ALTERNATIVE APPROACHES TO ENSURING ADEQUATE DISPOSAL CAPACITY FOR COMMERCIAL LOW-LEVEL RADIOACTIVE WASTE

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ABSTRACT

After 20 years and over one-half billion dollars in expenditures, states have not provided new regional disposal facilities for commercial low-level radioactive waste as envisioned under the Low-Level Radioactive Waste Policy Act of 1980 and its 1985 amendments. Yet despite this lack of progress, generators in all states currently have access to adequate disposal capacity.

Changing conditions in the next few years, however, may determine whether policy makers maintain the current approach to low-level radioactive waste management or explore alternatives. One such condition is the impending restriction of access to the disposal facility at Barnwell, South Carolina. Of the three currently operating disposal facilities for commercial low-level radioactive waste, only the Barnwell facility is both available to generators in all states and licensed to accept all classes of waste for which states must provide disposal. Access to this facility is to be phased out for most generators by mid-2008. Another important development is a proposed expansion of the radioactive materials license of the disposal facility operated by Envirocare of Utah, Inc. This facility currently accepts only class A low-level radioactive waste and mixed waste. However, Envirocare has applied for a license that would allow it, too, to accept all classes of low-level radioactive waste for which states must provide disposal. If the company receives the requested authorization, its disposal facility could offset the future loss of access to the Barnwell facility and provide adequate disposal capacity for commercial low-level radioactive waste for many years.

If Envirocare's requested authorization is denied, dwindling disposal capacity may provide an impetus for a change in federal policy governing management of commercial low-level radioactive waste. Two alternative policy approaches analyzed by the U.S. General Accounting Office are (1) repeal of the federal legislation so that private industry could develop and operate disposal facilities in response to market conditions and (2) disposal of commercial low-level radioactive waste at sites operated by the U.S. Department of Energy.

INTRODUCTION

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, efficiently and effectively managed by states on a regional basis. The act's objectives were to provide for new disposal capacity and to more equitably distribute the responsibility for

managing this waste among the states. To encourage states to form compacts and develop new disposal facilities, congressionally approved compacts may prohibit the disposal of waste generated outside of their respective regions.

When the 1980 act was passed, there were three operating disposal facilities for commercial waste. These facilities were located in Barnwell, South Carolina; near Richland, Washington; and in Beatty, Nevada. Both the Barnwell facility and the Richland facility are still operating. They each accept all classes of low-level radioactive waste for which states must provide disposal—classes A, B and C. Neither facility, however, has ever been authorized to dispose of "mixed" waste, which is low-level radioactive waste that also contains hazardous constituents.

The Barnwell facility opened in 1971 and was available to waste generators in most states until June 30, 1994. Then, for one year, access to the facility was restricted to only waste generators within the eight-state Southeast Compact, of which South Carolina was a member. In mid-1995, however, South Carolina withdrew from the compact, citing dissatisfaction with North Carolina's progress in developing a new regional disposal facility to replace the one in Barnwell. South Carolina then allowed the Barnwell facility to dispose of waste generated in all states except North Carolina. On July 1, 2000, South Carolina joined the Northeast Compact, consisting of Connecticut and New Jersey, which was renamed the Atlantic Compact. The compact commission has legal authority over importation of waste into the compact region for disposal, and it has delegated this authority to South Carolina. That state has lifted the ban on accepting North Carolina's waste and currently allows generators from all states to ship waste to the Barnwell facility, subject to certain restrictions and future limitations.

The facility near Richland, Washington, is located on the Department of Energy's (DOE) Hanford Site and leased by DOE to the state of Washington, which subleases the facility to a commercial operator. The Richland facility provided disposal services for waste generators throughout the nation from 1965 until January 1993, when access to the facility was restricted to waste generators located within the eight-state Northwest Compact. At about the same time, the governor of Nevada permanently closed the disposal facility for commercial low-level radioactive waste located at Beatty, Nevada. The three-state Rocky Mountain Compact, which includes Nevada, contracted with the Northwest Compact and the state of Washington to allow waste generators in the former compact to dispose of their waste at the Richland facility.

During 1992, Envirocare of Utah, Inc. began disposing of commercial low-level radioactive waste at a facility it had developed in the vicinity of a disposal site for uranium mill tailings. Envirocare developed this facility outside the framework of the Low-Level Radioactive Waste Policy Amendments Act but with the acceptance of the Northwest compact, of which Utah is a member. Currently, this facility, located west of Salt Lake City, serves commercial waste generators in all states except those in the Northwest Compact. The facility currently accepts only class A waste--the most mildly contaminated class of low-level radioactive waste--and mixed waste of the same radioactive content, but the facility operator is

seeking regulatory and political approvals from the State of Utah to expand the range of acceptable wastes.

STATES AND COMPACTS ARE NOT DEVELOPING NEW DISPOSAL FACILITIES

Although generators in all states currently have access to adequate disposal capacity at the Barnwell, Richland, and/or Envirocare of Utah facilities, none of these facilities was developed under the framework of the 1980 act and its amendments. After over 20 years and about $600 million in expenditures, states have not provided new regional disposal facilities for commercial low-level radioactive waste. Public and political opposition is generally regarded as the major factor affecting states' progress. In recent years, continued access to adequate disposal capacity, declining waste volumes, and high development costs have also contributed to halting efforts to build new disposal facilities.

Following is a summary of the current status of the efforts by compacts and the states that are not affiliated with compacts to provide disposal capacity:

- Appalachian Compact. Pennsylvania is the designated host state for this compact, which also includes Delaware, Maryland, and West Virginia. To encourage a community to voluntarily host a new disposal facility, the state's siting contractor participated in more than 340 outreach meetings around the state over a 2-year period. No municipality expressed interest in volunteering, however, so the state and compact halted the volunteer initiative at the end of 1998 after spending about $37 million. An 87-percent reduction in the amount of waste shipped to disposal facilities each year and the projected availability of the Barnwell and Envirocare facilities also contributed to the decision to stop the initiative.

- Atlantic Compact. Connecticut and New Jersey had originally formed the Northeast Compact so that they could legally exclude disposal of waste generated outside of the two states. Each state had attempted, without success, to select a site for disposing of its own commercial low-level radioactive waste. Connecticut spent over $15 million and New Jersey almost $10 million on siting efforts that encountered intense opposition from politicians, local citizens, and anti-nuclear organizations. Then, in July 2000, the Northeast Compact accepted South Carolina as its third member and changed the compact's name. Waste generators in the three states will dispose of their low-level radioactive waste at the Barnwell facility.

- Central Compact. When the compact, made up of Arkansas, Kansas, Louisiana, Nebraska, and Oklahoma, formed in the mid-1980s, Nebraska agreed to develop a disposal facility for the compact region. After screening the state, the compact's contractor identified a proposed disposal site and attempted to obtain a state license to develop and operate a disposal facility. In December 1998, however, the state denied the requested license on the basis of site groundwater issues, long-term maintenance requirements, and the contractor's financial qualifications. Shortly after the denial, major waste generators within the compact region filed contract claims against the state, attempting to recover some of the $88 million that waste generators provided for the unsuccessful siting process. In a preliminary finding in related litigation filed by the generators, a federal district court

stated in April 1999 that there was good reason to think that the license denial had been "politically preordained." Then, in May 1999, Nebraska enacted legislation that will withdraw the state from the compact after completion of a 5-year notification period required under the compact. The compact has not selected a new host state.

- Central Midwest Compact. This compact comprises Illinois, which is the designated host state, and Kentucky. Illinois identified, but subsequently rejected on safety grounds, a proposed site for a disposal facility. After spending about $96 million on that facility development effort, Illinois has decided not to develop a facility until at least 2012. In part, this decision is based on a significant reduction in the volume of waste disposed of each year by the compact's waste generators. Illinois has determined that, with lower annual waste volumes, a new disposal facility will not be economical until nuclear power stations are decommissioned. Finally, Illinois has concluded that the loss of access to the Barnwell facility would not necessarily constitute a waste management crisis because class A waste could be sent to Envirocare and the rest could be stored temporarily.

- Midwest Compact. This compact consists of Indiana, Iowa, Minnesota, Missouri, Ohio and Wisconsin. Initially, Michigan was in the compact and had been selected as the host state. That state was expelled from the compact, however, after a siting process characterized by intense public and political opposition culminated in state officials' decision that no area within the state could meet the state's strict siting criteria for a disposal facility. Ohio then became the host state. In mid-1997, however, the Midwest Compact Commission halted all efforts to identify and select a site for a regional disposal facility and withdrew Ohio's designation as host state. In so doing, the compact commission noted the escalating estimated cost for the project--from $105 million to $216 million, not counting annual operating costs. Also, the amounts of waste shipped to disposal facilities each year by waste generators within the compact had declined by 87 percent from 1989 to 1996.

- Northwest Compact. This compact's eight member states (Alaska, Hawaii, Idaho, Montana, Oregon, Utah, Washington, and Wyoming) use the Richland disposal facility. To support that facility, the compact does not allow its waste generators, including those located in Utah, to dispose of their waste at the Envirocare facility. Among the compact region's generators of low-level radioactive waste, there is one operating and one retired nuclear power plant.

- Rocky Mountain Compact. By contract with the Northwest Compact and the state of Washington, the three-state compact composed of Colorado, Nevada, and New Mexico has obtained access to the Richland disposal facility for waste generators within its member states. There are no nuclear power plants within the compact region.

- Southeast Compact. This compact consists of Alabama, Florida, Georgia, Mississippi, Tennessee, and Virginia. Initially, both North Carolina and South Carolina also were members of the compact. South Carolina withdrew from the compact in 1995. In late 1997, North Carolina, after spending $32 million in state funds and $80 million provided by the compact, halted its process for licensing a site near Raleigh due to what the state characterized as budgetary reasons. Subsequently, the state withdrew from the Southeast

Compact. The compact is suing the state of North Carolina for $90 million in sanctions for the state's failure to comply with provisions of the compact law and to fulfill its obligations as a party state to the compact.

- Southwestern Compact. This compact's member states are Arizona, California, North Dakota, and South Dakota, with California as the selected host state. In September 1993, California successfully completed its licensing procedures for a proposed disposal facility to be located on land in Ward Valley, about 20 miles west of Needles, California, in the Mojave Desert. Legal challenges to the licensing process were then denied by the state's courts. The Department of the Interior, however, did not agree to sell the federally owned Ward Valley site to the state. The Department's unwillingness to sell the land was, at least in part, based on political considerations. In 1995, the Department concluded "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." After protracted negotiations, in 1997 Interior asked for additional testing of the safety and suitability of the site, despite its own conclusion, on the basis of a study by the National Academy of Sciences, that the proposed facility could be operated safely. Then, in March 1999, Interior proposed that the Department and the state explore alternatives to the proposed transfer of the land. In 1999, the new governor of California ended the state's effort to acquire the site. By then, the state's contractor had spent about $93 million attempting to develop a disposal facility.

- Texas Compact. This compact, approved by the Congress in 1998, consists of the states of Maine, Texas, and Vermont, with Texas as the host state. After a state agency had spent $52 million to select a proposed site and seek a license to develop a new disposal facility, the Texas Natural Resource Conservation Commission denied the license application in October 1998. Subsequently, the state explored the feasibility of developing a facility for storing waste for 100 to 300 years, during which time radioactivity in some wastes would decay to background levels naturally found in the environment. Thereafter, the remaining radioactive waste would be permanently disposed of either in the storage facility or elsewhere. Proponents of this approach maintain that it preserves future waste management options; permits storage facilities to be safely co-located with existing nuclear facilities; and permits states to postpone disposal decisions. Critics argue that the storage approach may make it difficult to ensure the availability of funds to store waste for 100 or more years followed, perhaps, by retrieval and permanent disposal of some of this waste in a disposal facility. There are also legal concerns about whether a facility for long-term storage would comply with the Low-Level Radioactive Waste Policy Act's requirement for permanent disposal. Texas' attorney general has concluded that such a facility would meet the state's obligations to "manage and provide for" the disposal of the compact's low-level radioactive waste but would not satisfy its obligation to "permanently dispose of" this waste.

- States Not Affiliated With a Compact. The states of Massachusetts, Michigan, New Hampshire, New York, North Carolina, and Rhode Island, as well as the District of Columbia and Puerto Rico (both defined as "states" by the Low-Level Radioactive Waste

Policy Act), are not now affiliated with a compact and are not developing disposal facilities.

FACTORS THAT HAVE LED TO THE CURRENT STATUS ARE IN FLUX

Developments are occurring that affect two of the factors that have discouraged development of new facilities: access to adequate disposal capacity and declining waste volumes.

Changing Access to Disposal Capacity

Two recent developments will affect whether commercial low-level radioactive waste generators in most states continue to have access to adequate disposal capacity.

The first development is South Carolina's decision to join the Atlantic Compact and restrict future access to the commercial low-level radioactive waste disposal facility in Barnwell. Atlantic Compact policy and legislation enacted by South Carolina provide for the facility to accept declining volumes of out-of-region waste through June 30, 2008. After that date, access to out-of-region generators will be discontinued entirely. Waste generators in 36 states (all states except those belonging to the Atlantic, Northwest, and Rocky Mountain Compacts), the District of Columbia, and Puerto Rico will then have access only to the Envirocare facility unless other options become available in the meantime.

The second important development is a proposed change in the radioactive materials license of the disposal facility operated by Envirocare of Utah, Inc. This facility currently accepts only class A low-level radioactive waste. In November 1999, however, the facility operator applied for a license that would allow it, like the Barnwell and Richland disposal facilities, to also accept classes B and C waste. The disposal of additional classes of waste, as proposed by Envirocare, would require more stable waste forms, tougher packaging requirements, and measures to protect against future inadvertent human intrusion. Meeting these requirements would require a fundamental change in the way the disposal facility is designed and operated. Utah regulators have tentatively decided, subject to public comment, to grant the application. However, even if the company receives regulatory approval to accept the additional waste classes, Utah's law also requires the approval of both the governor and the state legislature. Such approvals, if granted, would not be made until early in 2002.

If Envirocare of Utah eventually receives authorization to accept the additional classes of waste, the Envirocare facility could offset the future loss of access to the Barnwell facility and provide adequate disposal capacity for commercial low-level radioactive waste for many years.

Changing Waste Volumes

Since 1986, the volume, if not the radioactivity, of low-level radioactive waste produced from commercial nuclear operations and disposed of each year as normal operating waste has declined from about 1.8 million cubic feet to less than 800,000 cubic feet. The 100

or so U.S. commercial nuclear power plants have produced the majority of this waste. Other types of waste generators include industries, such as radiopharmaceutical manufacturers; governmental organizations; academia; and medical hospitals, clinics, research facilities, and physicians.

In the 1990s, however, the decline in operating waste generated by nuclear power plants was offset, in part, by an increase in bulk waste, such as contaminated soil, generated from dismantling and cleaning up retired nuclear facilities. This cleanup waste has been disposed of primarily at the Envirocare facility in Utah. Since 1990, the volume, but not the radioactivity, of cleanup waste has exceeded the volume of operating waste. In 1998, for example, the more than 1 million cubic feet of commercially generated cleanup waste that was disposed of at the Envirocare facility contained only about 127 curies of radioactivity. In contrast, the approximately 195,000 cubic feet of operating waste disposed of at Barnwell in the same year contained over 330,000 curies of radioactivity.

These conditions are likely to continue until there is a significant increase in the number of nuclear power plants that are retired from service and decommissioned**.** At that point, both the volume and the radioactivity of the waste generated are expected to increase. Just when and at what rate the retirement and decommissioning of nuclear plants will occur, however, is uncertain. For example, as an alternative to ordering new nuclear or non-nuclear electrical generating plants, many utilities are seeking, or plan to seek, extensions of the licensed operating periods of their plants of up to 20 years. Extended operating periods will, of course, delay the decommissioning of the affected plants.

Another potential source of increased waste volumes for commercial disposal facilities is DOE's cleanup of its nuclear facilities. DOE has estimated that cleaning up its complex of nuclear facilities may generate over 300 million cubic feet of low-level radioactive waste (including mixed waste). Most of this waste would be disposed of at DOE facilities, but 20 million to 40 million cubic feet of the waste could be disposed of commercially. However, DOE's policy is that a commercially owned and operated disposal facility must be licensed and regulated by NRC (or a state that has agreed with NRC to regulate commercial applications of radioactive materials) before DOE will consider disposing of its radioactive waste at the company's facility. Presently, only Envirocare operates a licensed facility that DOE can use to dispose of some low-level radioactive and mixed waste. 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. Several companies had shown interest in developing these new facilities, but these initiatives were not successful. Had they succeeded, they would have resulted in new, licensed and regulated disposal capacity that, if future conditions warranted, could have also served the disposal needs of commercial generators of low-level radioactive waste.

ALTERNATIVE APPROACHES TO MANAGING LOW-LEVEL RADIOACTIVE WASTE

The current and possible future conditions discussed above raise the question of what, if anything, should be done to ensure that adequate, reliable disposal capacity remains available for the foreseeable future. There appear to be three basic alternatives: (1) retain the current compact approach, (2) rely instead on a free-market approach to waste disposal services, or (3) change to a federal approach and designate one or more of DOE's disposal facilities for the disposal of commercially generated waste.

Compact Approach

Continuing to rely on compacts of states may achieve some of the goals of safe, efficient, effective, and equitable waste management that the federal legislation of 1980 and its 1985 amendments were designed to promote. Compacts can use the flexibility contained in compact legislation to respond efficiently to changing conditions. For example, compacts are free to realign themselves as circumstances, such as the declining volume of waste, may warrant, which occurred with the Atlantic Compact. The compact system also ensures a measure of safety because facilities must meet stringent regulations promulgated by states and NRC. The compact system is also equitable in that states may enter into agreements to provide or obtain access to disposal capacity and may exclude access to generators from states that have not negotiated for such access.

As yet, however, the compact system has not shown itself to be an effective means of providing adequate disposal capacity, since, after collectively spending about $600 million, not one of the compacts has successfully developed a new disposal facility. This history raises questions about whether compacts could economically provide new disposal facilities, given the high costs and unabated political and local opposition.

Free-Market Approach

Some argue for repealing the Low-Level Radioactive Waste Policy Amendments Act so that private industry could efficiently develop and operate disposal facilities in response to national market conditions, including DOE's periodic needs for commercial disposal services. Proponents of this approach assert that abolishing the 10 regional compacts would create a single national market that would effectively encourage private development of disposal capacity.

This approach to providing additional capacity may be counterproductive, however, because it runs the risk that the state of Washington will close the Richland disposal facility. The state strongly supports the compact approach on equity grounds and state officials have said that the state probably would close the facility if it lost the right to exclude out-of-region waste provided by compact legislation. The operator's lease with the state expires in 2005, so the state could close the facility by simply declining to renew the lease. Other states may share Washington's concerns about equity and erect administrative barriers to new disposal facilities

within their borders if they do not have the exclusionary authority afforded by compacts. In addition, repealing the federal legislation would not effectively address the public and political opposition that has stymied state efforts to develop disposal facilities. This opposition has frustrated recent efforts of private companies to develop radioactive waste disposal facilities in Colorado, Texas and Utah. Moreover, these private undertakings, and the successful development of the Envirocare facility outside the framework of the Northwest Compact, demonstrate that repeal of the compact agreements is not a prerequisite for private sector disposal initiatives.

Federal Approach

Finally, the nation might develop adequate capacity for commercially generated low-level radioactive waste by having DOE dispose of this waste at one or more of its existing disposal facilities. Those who believe that state governments would successfully frustrate attempts to develop new disposal facilities under the compact and free market approaches discussed above support this approach on the grounds that it would be more effective. They also point to the efficiency of adding the relatively small volume of commercial waste to DOE's existing waste disposal operations. DOE's disposal facilities for low-level radioactive waste on its Hanford Site and its Nevada Test Site accept low-level radioactive waste from other DOE facilities and are physically capable of disposing of mixed waste. Both facilities have more disposal capacity than DOE estimates it needs, and the existing facilities at both locations could be expanded if necessary. There is also legislative precedent for making DOE responsible for disposing of commercial radioactive waste, since DOE is already responsible for disposing of spent fuel generated at commercial nuclear power plants and the most radioactive class (greater-than-class C) of commercial low-level radioactive waste.

There are, however, drawbacks associated with this approach. It would impose an additional burden on DOE, which has often been criticized by states and others for the poor safety performance of its nuclear facilities. DOE self-regulates its own disposal operations, whereas either NRC or an agreement state regulates the disposal of commercially generated low-level radioactive waste. 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.

In addition, there does not appear to be any incentive for the states most likely to be affected—Washington and Nevada—to accept this approach. In the late 1970s, 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 waste led to passage of the Low-Level Radioactive Waste Policy Act. At both the Washington and Nevada sites, moreover, DOE and the respective state governments are negotiating numerous issues pertaining to cleaning up the environmental legacy of the nuclear weapons program. It is unlikely that the two states would willingly accede to DOE's acceptance of commercial low-level radioactive waste at these sites until the outstanding cleanup issues are resolved. Without such resolution, the states might try to erect administrative barriers to prevent acceptance of additional waste. Nevada officials, for example, already want to ensure that DOE does not transport waste through the greater Las Vegas Valley en route to the test site; the prospect of

additional waste might intensify their efforts to restrict transportation routes. In addition, for more than 10 years the state of Nevada has vigorously opposed the possible use of Yucca Mountain as a repository for spent fuel and other highly radioactive waste. In 1989, for example, the state enacted legislation (later overturned by a federal court) making it illegal to store high-level radioactive waste in Nevada. The strain on state and federal relations engendered by the high-level radioactive waste program renders it all the more unlikely that Nevada would support DOE's acceptance of additional waste at the Nevada Test Site.

Although DOE has legal authority to dispose of commercial low-level radioactive waste, it has, as a matter of policy, shied away from doing so. For example, when the Department of the Interior would not agree to sell the proposed disposal site in Ward Valley to California, an organization of users of radioactive materials in that state requested that DOE dispose of their low-level radioactive waste at the Department's Nevada and Hanford disposal facilities. DOE denied the organization's request on the basis of equity considerations in Nevada and Washington.

CONCLUSIONS

If Envirocare is able to expand its disposal capabilities, commercial low-level radioactive waste generators around the country may have adequate access to disposal capacity for their low-level radioactive waste for the foreseeable future. If not, the waste generators that lose access to the Barnwell facility will not have access to a disposal facility for some wastes unless some other option becomes available. Accordingly, there may be a need to provide additional disposal capacity.

Since nuclear power generates the vast majority of commercial low-level radioactive waste, an appropriate strategy to providing this additional capacity may, in the end, depend upon the future of the nuclear industry in the United States. Continuing the approach of encouraging compacts of states to develop new regional disposal facilities may be appropriate if it is expected that a new generation of nuclear power plants will be developed and create an ongoing stream of operational waste. An ongoing waste stream would assure a market for new disposal capacity and lend greater moral weight to equity concerns. Public and political opinion might even be swayed in favor of developing new disposal facilities if they were needed in order to continue the beneficial uses of radiation. Alternatively, if the retirement of existing nuclear plants is expected to end the age of nuclear power in this country, then limiting disposal of commercial low-level radioactive waste to commercial and DOE disposal sites that already exist may be a more appropriate strategy.