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May 17, 1996

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The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
626 Indiana Avenue, NW
Suite 700
Washington, D.C. 20004

Dear Mr. Chairman:

Enclosed is the Department of Energy's (DOE) Final Report, *Complex-Wide Review of DOE's Low-Level Waste Management ES&H Vulnerabilities*, dated May 1996. DOE committed to provide this deliverable in my letter dated April 12, 1996. The deliverable includes three volumes and one appendix. Volume I provides an overall summary of the complex-wide review effort, including the assessment methodology, site specific vulnerabilities, complex-wide vulnerabilities, and DOE's conclusions and recommendations. Volume II discusses in detail the assessment methodology and evaluation instruments developed by DOE for the complex-wide review. Volume III includes the Site-Specific Assessment Reports for each of the 38 sites for which assessments were conducted, including 8 sites (10 facilities) for which on-site assessments were conducted and 28 sites for which assessments were conducted through document reviews and interviews with DOE Headquarters, Field Office, and site personnel. The appendix includes biographical sketches of Working Group Assessment Team members, excerpts from the Integrated Data Base Report-1994, and Vulnerability Assessment Forms supporting the Site Specific Assessment Reports.

This document is unclassified and is suitable for final placement in the public document room. DOE is transmitting this report to the DNFSB and DOE managers to complete all actions associated with Task Initiative 3: "Conduct First Priority On-Site Independent Assessment," of Chapter V of the March 31, 1995, Defense Nuclear Facilities Safety Board 94-2 Implementation Plan.

Sincerely,

Richard J. Guimond
Assistant Surgeon General, USPHS
Principal Deputy Assistant Secretary
for Environmental Management

Enclosure



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EXECUTIVE SUMMARY

The Department of Energy (DOE) conducted a comprehensive complex-wide review of its management of low-level waste (LLW) and the radioactive component of mixed low-level waste (MLLW). This review was conducted in response to a recommendation from the Defense Nuclear Facilities Safety Board (DNFSB) which was established and authorized by Congress to oversee DOE. The DNFSB's recommendation concerning conformance with safety standards at DOE LLW sites was issued on September 8, 1994 and is referred to as Recommendation 94-2. DOE's Implementation Plan for its response to Recommendation 94-2 was submitted to the DNFSB on March 31, 1995.

The DNFSB recommended that a complex-wide review of LLW management be initiated. The goal of the complex-wide review of DOE's LLW management system was to identify both programmatic and physical vulnerabilities that could lead to unnecessary radiation exposure of

workers or the public or unnecessary releases of radioactive materials to the environment. Additionally, the DNFSB stated that an objective of the complex-wide review should be to establish the dimensions of the DOE LLW problem and support the identification of corrective actions to address safe disposition of past, present, and future volumes of LLW.

The complex-wide review involved an evaluation of LLW management activities at 38 DOE facilities at 36 sites that actively manage LLW and MLLW. The evaluations were conducted as follows:

- 1) Descriptions of site LLW management activities were developed by knowledgeable site personnel.
- 2) Site personnel responded to a Site Evaluation Survey (SES), which contained questions concerning the management of LLW.

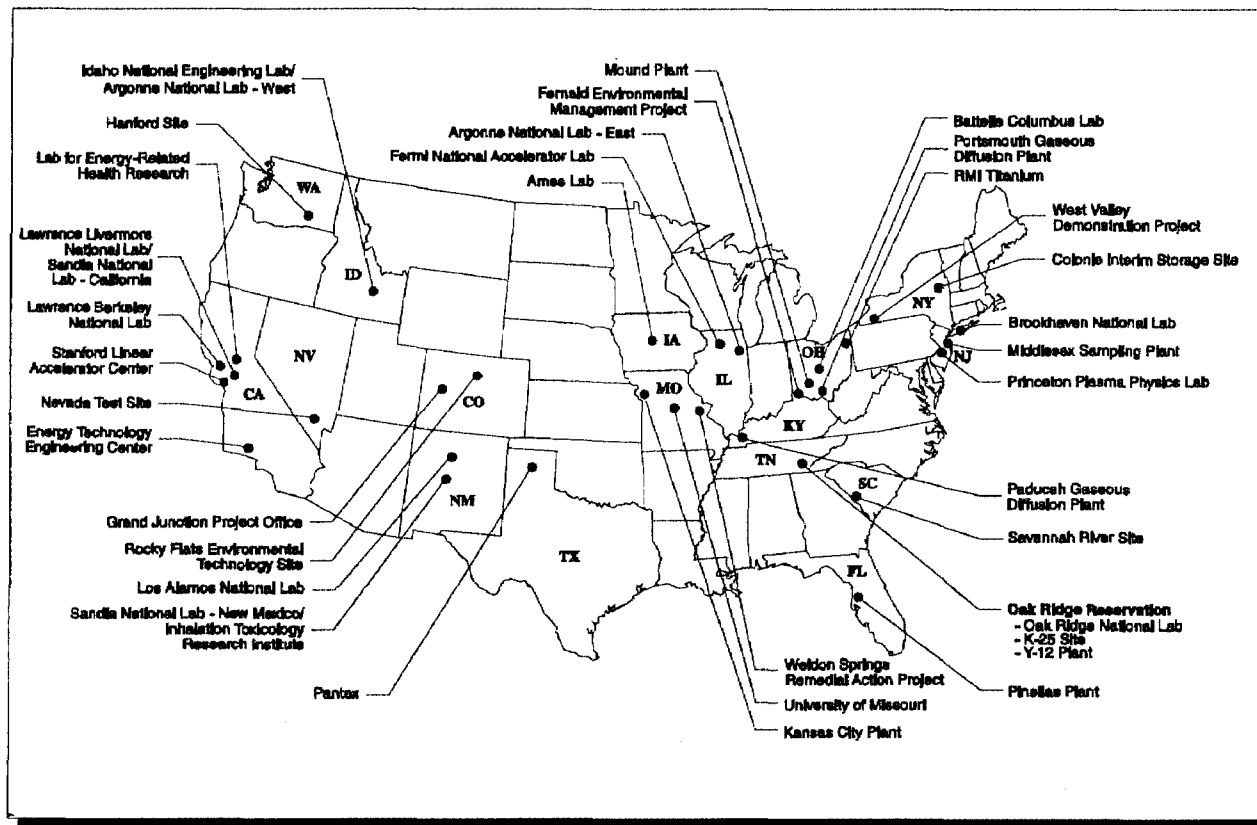


Figure ES-1. Thirty-eight DOE Facilities Managing Low-Level Waste

- 3) Teams independent of each site reviewed the SES and other information, as necessary, to evaluate the adequacy and effectiveness of the site's management of LLW.
- 4) Working Group Assessment Teams (WGATs) visited eight sites (10 facilities) which account for over 77 percent of all LLW currently managed and expected to be generated across the DOE complex over the next 20 years: Fernald Environmental Management Project, Hanford Site, Idaho National Engineering Laboratory, Los Alamos National Laboratory, Nevada Test Site, Oak Ridge Reservation (Oak Ridge National Laboratory, K-25 Site, Y-12 Plant), Rocky Flats Environmental Technology Site, and Savannah River Site. Other sites were evaluated through document reviews and interviews with cognizant DOE Headquarters, Field Office, and site personnel.
- 5) The site-specific vulnerabilities identified by the assessment teams were analyzed to identify complex-wide vulnerabilities.

Site-Specific Vulnerabilities

The site-specific assessments entailed on-site assessments, surveys, document reviews, interviews with site personnel, and inspection of facilities and operations. Through the site-specific assessments of the 38 facilities, 45 site-specific vulnerabilities were identified. None of the site-specific vulnerabilities were identified as being in the high or immediate risk category. Of the 45 site-specific vulnerabilities identified, 16 were classified as medium risk and 29 were classified as low risk.

The majority of the site-specific vulnerabilities resulted from missing or inadequate requirements and a failure to implement existing requirements. None of the site-specific vulnerabilities identified were associated with a failure to review the implementation of requirements or a lack of corrective action programs as a primary cause. Most of the site-specific vulnerabilities were associated with disposal activities, with some associated with both generation and storage

activities, and very few associated with treatment activities.

Complex-Wide Vulnerabilities

Once the site-specific vulnerabilities were identified, a joint team composed of Assessment Working Group (AWG) representatives and the leader or a key representative from each WGAT grouped, classified, and evaluated the site-specific vulnerabilities to identify complex-wide vulnerabilities. This joint AWG/WGAT team analyzed the groupings of site-specific vulnerabilities to identify trends and common causes among the site-specific vulnerabilities. In so doing, the AWG/WGAT team identified a number of vulnerabilities which could be characterized as endemic to the system. These endemic complex-wide vulnerabilities were the result of multiple examples of similar vulnerabilities with similar causes in similar activities among the sites assessed. The AWG/WGAT team also looked across the grouping of site-specific vulnerabilities to identify and establish contributing causes and programmatic origins of each, and analyze trends among the vulnerabilities. This analysis resulted in the identification of a number of structural, institutional, and/or programmatic causes and contributing factors to the vulnerabilities that were determined to be inherent to the DOE LLW management systems, and were identified by the AWG/WGAT team as inherent complex-wide vulnerabilities.

As a result of this analysis, six complex-wide vulnerabilities were identified:

LLW forecasting and capacity planning is inadequate. Current DOE forecasting and capacity planning efforts do not provide adequate information to support effective and integrated planning. This inadequacy results in capacity shortages, program ineffectiveness, and unnecessary storage of LLW, which increases the risk for releases to the environment and exposures to workers and the public.

Characterization of LLW is ineffective. Inadequacies and inaccuracies in characterization

efforts complicate effective waste management activities and planning. Ineffective characterization results in mismatched technologies and increased volumes of waste in storage, and increased risk for releases to the environment and exposures to workers and the public.

LLW that has an identified path forward for disposal remains in storage. A lack of specific requirements to dispose of LLW, absence of time limits on the storage of LLW, and competing management priorities, result in indefinite storage of LLW even if there is an identified path forward for disposal. Unnecessary storage of LLW often results in increased risk to workers and increased risk of future remediation and clean-up liabilities.

Storage conditions for LLW are inadequate. A lack of requirements regarding safe conditions for storage of LLW and poor planning result in increased risk for releases to the environment and exposures to workers and the public. The potential for releases is primarily from deteriorating packages and storage of waste in a manner that is not appropriately protected from natural events and phenomena based on the inherent risk of the waste stored.

Some LLW has no technical path forward for disposition. The lack of a technically feasible or identified path forward for managing some wastes results in indefinite storage and increased risk for releases to the environment and exposures to workers.

Performance assessments are unapproved and lack adequate requirements. Performance assessments for DOE LLW disposal facilities do not consistently address all considerations important to demonstrating compliance with performance objectives. The approval process for performance assessments is cumbersome, and results in a lack of confidence regarding long-term protectiveness.

Conclusions

The DOE LLW management system, though imperfect, appears to be generally protective of the

key receptors - the public, workers, and the environment - in the short term from current operations. However, planning for long-term protectiveness and performance of disposal facilities cannot be clearly demonstrated due to lack of approved performance assessments and lack of complex-wide integrated planning. Over one-half (57 percent) of the site-specific vulnerabilities identified through this assessment were determined to impact disposal activities. Generation and storage activities were found to each be affected by 22 percent and 16 percent of the site-specific vulnerabilities, respectively.

None of the site-specific or complex-wide vulnerabilities identified were classified as a high risk. Approximately two-thirds (64 percent) of the site-specific vulnerabilities identified were determined to pose low overall risks to the workers, public, and the environment. While the complex-wide vulnerabilities identified present opportunities for improvement of DOE LLW management activities, there do not appear to be any circumstances that would precipitate immediate and dramatic corrective actions by DOE or its M&O contractors.

In general, the deficiencies in the DOE LLW management system identified as primary or contributing causes of the complex-wide vulnerabilities reflect:

- A lack of adequate and comprehensive requirements
- A lack of consistency across sites in implementing program requirements
- A lack of complex-wide perspective and management focus on DOE's LLW policies

Generally, the complex-wide vulnerabilities identify both programmatic and technical factors as their primary or contributing causes. Programmatic factors identified as primary and contributing causes of the complex-wide vulnerabilities included lack of policies and requirements, inadequate requirements, and lack of consistent application of requirements at the site-specific level for all LLW program activities.

Technical factors identified as primary and contributing causes of the complex-wide vulnerabilities included methods for characterizing, packaging, and handling wastes; assumptions and parameters for performance assessments and site characterization; and material and design compatibilities for LLW handling and management. Only one complex-wide vulnerability was identified for which operations and maintenance (program implementation) was determined to be a primary or contributing cause and was related to ad hoc decisions concerning conditions for storage of LLW.

An important and unanticipated result of recruiting site personnel to staff the Working Group Assessment Teams (WGATs) was that the assessors generally gained greater complex-wide perspectives on DOE's LLW management system. As a result, the WGAT assessors generally became more aware of the LLW programs at their own sites and were able to identify problem areas and noteworthy practices relevant to their own facilities.

Recommendations

As noted, the complex-wide review of DOE's LLW management ES&H vulnerabilities presents opportunities for improving DOE's LLW management activities and demonstrating long-term protectiveness. Recommendations relative to the six complex-wide vulnerabilities identified in this report are discussed in Chapter 2 of Volume I. Three general recommendations are discussed below which represent the synthesis and integration of the recommendations for each of the complex-wide vulnerabilities.

DOE should identify the specific inadequacies in its LLW management requirements and develop, where necessary, more comprehensive requirements and guidance. New and revised requirements are needed to provide comprehensive, specific direction for all aspects of LLW management and provide penalties for not following specific requirements. For example,

comprehensive requirements for developing waste generation forecasts should be developed to promote consistency in the information developed by generators. Some current DOE LLW requirements lack sufficient supporting guidance which results in interpretation of requirements that is inconsistent from site to site.

DOE should identify what level of consistency for implementation of program requirements is necessary across the DOE LLW complex and generate guidance as necessary to achieve consistency. Requirements and program direction need to focus on complex-wide perspectives, acknowledge and account for site-to-site linkages, and promote complex-wide integration of LLW management activities and facilities. Completely standardized methods and rigid procedures for all activities are not warranted. However, greater consistency in the generation and use of LLW information is necessary to promote efficiencies among sites.

DOE should promote a more complex-wide perspective among its senior managers and sites regarding all aspects of LLW management. Senior management support is needed to coordinate and integrate activities, optimize facility capacities, identify problems, and to develop solutions. The need for senior management attention is emphasized due to the predominance of programmatic causal factors identified for the complex-wide vulnerabilities, including lack of direction, guidance, decision-making, and priority setting.

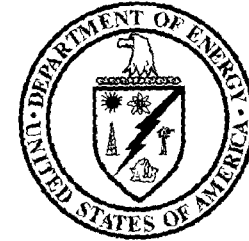
Additionally, it is recommended that opportunities be identified to exchange personnel among sites and promote greater sharing of lessons learned to enhance the integration of LLW management system components across the DOE complex.

It should also be noted that these complex-wide vulnerabilities, conclusions, and recommendations do not generally identify any issues which have not been raised previously within DOE.

U.S. Department of Energy
Office of Environmental Management

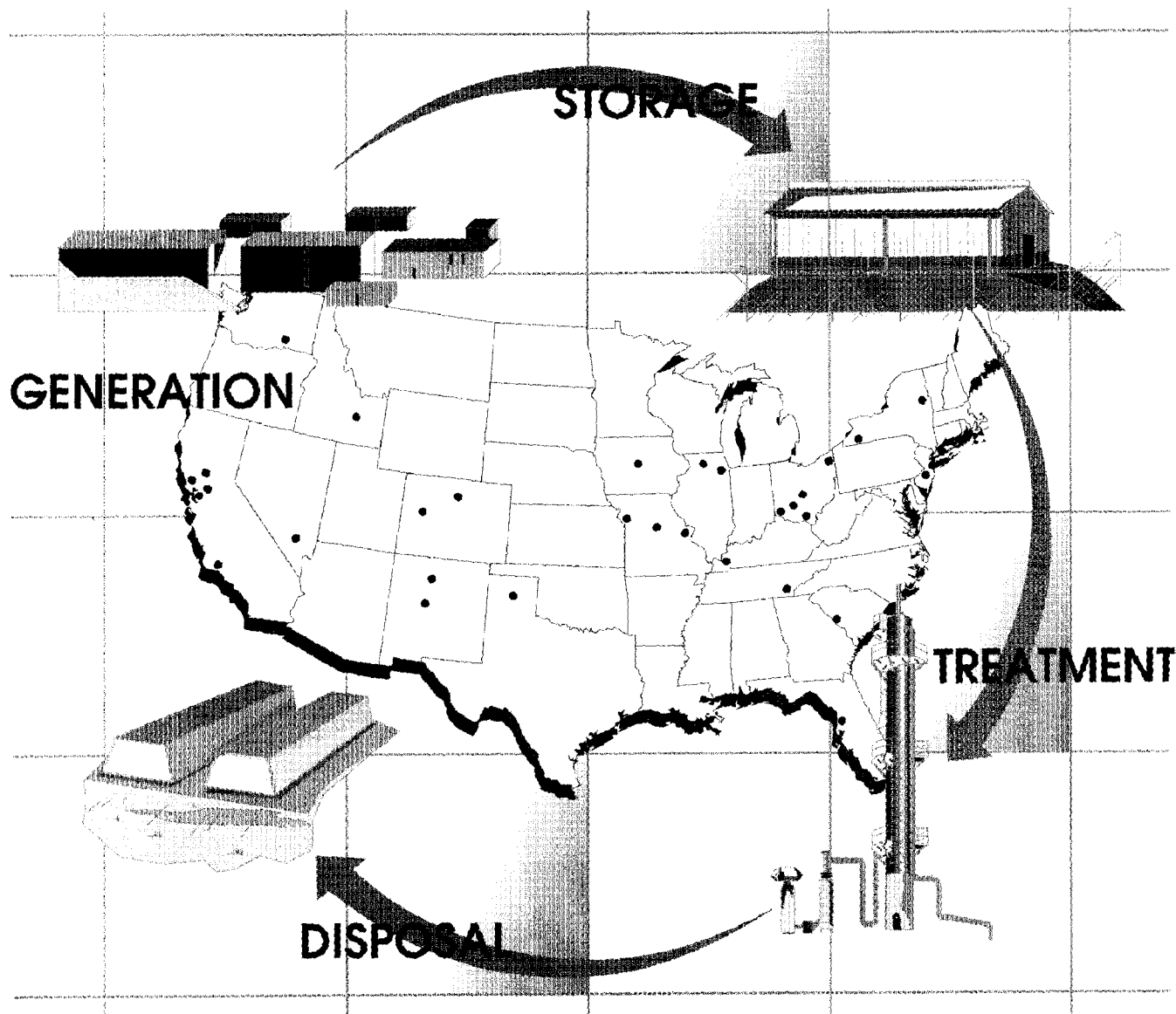
Volume II of III

Final Report
**Complex-Wide Review of
DOE's Low-Level Waste Management
ES&H Vulnerabilities**



DOE/EM-0280

ASSESSMENT METHODOLOGY



Volume II

May 1996

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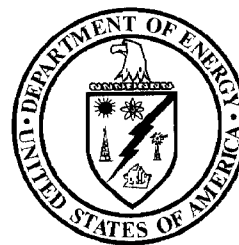
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ES&H Vulnerabilities**



DOE/EM-0280

SITE-SPECIFIC ASSESSMENT REPORTS

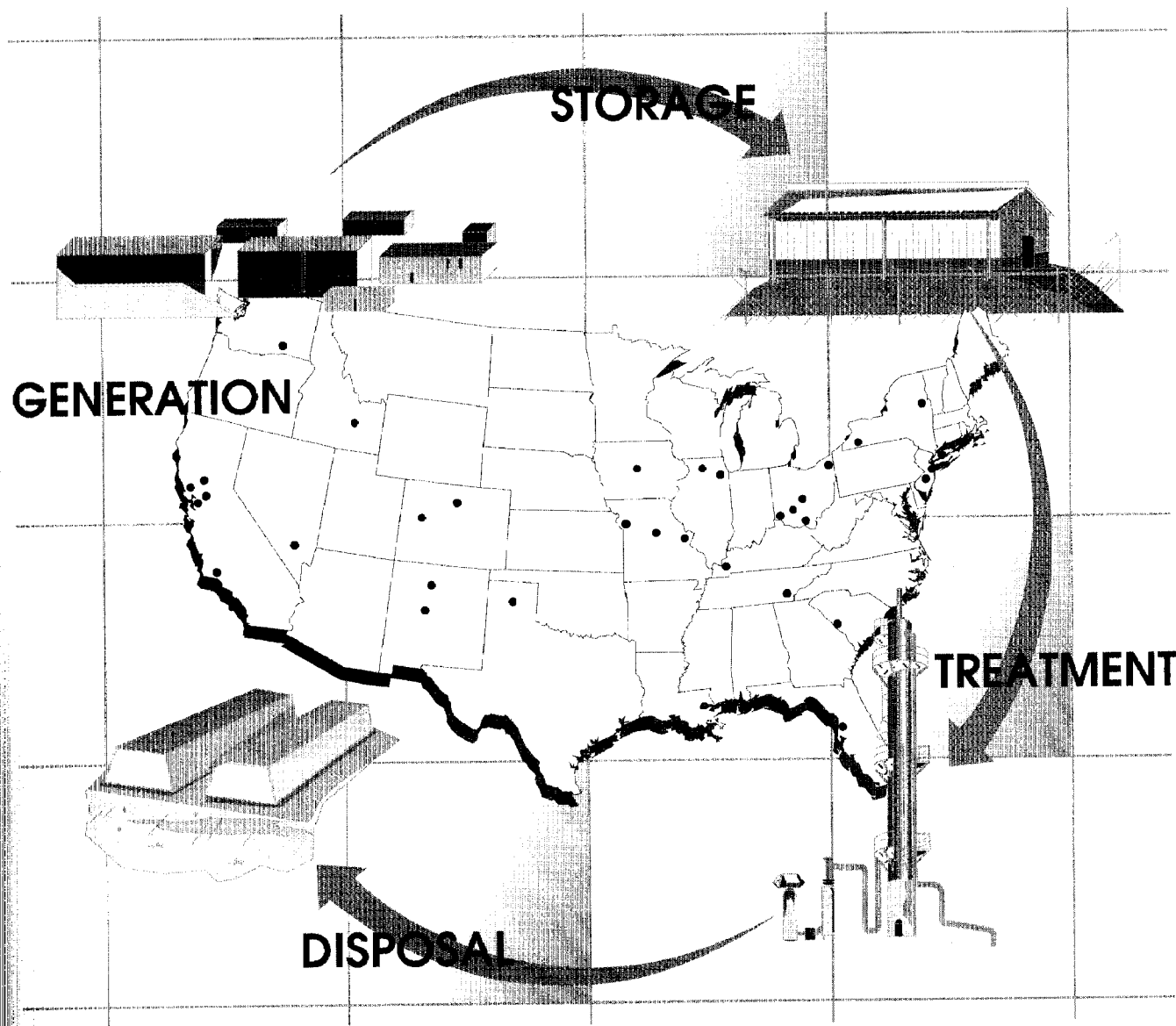


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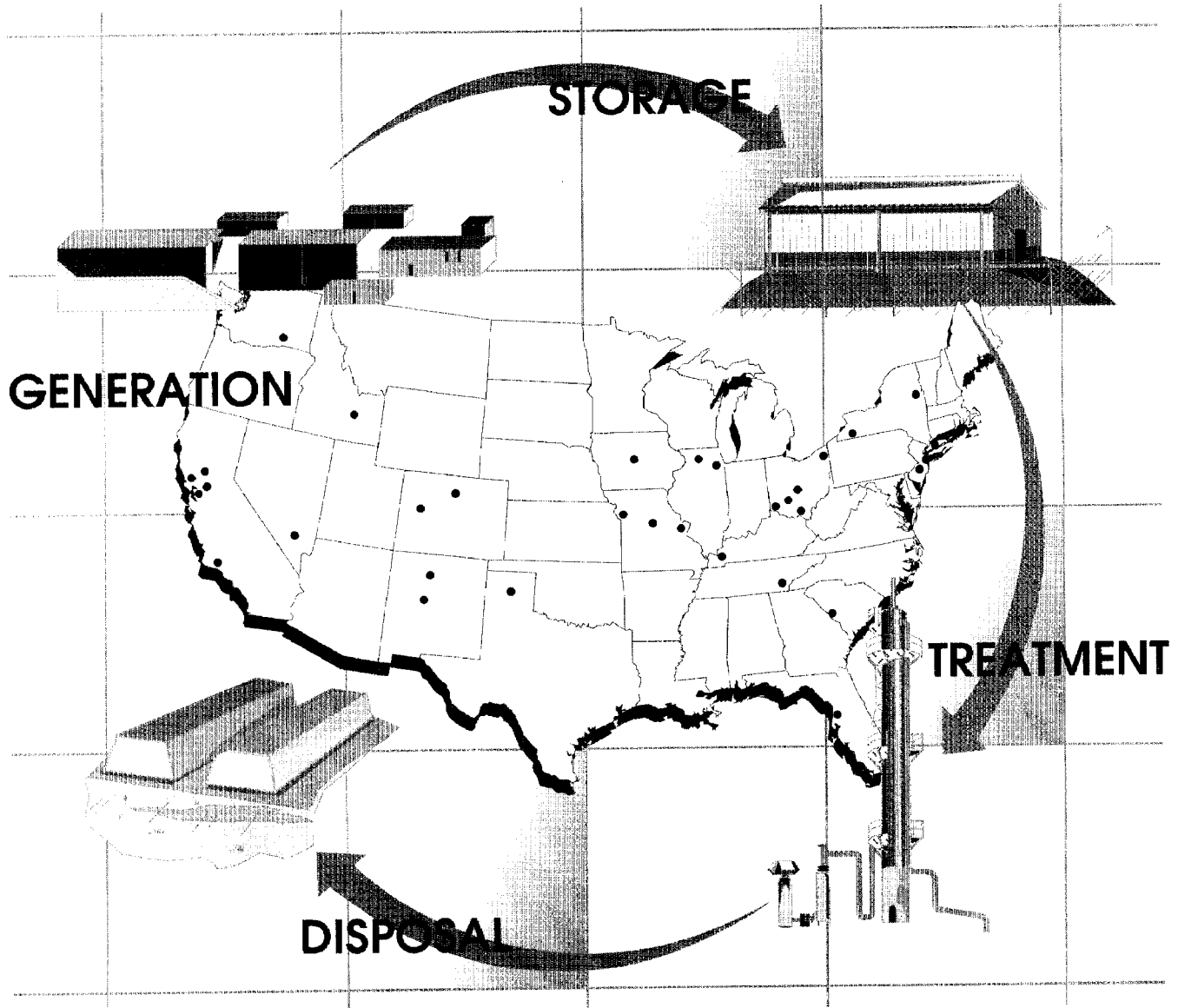
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