facility, and another post-closure fund also has over $26 million available. Finally, customers also pay a per-cubic-foot economic impact surcharge that goes to the local county and into a Hanford Area Investment fund. Since 1992, this surcharge has generated over $4.1 million.

Table II.2 shows that from 1986 through 1998, more than 98 percent of the volume of commercially generated low-level radioactive wastes disposed of at the Richland facility were Class A wastes and that, over this period of time, the volume of disposed wastes has been declining. Contributing to the wastes that Richland has or will receive are three nuclear power plants that are located in the region that Richland serves—the Northwest and Rocky Mountain compacts. One plant—Ft. St. Vrain in Colorado—has been decommissioned. A second plant—Trojan, near Portland, Oregon—has been retired and is now being dismantled. The third plant—WNP-2—is an operating commercial plant located in another area of DOE's Hanford site.

Table II.2: Volume of Wastes Disposed of at Richland by Class of Wastes From 1986 Through 1998

Cubic feet

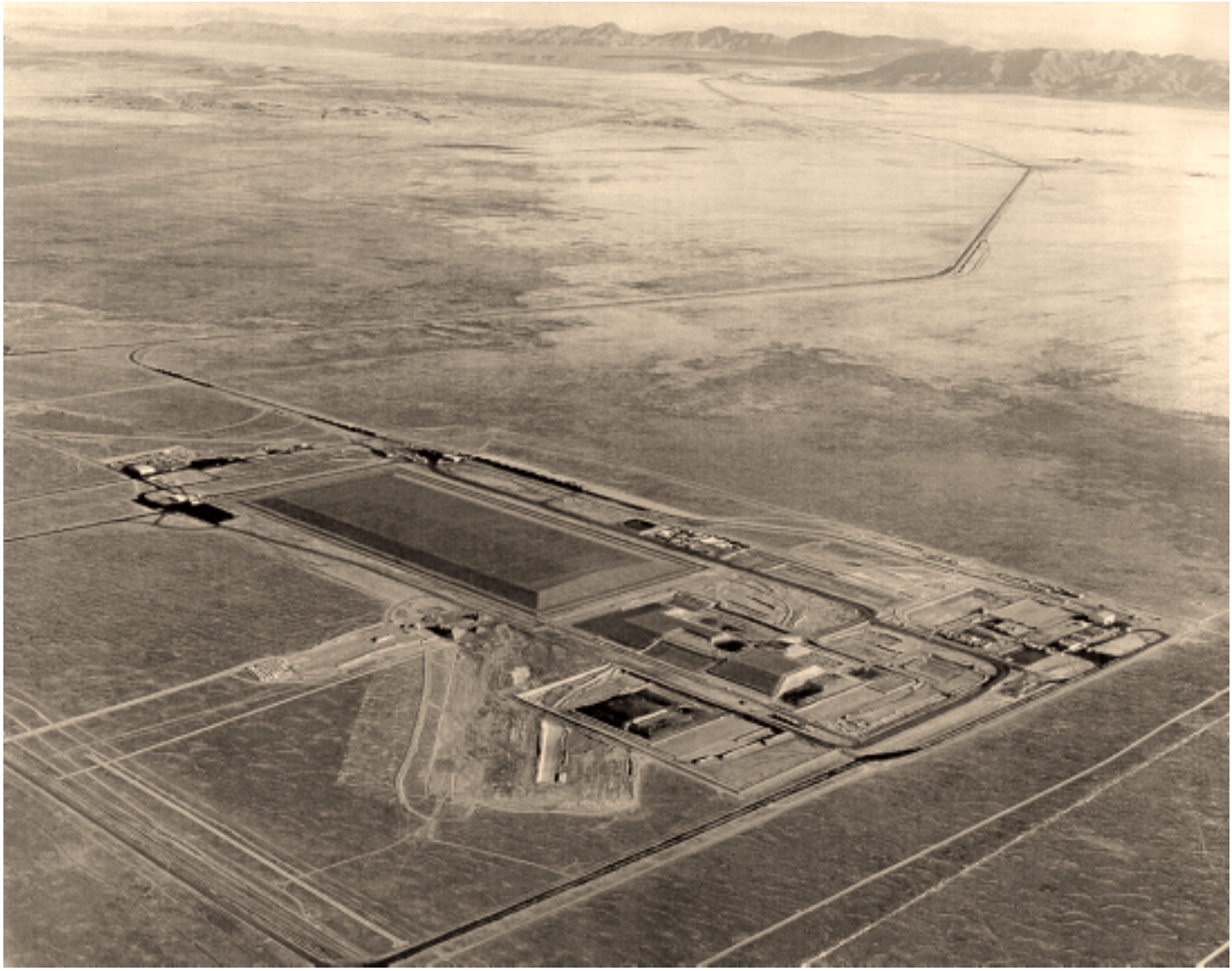
	Waste Classification						
	A		B		C		
Year	Volume	Percent	Volume	Percent	Volume	Percent	Brokered[a]
1986	594,577	98	6,007	1	6,120	1	36,568
1987	448,712	98	7,119	2	1,343	0	97,722
1988	294,967	98	3,969	1	2,243	1	102,451
1989	251,140	98	3,956	2	1,978	1	151,217
1990	209,617	99	1,932	1	612	0	83,139
1991	328,596	99	3,448	1	1,340	0	85,823
1992	298,743	98	4,353	1	1,624	1	93,682
1993	172,266	99	662	0	702	0	13,703
1994	97,705	99	397	0	202	0	26,448
1995	125,951	100	530	0	0	0	78,482
1996	104,309	99	821	1	57	0	
1997	89,881	99	1,139	1	65	0	
1998	143,972	99	96	0	699	0	
Total	**3,160,436**		**34,429**		**16,985**		**769,235**

[a]The "Brokered" classification is used because prior to the use of the Uniform Manifest reporting system, brokers were not required to report the activity/concentration of the waste shipments from individual generators. This reporting oversight was corrected in 1996 for the Richland disposal facility.

Envirocare Facility

Since 1988, Envirocare of Utah, Inc., has operated a 540-acre commercial radioactive waste disposal facility located 80 miles west of Salt Lake City. The facility is located in western Tooele County within a 100-square-mile hazardous waste zone established by the county. In addition to the Envirocare facility, the hazardous waste zone includes two incinerators and the Army's depot, nerve gas storage site, and Dugway Proving Grounds. There is no town within 40 miles. The site is located on an ancient lake bed just west of the Cedar Mountains, and the surrounding land is open range used primarily for grazing.

Figure II.4: Overview of the Envirocare of Utah Waste Disposal Facility



Source: Envirocare of Utah

The Envirocare facility is authorized to dispose of large quantities of bulk low-level radioactive wastes, naturally occurring radioactive wastes, and

mixed low-level radioactive wastes under specified restrictions. The license restrictions include limits on radionuclides and concentrations of radionuclides, and specifications must be imposed on the physical and chemical properties of the wastes. The state of Utah initially licensed the facility in 1988 as a facility for disposing of naturally occurring radioactive wastes. In March 1991, the state amended the license to permit the disposal of low-level radioactive wastes. Finally, NRC has licensed the Envirocare facility to dispose of uranium and thorium mill tailings. In addition to commercial waste generators, the Environmental Protection Agency, DOE, and the Department of Defense have shipped wastes to Envirocare for treatment and disposal.

Table II.3 shows the amount of operating wastes and cleanup wastes that has been disposed of at the Envirocare facility, as well as the amount of radiation over the last 8 years. Unlike Barnwell and Richland, the quantities do not show a decreasing trend, and the waste activities are increasing.

Table II.3: Volume and Curies of Wastes Disposed of at the Envirocare Facility

	Waste Volume			
Year	**Operating**	**Cleanup**	**Total[a]**	**Curies**
1991	10,233	113,322	123,554	N/A
1992	58,380	2,999,882	3,058,262	22
1993	2,119	1,109,664	1,111,783	17
1994	8,168	492,375	500,543	8
1995	53,753	523,036	576,789	12
1996	166,787	1,669,359	1,836,146	88
1997	257,299	1,959,135	2,216,434	142
1998	62,364	1,017,386	1,079,750	127
Total[a]	**619,104**	**9,884,158**	**10,503,261**	**416**

Legend N/A = not applicable

[a]Totals may not add because of rounding.

Source: DOE's Manifest Information Management System. Envirocare data prior to 1998 from monthly reports by Envirocare to the Northwest compact.

Typically, the low-level radioactive wastes received for disposal at the Envirocare facility are bulky soil or soil-like materials or debris originating from cleanup projects. To dispose of these materials, Envirocare uses a different form of land burial from that used at either the Barnwell or Richland disposal facilities. Unlike the latter two facilities, at the

Envirocare facility, low-level radioactive wastes are placed in above-grade disposal cells consisting of natural materials, including clay and rocks, as liner and cap materials. Prior to receiving an initial, low-level radioactive waste shipment for disposal, Envirocare obtains from the waste generator, documentation that the low-level radioactive wastes have been approved for export/transfer to the Envirocare disposal facility. Approval is required from the low-level radioactive waste compact of origin or from states unaffiliated with a low-level radioactive waste compact or the state of origin, to the extent that a state can exercise such control. Wastes are disposed of in 12-inch layers called "lifts." Any waste containers received at the landfill are spilled and compacted with fill materials. Wastes are compacted and mixed, then capped with fill material. Wastes are sometimes encapsulated in concrete. A waste cell must be permanently capped within a reasonable time from being filled. Mixed wastes are treated by encapsulating the contents in plastic, placing the plastic bundle in the landfill, and then capping the wastes with fill materials.

Figure II.5: Unloading Bulk Waste Materials From a Rail Car at the Envirocare Disposal Facility

Source: Envirocare of Utah

Comments From Compacts of States

Northeast Interstate Low-Level Radioactive Waste Commission
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JANICE B. DESHAIS

August 2, 1999

Gary L. Jones
Associate Director
Energy, Resources and Science Issues
U.S. General Accounting Office
Washington, D.C. 20548

Re: *Draft Report: "Radioactive Waste: States Are Not Developing Disposal Sites"*

Dear Ms. Jones:

Thank you for sending the Northeast Interstate LLRW Compact Commission a copy of the above-noted Draft Report. The Commissioners have reviewed this document. I have compiled their comments for your consideration.

Overall, the report is a factual and complete presentation of the status of low-level radioactive waste management in the United States. The document correctly identifies the primary reasons for the current disposal situation. The identification of the controversial nature of low-level waste disposal is crucial to an understanding of the reasons for the lack of success thus far. Your report could note that controversy almost always accompanies even the most careful and conscientious efforts to site waste facilities.

The report also accurately outlines the issues associated with alternative approaches for the disposal of the nation's low-level radioactive waste. In particular, the report correctly notes that if the compact system is discarded, access to current disposal options such as the Richland facility could be lost.

The Commissioners note that your draft report has blank sections following the headings "Agency Comments and GAO's Recommendations". They assume and hope these sections will include comments and recommendations, and believe this is essential to your agency's analysis of the low-level waste situation. One Commissioner suggests the following conclusions: 1) The federal laws have not resulted in new regional disposal sites as states are unable or unwilling to develop facilities; and 2) Generators, not states, should manage their own waste in accord with current regulations. Both Commissioners agree with the idea that the DOE should take on more responsibility for disposal (however, one notes, this agency cannot seem to handle the waste for which it now has responsibility).

One Commissioner notes that in the list of reasons for the requested review, the status of the management and disposal of all commercial low-level radioactive wastes is included. He comments that no mention is made of the quality of present or proposed facilities and wishes to bring this essential element of the nature of waste management to your attention.

The Commissioners have the following more specific comments.

1) On pages 3 and 4 and in other pages in the report (for example, page 41) greater than Class C waste is defined as the most hazardous or relatively hazardous class of low-level radioactive waste. It would be more useful to the reader's understanding if the report defines greater than Class C as described above, then refers to, or at least notes, this waste as greater than Class C for the rest of the report.

2) On page 11, the report states that spent fuel is considered "high level" because of the amount of radioactivity in the fuel. This is not a complete definition of high level waste. The report should include a more precise definition.

3) On page 26, at the end of the first incomplete paragraph on the page, the report notes the voluntary siting plans of Connecticut and New Jersey and states: "No volunteers came forward before Connecticut put its program on hold and New Jersey suspended its program." This is not entirely accurate. The New Jersey Siting Board had interactions with several communities that came forward to explore the potential of volunteering to host the State's disposal facility. These potential volunteers were eventually eliminated, either by vote or other action of the municipalities involved, or because of investigation and elimination of the potential site by the Siting Board. In Connecticut, several potential volunteers discussed the concept of proposing a site for the State's disposal facility with the Connecticut Hazardous Waste Management Service, the State's siting agency.

4) On page 28, the third full paragraph, the report says that at least three states, including Connecticut, are considering some form of long-term storage of waste. It is more accurate to note that at least in Connecticut, the Connecticut Hazardous Waste Management Service, the State's siting entity, is exploring the concept of assured isolation.

5) On page 29, second full paragraph, similar to the comments just noted, it is more accurate to note that the State siting entity, not the State of Connecticut, is exploring the concept of assured isolation.

6) On page 42, second full paragraph, it would be useful to the reader's understanding of the power of compacts to exclude waste from outside the compact region to use the term "exclusionary authority" in the description of this provision of the compact legislation.

7) On page 62, second paragraph, again, it is more accurate to note that the State's siting entity, the Connecticut Hazardous Waste Management Service, is exploring the concept of assured isolation.

8) On Page 63, in the third paragraph, the report notes the suspension of active siting in New Jersey. The report should note that the State's Siting Board remains active, and is working with the Northeast Compact and its partner state of Connecticut to monitor the national situation. The report should note that if it becomes necessary, the Siting Board is ready to re-start the siting process.

Please contact the Commission office with any questions.

Thank you for this opportunity to comment on the draft report.

Very truly yours,

Janice B. Deshais

Northwest Interstate Compact
On Low-Level Radioactive Waste Management
P.O. Box 4-7600 . Olympia, Washington 98504-7600 . (360) 407-7102 . Mike Garner, Executive Director

July 30, 1999

Mr. Dwayne E. Weigel
Assistant Director
Resources, Community, and
Economic Development Division
U.S. General Accounting Office
441 G Street, N.W., Room 2T23
Washington, D.C. 20548

Dear Mr. Weigel:

RE: Comments on Draft Report - Radioactive Waste: States Are Not Developing Disposal Facilities

We appreciate the opportunity to comment on the Draft Report - Radioactive Waste: States Are Not Developing Disposal Facilities. The following is a summary of our comments.

1. **Report**
   On page 3, the report states, "The Richland and the Barnwell, South Carolina, facilities continue to accept all types of commercial low-level wastes except "mixed wastes"-wastes that contain both radioactive and chemically hazardous constituents-and the most hazardous class of low-level radioactive wastes. The 1985 amendments to the compact act made DOE responsible for disposing this class of wastes."
   Comment
   This gives the impression that DOE is responsible for the disposal of commercial mixed low-level radioactive wastes. This is not the case. States are responsible for the disposal of this waste.

2. **Report**
   On page 47 the report states, " In 1998, DOE estimated that it may generate and dispose of over 200 million cubic feet of low-level radioactive wastes (including mixed low-level wastes) over the next 70 years as it cleans up its complex of nuclear facilities." Then on page 52 the report states, " At Hanford, the existing disposal capacity is expected to be capable of disposing of about 71 million cubic feet of wastes, or almost four (4) times the amount that DOE expects to dispose of over the next 70 years."
   Comment
   These statements appear to contradict one another. This needs to be resolved.

3. **Report**
Regarding the reports numerous references to access to the Envirocare facility. The report mentions that all states except those states within the Northwest Compact have access to Envirocare (pages 5 and 17). Elsewhere, the report mentions that all states except those states in the Northwest Compact and the Rocky Mountain Compact may dispose of their wastes at the Envirocare facility (pages 31 and 37).
Comment
Article 5 of the Northwest Compact's Second Amended Resolution and Order states, "It is the intent of the Committee that only those wastes approved by the compact of origin (including the Northwest Compact) be allowed. For states unaffiliated with a compact, state approval for export is required to the extent states can exercise such approval..." These requirements were included to ensure that compacts/states that developed sites could protect the economic viability of their own site by restricting export to Envirocare. I believe that generators within the Rocky Mountain Compact use the Envirocare facility for disposal of certain types of waste. Generators within the Northwest Compact could request authorization to dispose of wastes at Envirocare, similar to generators within other compacts. However, it is unlikely the Northwest Compact Committee would authorize disposal at Envirocare as the compact wants to ensure: 1) the Richland facility operation remains economically viable; and 2) disposal costs for in-region generators are maintained as low as possible.

4. **Report**
On page 74, in reference to the Richland disposal facility, the report states, "As the volume of wastes disposed of at the facility has declined over the years, disposal fees have increased to cover the fixed costs of disposal operations."
Comment
I agree that disposal volumes declined once the Northwest Compact exercised its authority to exclude out-of-region low-level waste effective January 1, 1993. However, although disposal volumes have fluctuated during the period of 1993 through 1998, it seems it would be difficult to draw the conclusion that waste volumes have been declining.

5. **Report**
On page 74, in reference to the Richland disposal facility, the report states, "In addition to these regulated charges, disposal fees include an assessment for eventually closing the facility and for perpetual care and maintenance of the facility."
Comment
Disposal fees do include an assessment for perpetual care and maintenance but do not presently include an assessment for eventual closure.

6. **Report**
On page 40 the report states, "According to officials of the Northwest compact, for example, the Envirocare facility disposes of bulk contaminated soil and rubble that the Richland facility does not accept."
Comment
The license of the Richland facility would allow for acceptance of this waste as long as it was properly packaged and was generated within the Northwest or Rocky Mountain Compacts. The original Resolution and Order was adopted by the Northwest Compact to further the national site development process. The Resolution and Order provided access to the region for disposal of large volume, low activity cleanup wastes, that many of the developing facilities, primarily engineered facilities, were not designed to accept. Without the Resolution and Order many of the waste streams that have been disposed at Envirocare likely would have ended up as orphan wastes.

7. **Report**
On page 40 the report states, "The Barnwell facility in South Carolina opened in 1971 and currently serves 40 states."
Comment
All states except North Carolina have access to the Barnwell facility. Due to the cost of disposal I would not imagine that many generators from the Northwest Compact or the Rocky Mountain Compact dispose of their waste at the Barnwell facility.

8. **Report**
On page 5, the first paragraph under "Current Disposal Situation" that addresses disposal capacity.
Comment
Early in the paragraph it mentions that the Richland facility has an unused capacity of over 45 million cubic feet. However, the last few sentences could be interpreted by someone who is not familiar with the sites as implying there is 247 million cubic feet of unused capacity at the Richland site instead of the Envirocare site to which this number apparently applies. I believe this could be clearer.

9. **Report**
On page 40 the report states, "In January 1996, Envirocare applied for a renewal of its license for the disposal facility. The state of Utah issued the renewed license in October 1998. According to officials of the state and the Northwest compact, the new license removed the restriction that only "large volumes" of cleanup wastes could be disposed of at the Envirocare facility by authorizing Envirocare to accept waste shipments of less than 1,000 cubic feet from any one shipper."

Comment
The state of Utah issued Envirocare's license renewal in October 1998. The license identifies what low-level radioactive wastes the facility may accept. However, the Northwest compact addresses access to the region for disposal of out-of-region wastes at the Envirocare facility. Between April 1995 and November 1998, the Northwest compact's Amended Resolution and Order identified those wastes that were provided access to the region for disposal at the Envirocare facility. This document contained the "large volume" reference that was intended to limit access to waste volumes in excess of 1,000 cubic feet from any one generator. On November 9, 1998, the Northwest compact adopted its Second Amended Resolution and Order. This document does not include a volume restriction and provides that low-level radioactive waste as allowed under, and regulated by, the radioactive materials license of Envirocare, as determined by the State of Utah, is allowed access to the Envirocare facility. (See enclosures: Northwest compact's Amended Resolution and Order and Second Amended Resolution and Order)

Overall, the report appears accurate and fairly portrays the current situation. Please contact me if you have any questions.

Sincerely,

Mike Garner

Mike Garner
Executive Director
Northwest Interstate Compact

Enclosure(s) 2

STATE OF COLORADO

Bill Owens, Governor
Jane E. Norton, Executive Director

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ROCKY MOUNTAIN LLW BOARD

July 28, 1999

Dwayne E. Weigel
Assistant Director
Resources, Community, and
Economic Development Division
U.S. General Accounting Office
441 G Street, NW, Room 2T23
Washington, D.C. 20548

Re: Comments on Draft Report - Radioactive Waste: States Are Not Developing Disposal Facilities

Dear Dwayne:

We appreciate the opportunity to comment on the Draft Report - Radioactive Waste: States Are Not Developing Disposal Facilities. Overall, we find the report to be accurate and balanced.

Please find enclosed our comments marked on the relevant pages. Following is a summary of our most significant comments.

1. While the report states that the radioactivity of low-level radioactive wastes (LLWs) being disposed has not declined, there are several sections of the report where this information should be added, so as not to mislead the reader (pages 3, 5, 7, 28). A graph showing activity over time should be added (pages 6 and 33).

2. It should be made clear that "commercial" waste includes all federal LLWs except for DOE and nuclear Navy (and of course above Class C) (page 11).

3. There are several areas where the relationship of the Rocky Mountain Compact and Northwest Compact (and facilities in the Northwest Compact) is not stated accurately. The Rocky Mountain Compact has full access to the EnviroCare facility (pages 31 and 35). The Rocky Mountain Compact is not required to dispose of any waste at the

Richland facility (pages 38 and 39). The Rocky Mountain generators have access to Barnwell (page 44).

4. The report is not consistent in describing the universe of waste that EnviroCare is authorized to accept (pages 17 and 31).

5. It should be clarified that the Rocky Mountain Compact has access to the Northwest Compact's Richland facility not the DOE-operated Hanford facility (page 64).

We hope that these are helpful to you in finalizing the report. Please feel free to contact us if you have any questions.

FOR THE ROCKY MOUNTAIN LOW-LEVEL RADIOACTIVE WASTE BOARD

Robert M. Quillin
Chair

cc: Rocky Mountain Board Members

Comments From the Nuclear Regulatory Commission

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 30, 1999

Ms. Gary L. Jones
Associate Director, Energy, Resources,
and Science Issues
U.S. General Accounting Office
Washington, D.C. 20548

Dear Ms. Jones:

I am responding to your letter of July 23, 1999, to Chairman Dicus of the U.S. Nuclear Regulatory Commission, in which you requested comments on your draft report addressing the disposal of commercially generated low-level radioactive wastes. Our comments are enclosed.

Sincerely,

William D. Travers
Executive Director
for Operations

Enclosure: As stated

U.S. NUCLEAR REGULATORY COMMISSION STAFF COMMENTS ON DRAFT U.S. GENERAL ACCOUNTING OFFICE REPORT, "RADIOACTIVE WASTE: STATES ARE NOT DEVELOPING DISPOSAL FACILITIES"

1. Page 39 of the report notes that the State of Utah has licensed the Envirocare facility to dispose of uranium and thorium mill tailings, and the U.S. Nuclear Regulatory Commission (NRC) has licensed the facility to dispose of bulk materials containing small quantities of special nuclear material (SNM). Neither of these statements is correct. NRC has issued the license for uranium and thorium mill tailings. Also, although Envirocare submitted an application to possess certain quantities of SNM, the application was withdrawn and the company has no plans to resubmit it.

   We also recommend that the phrase ". . .under its NRC Agreement State authority. . " be added after "In March 1991. . ." to describe Utah's legal authority for granting the low-level waste license.

2. On page 41, the report states that neither the U.S. Department of Energy (DOE) nor NRC compiles information on the amount of low-level mixed wastes generated in the United States. Actually, in 1992, NRC and the U.S. Environmental Protection Agency jointly published the "National Profile on Commercially Generated Low-Level Radioactive Mixed Waste" (NUREG/CR 5938). This report compiled a national profile on the volumes, characteristics, and treatability of commercially generated low-level mixed waste for 1990. Since then, other reports have been published, such as the DOE National Low-Level Waste Management Program's "Mixed Waste Management Options: 1995 Update (DOE/LLW-219)." State and DOE officials can provide the titles of the other reports that have been prepared. Generally, these reports have found that the amount of mixed waste generated each year is relatively small, and that most of it can be treated to remove its hazardous constituents or characteristics. We recommend that the report be revised to summarize the results of various studies' conclusions on amounts of mixed waste being generated.

3. On page 15, the report states that Class B wastes " . . . must be in a form and packaged more stringently than Class A wastes." For clarity, we suggest that you consider changing the sentence to " . . . must maintain its physical dimensions and its form, and be packaged more stringently than Class A wastes."

4. On page 55, the report states that DOE self-regulates its own disposal operations, but that either NRC or an Agreement State regulates the disposal of commercially generated wastes. The report then notes that resolving 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 waste. This conclusion, however, does not follow from the statements about DOE, NRC, and Agreement State authorities. Under existing regulations, NRC and Agreement State licensees are authorized to dispose of low-level radioactive waste in DOE facilities that are regulated only by DOE.

Comments From the Department of Energy

Department of Energy
Washington, DC 20585

August 16, 1999

Ms. Gary L. Jones
Associate Director
Energy, Resources, and Science Issues
U.S. General Accounting Office
Washington, D.C. 20548

Dear Ms. Jones:

Thank you for providing our office a copy of the GAO draft report addressing the disposal of commercially generated low-level radioactive waste for comment. We have completed our review and offer as an enclosure suggested modifications.

Many of the comments address the distinction between assured isolation and long-term storage of waste. Long-term storage is simply that, storage for an extended time period, e.g., years. The intent of an assured isolation facility is that it would be a robust engineered facility in which low-level waste is isolated and monitored, e.g., decades. Such a facility would be designed and operated in a manner that would ensure preservation of a wide range of options for disposition of the waste including continued isolation, retrieval, recycling, or disposal. For this report, the distinction between assured isolation and long-term storage should be clarified.

It is also important in the discussion on page 3 regarding mixed waste and Greater-Than-Class C waste that the report does not give the impression that the Department of Energy (DOE) is responsible for disposal of commercial mixed low-level radioactive waste. However, as indicated, DOE does have responsibility for disposal of Greater-Than-Class C waste. We believe that the suggested modifications to page 3 have made this clarification.

If you have questions or wish to discuss these comments, please call Jay Rhoderick of my staff at 301/903-7211.

Sincerely,

Mark W. Frei
Acting Assistant Secretary
for Waste Management
Environmental Management

GAO Contacts and Staff Acknowledgments

GAO Contacts

(Ms.) Gary L. Jones, (202) 512-3841
Dwayne E. Weigel, (202) 512-3841

Acknowledgments

In addition to those named above, John Bagnulo, Charles Sylvis, John Cass, and Susan Irwin made key contributions to this report.

Related GAO Products

Nuclear Regulation: Better Oversight Needed to Ensure Accumulation of Funds to Decommission Nuclear Power Plants (GAO/RCED-99-75, May 3, 1999)

Radioactive Waste: Interior's Continuing Review of the Proposed Transfer of the Ward Valley Waste Site GAO/RCED-97-184, July 15, 1997)

Radioactive Waste: Status of Commercial Low-Level Waste Facilities (GAO/RCED-95-67, May 5, 1995).

Nuclear Waste: Connecticut's First Site Selection Process for a Disposal Facility (GAO/RCED-93-81, Apr. 5, 1993).

Nuclear Waste: New York's Adherence to Site Selection Procedures is Unclear GAO/RCED-92-172, Aug. 11, 1992).

Nuclear Waste: Slow Progress Developing Low-Level Radioactive Waste Disposal Facilities (GAO/RCED-92-61, Jan. 10, 1992).

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