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Technical Bulletins provide information to States, compact regions, and other interested parties on issues related to the development of low-level radioactive waste disposal facilities. The Bulletins distribute information that is either of immediate concern to the States and compact regions or that is not suited to more formal reports. These Bulletins are published on an as-needed basis.

The objective of this particular Technical Bulletin is to provide a comprehensive list of issues and potential problem areas that States and compact regions may face when considering the temporary storage beyond 1992, of low-level radioactive waste (LLW) including mixed waste, either at the point of waste generation or collection or at a centralized temporary storage facility.

**MANAGING COMMERCIAL LOW-LEVEL RADIOACTIVE
WASTE BEYOND 1992:
ISSUES AND POTENTIAL PROBLEMS OF TEMPORARY STORAGE**

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Executive Summary

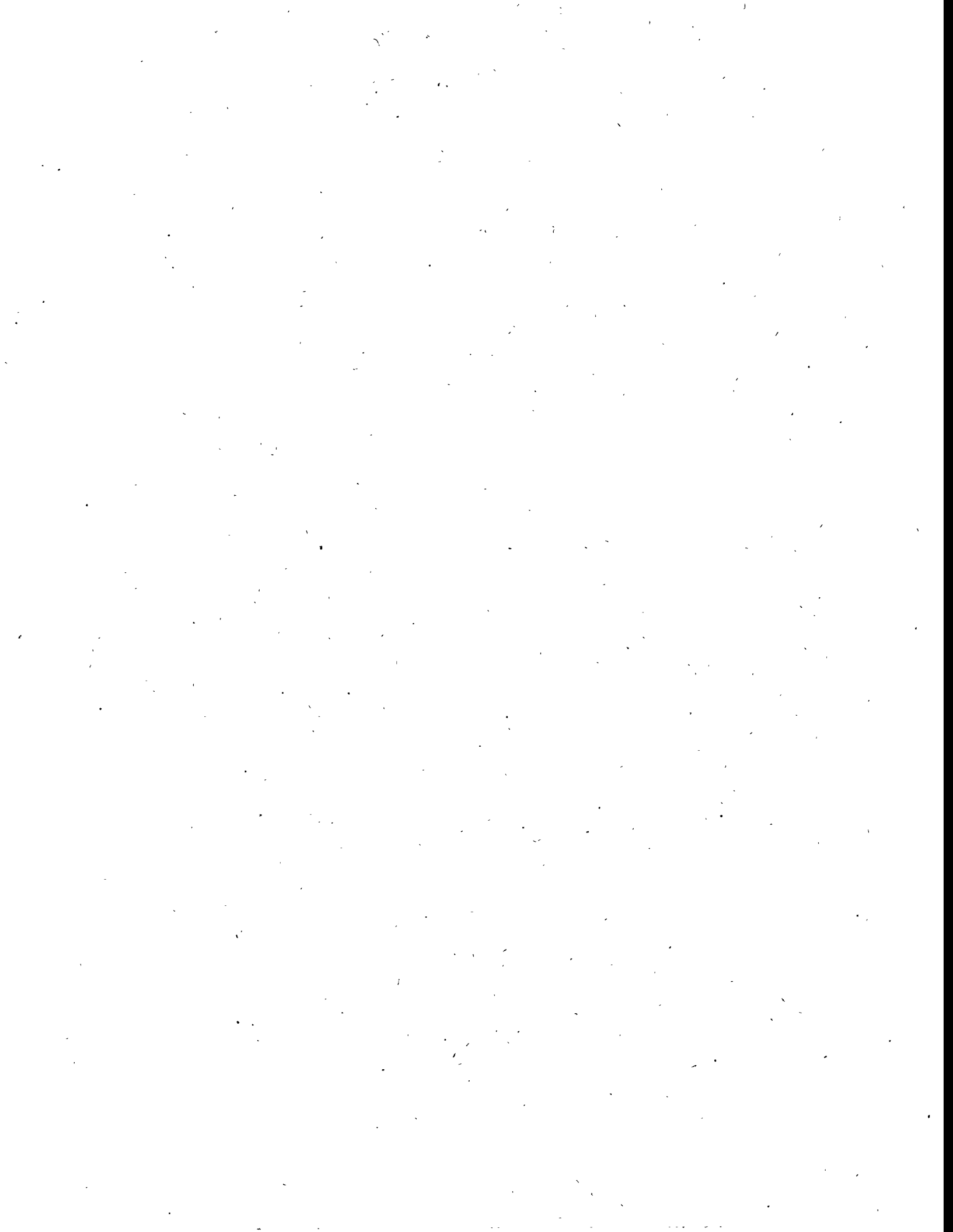
In accordance with the Low-Level Radioactive Waste Policy Amendments Act of 1985, States will become responsible for managing low-level radioactive waste, including mixed waste, generated within their borders as of January 1, 1993. In response to this mandate, many States and compact regions have made substantial progress toward establishing new disposal capacity for these wastes. While this progress is noteworthy, many circumstances can adversely affect States' abilities to meet the 1993 deadline, and many States have indicated that they are considering other waste management options in order to fulfill their responsibilities beyond 1992.

Among the options that States are considering for the interim management of low-level radioactive waste is temporary storage. Temporary

storage may be either short term or long term and may be at a centralized temporary storage facility provided by the State or a contractor, or may be at the point of generation or collection.

Whether States choose to establish a centralized temporary storage facility or choose to rely on generators or brokers to provide additional storage capacity, they will encounter many issues and problem areas that must be addressed and resolved. Areas with many potential issues associated with the temporary storage of waste include:

- Regulations, legislation, and policy and implementation guidance,
- Economics,
- Public participation,
- Siting, design, and construction,



- Operations,
- Closure and decommissioning.

Identifying issues and anticipating problems related to temporary storage of waste will help States to make decisions, plan their actions, devise mitigative measures, and carry out their management responsibilities for low-level radioactive waste beyond 1992.

Introduction

Beginning on January 1, 1993, the Low-Level Radioactive Waste Policy Amendments Act of 1985 (the Act) makes States responsible for managing commercial low-level radioactive waste generated within their borders. Also as a result of the Act, the three operating LLW disposal facilities located in Washington, Nevada, and South Carolina may deny access to LLW generators outside their borders after December 31, 1992. While Washington will remain open for generators in the Northwest compact region, South Carolina and Nevada have repeatedly indicated that they will close their sites at that time.

In spite of substantial incentives and penalties, at least 34 States (11 individual States, and 4 compact regions representing an additional 23 States) may be unable to establish permanent disposal capacity for their LLW beginning in 1993 (see Table 1). As a result, many states have begun examining alternative management techniques while awaiting the establishment of permanent disposal. One of the options being considered is temporary storage of LLW.

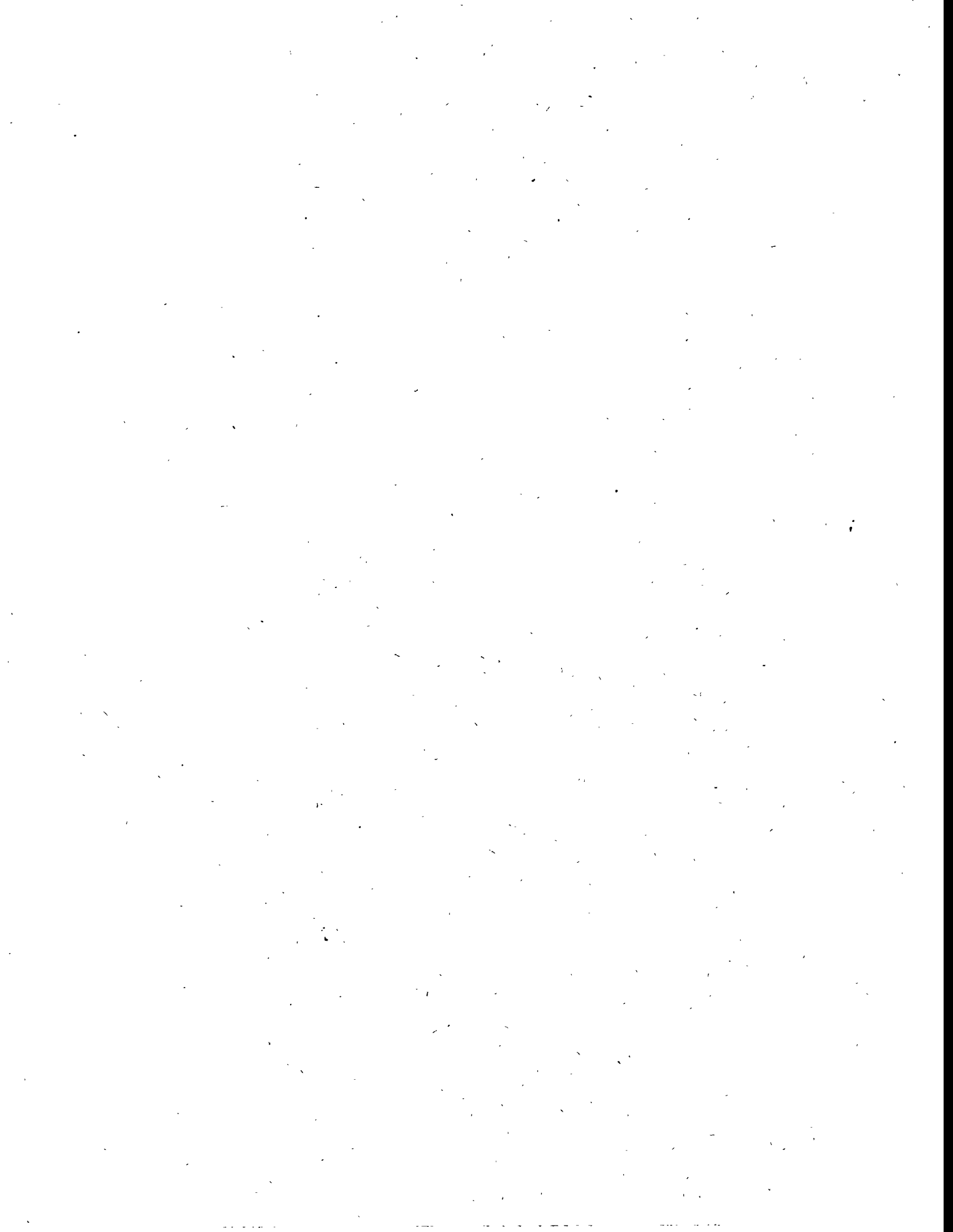
When considering temporary storage, States and compact regions have two broad options: (1) storage by the generators and brokers at the point of generation or collection, and (2) storage at a centralized temporary storage facility. Of course, centralized temporary storage could take place at more than one facility, and States could choose to combine the options with some centralized storage and some storage at the generators. Issues and problem areas can, however, be divided along the lines of the two broad options

defined above, and can be evaluated based on the specific circumstances of each State.

Table 1. Status of State and compact region plans to provide low-level radioactive waste disposal capacity.

State (Compact Region)	Facility Operational
California (Southwest)	November 1991
*Colorado (Rocky Mountain)	Undecided
*Connecticut (Northeast)	July 1994
*District of Columbia	Undecided
Illinois (Central Midwest)	January 1993
*Maine	June 1996
*Massachusetts	September 1995
*Michigan (Midwest)	February 1997
Nebraska (Central)	January 1993
*New Hampshire	Undecided
*New Jersey (Northeast)	July 1995
*New York	Under review
*North Carolina (Southeast)	January 1995
*Pennsylvania (Appalachian)	June 1996
*Puerto Rico	Undecided
*Rhode Island	Undecided
*Texas	April 1994
*Vermont	Undecided
Washington (Northwest)	Operational

* States and compact regions indicating that they will be unable to establish new LLW disposal capacity by 1993. This information was drawn from the LLW Forum Composite Timeline (Afton and Associates, Inc., August 1990).



Temporary Storage at the Point of Generation or Collection

In the Governors' Certifications submitted in response to the 1990 milestone of the Act, many Governors indicated that, if permanent LLW disposal capacity was not available by the end of 1992, their States would rely on their LLW generators and/or brokers to provide temporary storage for LLW. While this approach is certainly attractive from a logistical standpoint, it does raise several issues and problems that States should consider before implementation.

Regulatory, Legal, and Guidance Issues

Regulatory, legal, and guidance issues will be very complex for States and compact regions that rely on their LLW generators and brokers for temporary storage of LLW. Issues and problems that hold a potential for serious negative impact to States include:

- Determining the point at which change of title to the waste occurs between the generators or brokers and the State
- Determining the point at which material is defined as LLW
- Determining liability for direct and indirect damages as a result of LLW generators and brokers storing the waste if the State does not take title and possession or if the State takes title only
- Resolving regulatory conflicts, overlaps, and gaps among the Environmental Protection Agency (EPA), Nuclear Regulatory Commission (NRC), and Agreement State authorities
- Assessing the impacts of changing Department of Transportation radioactive material and hazardous waste transportation regulations concerning stored LLW, including the impacts of changing International Atomic Energy Agency regulations and policies on domestic regulatory evolution
- Determining the impact of Below-Regulatory-Concern (BRC) rulings on waste volumes and characteristics
- Determining the impact of NRC policy that limits on-site storage to five years
- Assessing the effect of changes to the regulatory and guidance framework under which States and compact regions are working, such as potential promulgation of 40 CFR 193
- Assessing the impact of the expiration of EPA's National Capacity Variance for mixed LLW and the implementation of Resource Conservation and Recovery Act (RCRA) Land Disposal Restrictions
- Assigning responsibility and authority for inspection and enforcement activities at the point of generation and collection
- Dealing with license amendments and RCRA permitting issues, such as time limits, radioactivity limits, and volume limits
- Resolving licensing issues, such as determining the ability for a licensee to receive treated LLW back from a LLW processor for temporary storage
- Determining the viability and consequences of storing nonreactor LLW at a reactor site
- Providing guidance to LLW generators on LLW forms, i.e., processing the waste prior to storage or storing it in an untreated form because waste disposal acceptance criteria have not been established or may change.

Economic Issues

As States and compact regions continue to make progress toward establishing new LLW disposal capacity, the availability of funds and other economic issues become more important. States that rely on their LLW generators and brokers to store LLW beyond 1992 face serious financial consequences such as:

- Becoming ineligible to receive the full 25% rebate on surcharges collected from LLW generators by the operating LLW disposal facilities for January 1, 1990, to December 31, 1992
- Assuming liability for direct and indirect damages experienced by generators as a result of the State's failure to take title and possession of LLW by 1996 at the latest
- Resolving insurance issues if title, but not possession, is transferred to the State
- Working out agreements with brokers regarding cost and liability (including liability insurance required by RCRA) for temporary storage at their facilities
- Losing businesses that choose to move or close rather than increase storage capacity or experience increased storage or processing costs
- Incurring liability from businesses that fail while storing LLW
- Hiring additional staff to handle increased regulatory burden of LLW storage at multiple locations
- Coping with potential dilution of State resources devoted to other areas of LLW management, especially disposal
- Bearing the costs of litigation involving disputes over damages or liability.

Public Participation Issues

Although opportunities for public participation in the temporary storage of LLW (at the point of generation or collection) are more limited than those generally available in a LLW disposal facility siting process, special interest groups and members of the general public may choose to participate in the license amendment or RCRA permitting process in order to influence decisions about temporary storage. Such participation would be most likely if temporary storage involved a significant expansion of capacity or change in the character of the waste. Responsible authorities will have to maintain good communication with the public throughout the process to ensure that the public remains well informed and has the opportunity to participate.

Operational Issues

With temporary storage occurring at the point of generation or collection, operational issues and problem areas will be the responsibility of the LLW generator or broker. However, generators and brokers may be faced with some unique operational challenges during extended temporary storage and may request assistance from States in overcoming obstacles. Normally, these operational situations would be dealt with through licensing or permitting actions or regulatory guidance. Some of the issues with which generators and brokers may need assistance include:

- Locating and establishing access to LLW processing facilities
- Working with processors to devise practical means of processing small batches of waste (such as with incineration and supercompaction), and returning that processed waste to individual generators and brokers
- Ensuring radiation protection for workers and the general public
- Ensuring occupational safety and health

- Designing and conducting operational and environmental monitoring
- Handling special–case wastes, such as animal carcasses, wastes with high radiation dose rates, or wastes with unusual shapes
- Developing waste inspection criteria and procedures
- Developing and conducting worker training and qualification
- Complying with Occupational Safety and Health Administration (OSHA) community right–to–know regulations and the Hazard Communication Standard
- Establishing security systems
- Developing emergency response and contingency plans
- Recordkeeping.
- Processing, packaging, and transporting LLW generated as a result of decontamination and decommissioning of temporary storage facilities.

Temporary Storage at a Centralized Storage Facility

Several States have begun to consider seriously the option of establishing centralized temporary storage facilities for LLW management beyond 1992. Such facilities could be developed and operated by either the States or contractors. Centralized temporary storage is an attractive option in terms of control and concentration of financial and technical resources, but it also raises some significant issues and problems that should be addressed prior to implementation.

Regulatory, Legal, and Guidance Issues

Regulatory, legal, and guidance issues related to temporary storage of LLW at a centralized facility are likely to be even more complex than those related to storage at the point of generation or collection. Issues that States should consider include:

Transition from Temporary Storage to Permanent Disposal Issues

As new LLW disposal capacity is established and becomes available, there will be a transition period as LLW is transferred out of temporary storage to permanent disposal. States and generators or brokers entering this transition period will be faced with logistical problems and other issues such as:

- Determining the points at which change of title and possession of the waste occur between the generators or brokers and the State
- Assessing the extent of liability assumed by the State as a result of taking title and possession
- Determining ownership and liability for the temporary LLW storage facility
- Resolving regulatory conflicts, overlaps, and gaps among EPA, NRC, and Agreement State authorities
- Assessing the impacts changing of Department of Transportation radioactive material and hazardous waste transportation regulations may have on stored LLW, including the impacts that changes in International Atomic Energy Agency
- Ensuring that the rate of LLW removal for permanent disposal exceeds the rate of LLW generation so that the inventory of LLW in temporary storage can be reduced relatively quickly
- Potentially processing and repackaging LLW due to changed or new disposal requirements
- Manifesting and tracking LLW for shipment to a permanent disposal facility

regulations and policies may have on domestic regulatory evolution

- Ensuring that a regulatory framework that addresses temporary LLW storage away from the point of generation exists
- Determining the impact of BRC rulings on waste volume and characteristics
- Resolving the issue of an unlicensed State taking title and possession of LLW
- Assessing the effect of changes to the regulatory and guidance framework under which States and compact regions are working, such as potential promulgation of 40 CFR 193
- Assigning inspection and enforcement authority and licensing and RCRA permitting duties
- Resolving problems associated with “foreign” control of waste, i.e., determining responsibilities of States with regard to waste temporarily stored outside their borders
- Dealing with compact issues such as designation of a host State for a temporary storage facility, or approval of such a facility as a regional facility and host State approval of this designation.

Siting, Design, and Construction Issues

In establishing centralized temporary storage facilities, States will need to locate a site, design a facility, obtain a license and RCRA permit, and finally construct the facility. Issues that States should consider in planning these activities include:

- Securing funding (including insurance) and maintaining experienced staff for siting, designing, licensing and RCRA permitting, and constructing the facility

- Evaluating various storage technologies and volume reduction techniques
- Determining Federal, State, and local regulatory requirements and constraints
- Establishing siting criteria and selection methodology
- Conducting required site studies and preparing supporting documentation
- Determining the design life and capacity of the LLW storage facility
- Incorporating design features, such as shielding; fire suppression and control; ease of inspection; ventilation to be able to handle waste decomposition and gas generation; ability to withstand natural phenomena (tornadoes, floods, hurricanes, earthquakes, and extremes of temperature and humidity); and the ability to segregate and retrieve LLW, including sequence and timing of retrieval (i.e., by waste class, LLW generator, State, destination, and chemical compatibility)
- Purchasing or leasing land and buildings
- Evaluating contractor capabilities and negotiating contracts for all aspects of the process
- Involving the public in the decision-making process, which could include negotiating compensation and benefits packages, providing assurances that the temporary facility will not become a defacto disposal facility, and determining the degree of control the local community may exercise at key points in the decisionmaking process.

Operational Issues

For centralized temporary storage, operational issues will be the responsibility of the States or their selected contractors. Issues that should be considered by storage facility operators include:

- Devising a pricing structure for temporary storage funding, which would cover the cost of operations, potential processing and repackaging of LLW, and eventual shipment to, and disposal at, a permanent disposal facility
- Developing waste acceptance criteria for storage that are compatible with waste acceptance criteria for permanent disposal, or deciding to keep waste in an untreated form until disposal waste acceptance criteria for disposal are developed and are unlikely to change
- Locating and establishing access to LLW processing facilities
- Working with waste processors to devise practical means of processing waste (such as incineration and supercompaction) on a State-by-State basis and ensuring that waste is returned to the proper State
- Ensuring radiation protection for workers and the general public
- Ensuring worker health by complying with OSHA regulations
- Conducting operational and environmental monitoring
- Determining equipment needs and concluding purchase or lease agreements
- Segregating incompatible wastes or Class A, B, C, and mixed wastes, if required; if a centralized temporary storage facility serves more than one host State, segregation could also be required on that basis, since retrieval would begin at different times
- Handling special-case wastes, such as animal carcasses, wastes with high radiation dose rates, or wastes with unusual shapes
- Establishing waste inspection criteria and procedures and training inspectors
- Hiring, training, and qualifying workers
- Complying with OSHA community right-to-know regulations and the Hazard Communication Standard
- Establishing emergency response and contingency plans
- Training and equipping local community emergency response organizations
- Establishing a quality assurance program and quality control procedures
- Establishing security systems
- Establishing an inventory and control system, which can accurately assess characteristics such as rate of gas generation and radioactive decay on both an individual container and total basis, and which can also track individual and total quantities of special nuclear material
- Potentially processing and repackaging waste due to changed or new disposal requirements
- Ensuring that the rate of acceptance of LLW for permanent disposal exceeds the rate of generation, so that LLW inventory in temporary storage can be reduced relatively quickly
- Packaging and preparing waste for shipment to a permanent disposal facility
- Manifesting and tracking the waste
- Designating routes to be used to ship LLW to and from temporary storage

- Shipping waste from temporary storage to a permanent disposal facility.

Postoperational Issues

When new LLW disposal capacity becomes available and the LLW inventory in storage has been transferred to permanent disposal facilities, States will be faced with the need to close and decommission temporary storage facilities. Issues that the States will need to deal with during this process include:

- Ensuring that adequate funding (including insurance) and manpower are available to close, decontaminate, and decommission the facility
- Ensuring that adequate funding and insurance are available for any postclosure activities, such as extended monitoring or remediation
- Processing, packaging, and shipping decommissioning waste to a permanent disposal facility
- Restoring the temporary storage site to its original condition or converting it to another use

- Determining the need to conduct post-closure environmental monitoring
- Selling or otherwise liquidating holdings such as land, buildings, and equipment.

Conclusion

In response to the mandates of the Act, many States and compact regions are beginning to evaluate the possibility of temporarily storing LLW at the point of either generation or collection, or at a centralized temporary storage facility. One of the first steps in the evaluation process is to identify those issues and problems that will require attention and resolution. As this paper has indicated, the list of issues is long, and individual issues or problems can be complex and difficult to define and resolve. Before making any decisions, States and compact regions that must incorporate some form of temporary storage into their management plans should recognize and carefully weigh the advantages and disadvantages of centralized temporary storage versus storage at the point of generation or collection. Areas of consideration include compatibility with the regulatory and legal framework, economics, siting and design, public participation, operations, postclosure requirements, and ease of transition from storage to disposal mode.

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