

INSTITUTIONAL AND TECHNICAL ISSUES IN  
THE MANAGEMENT OF LOW-LEVEL MIXED WASTES<sup>a</sup>

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ABSTRACT

The Atomic Energy Act of 1954 vested in the Atomic Energy Commission the exclusive authority to regulate source, special nuclear, and byproduct materials and to own and operate the facilities for their production. It further authorized the Commission to regulate any activity covered by the Act in order to protect health and to minimize danger to life and property. In addition, Executive Order 12088 of October 13, 1978, required federal agencies to meet pollution control standards equivalent to those required of the regulated community. These legislative mandates had been interpreted to exempt federal Atomic Energy Act facilities from all outside regulation, until the recent, successful, legal challenge to this interpretation. This court challenge raised the prospect of dual regulation of mixed (radioactive and chemically hazardous) wastes and led us to analyze the consequences of such dual regulation. In addition, the Environmental Protection Agency and the Department of Energy have been developing a basis for delineating their relative responsibilities in order to avoid the necessity for a dual program.

INTRODUCTION

The Department of Energy (DOE) operates research laboratories, uranium enrichment plants, and production plants having a national defense mission. All of the DOE facilities produce waste streams which may include municipal garbage and domestic sewage as well as those which are highly radioactive or chemically hazardous. Virtually all waste streams are subject to one or more environmental regulations, but the regulation of waste streams that are both radioactive and contain chemical hazards has presented challenges that require special consideration.

DOE's authority comes from the Atomic Energy Act of 1954 (AEA). The AEA established the Atomic Energy Commission (AEC), which the Department succeeds, and vested in the Commission the authority to own and operate the means of producing the nuclear materials used in national defense, and to license the operation of facilities used in the civilian nuclear programs. Subsequent legislation has placed civilian licensing authority in the Nuclear Regulatory Commission (NRC) while the defense mission has come down to DOE. The AEA provides the authority to "establish by rule, regulation, or order, such standards and instructions to govern the possession and use of special nuclear material, source material, and byproduct material as the Commission may deem necessary or desirable to promote the common defense and security or to protect health or to minimize danger to life or property" (Sec. 161.b.). (The terms "source, byproduct, and special nuclear material" are defined at the end of the text.)

The mandate of the AEA was exclusive and provided the basis by which the AEC and its successor agencies operated the facilities and managed the wastes produced. The management of hazardous wastes under the AEA was challenged by environmental groups, and the U.S. District Court in Knoxville, Tennessee, ruled that the AEA did not preempt the authority of other statutes, except in the specific control of source materials, special nuclear materials, and byproduct materials. The District Court's ruling has placed regulation of purely hazardous wastes under the Environmental Protection Agency (EPA), while control of source, special nuclear, and byproduct materials remains under DOE.

REGULATORY ENVIRONMENT FOR DOE WASTES

Low-level Radioactive Wastes

The purely radioactive wastes produced by DOE facilities have been regulated by the Department under the authority of the AEA. No significant challenge to that authority has been advanced, to date. The Department has issued internal orders (e.g., DOE Order 5820.2) which serve as the implementing authority for DOE sites in carrying out Departmental policy on low-level waste management.

DOE policy for low-level radioactive waste disposal, as embodied in Order 5820.2, emphasizes the protection of human populations from the hazards of ionizing radiation. Key elements of that policy include site selection procedures, waste acceptance criteria, waste segregation, closure requirements, and postclosure institutional control of sites.

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Site selection is the keystone of the low-level waste disposal strategy. Because relatively small volumes of low-level radioactive waste are generated in the United States, few waste disposal sites are needed. It is possible to select a waste disposal site which has desirable geology, climate, and population characteristics. Careful site selection allows the use of natural barriers to offsite migration and reduces, and in some cases eliminates, the need for engineered barriers. In addition, some migration of radionuclides is permissible, as long as it is sufficiently slow that radioactive decay will eliminate any possible hazard before the material migrates beyond the site. Consequently, low-level waste disposal guidance does not require the use of liners or other engineered barriers to migration. The waste acceptance criteria contained in DOE Order 5480.2 ensure that only wastes suited to shallow-land burial are accepted at low-level waste disposal sites, including those wastes requiring greater confinement disposal.

#### Hazardous Chemical Wastes

Hazardous chemical wastes are regulated by the EPA under the Resource Conservation and Recovery Act of 1976 (RCRA). Wastes are hazardous under RCRA if they are listed as hazardous in 40 CFR Part 261, or if they exhibit any one of four hazardous characteristics (ignitability, corrosivity, reactivity, or EP toxicity). Hazardous waste regulations affect the generation, transportation, treatment, storage, and disposal of wastes. Facilities for each of the above require a separate permit or identification number.

Hazardous chemical wastes are produced in a much greater variety, in greater volume, and in more locations than low-level radioactive wastes. The sheer need for waste disposal sites precludes reliance on natural barriers to migration. Waste disposal sites must be located near the sources of waste generation and must, therefore, be located in all kinds of geological, climatic, and population conditions. Hazardous chemical waste disposal depends upon liners, leachate collection systems, and other engineered barriers to prevent its migration from burial sites.

#### Mixed Wastes

The order of the federal court in Knoxville, Tennessee, clarified the responsibility for low-level radioactive wastes (DOE, under the authority of the AEA) and for chemical hazardous wastes (EPA, under the authority of RCRA). The court's ruling did not mention mixed wastes, that is, wastes that are both radioactive and chemically hazardous. Preliminary information gathered by the DOE Hazardous Waste Management Program indicates that more than 70% of the waste streams generated by DOE defense installations that are either radioactive or chemically hazardous are, in fact, both. Since the court's ruling provides no guidance, we must assume that mixed wastes are regulated by both acts, unless exempted by a provision in RCRA that addresses inconsistencies between acts. Specifically, RCRA states, "Sec. 1006.(a) APPLICATION OF ACT.—Nothing in this Act shall be construed to apply to ... any activity or substance which is subject to ... the Atomic Energy Act of 1954 ... except to the extent that such application is not inconsistent with the requirements of such Act" (emphasis added). It was

this provision that the court cited in ordering the DOE to comply with RCRA, expressing the opinion that there was no inconsistency between the two acts. In order to avoid dual regulation of mixed wastes, DOE and EPA must agree that the two acts are inconsistent when applied to mixed wastes.

#### CONSEQUENCES OF DUAL REGULATION

Compliance with dual sets of regulations is possible only if the regulations are compatible. If regulations contain conflicting requirements, compliance with one will lead to violation of the other. To determine the compatibility of regulations affecting the disposal of mixed wastes, the regulations contained in 40 CFR Part 264 (EPA's regulations for treatment, storage, and disposal of hazardous wastes) were compared with the regulations contained in 10 CFR Part 61 (NRC's regulations for licensing facilities for land disposal of low-level nuclear wastes). The regulations of 10 CFR Part 61 were used because they are more detailed than DOE's Order 5820.2 which governs shallow-land burial at DOE sites, but the two are purported to be essentially the same in both objectives and process. The comparisons are detailed elsewhere<sup>1</sup> and summarized here.

Seventeen specific areas for comparison were identified by reading through both 10 CFR Part 61 and 40 CFR Part 264. Analogous portions of each set of regulations were compared directly and judged to be consistent, to contain minor inconsistencies, or to contain major inconsistencies. The areas compared are grouped according to our conclusions in Table I.

TABLE I

Areas of Comparison Between 10 CFR Part 61 and 40 CFR Part 264, Grouped by Conclusions.

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ESSENTIALLY CONSISTENT
Financial requirements
Packaging requirements
Record keeping, reporting, and manifesting
Site security
Inspection and surveillance
Employee qualifications and training
Waste segregation
Emergency planning
Container management
MINOR INCONSISTENCIES
Licensing and regulation
Site ownership and control
Waste analysis and verification
Storage
Alternative treatment and disposal
MAJOR INCONSISTENCIES
Nature of hazard contained
Approach to groundwater protection
Reliance on landfilling

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### Essentially consistent provisions

The two sets of regulations were found to be essentially consistent in most areas. Both exempt federal facilities from financial requirement provisions, relying upon the federal agency and Congress to provide funds for closure and for post-closure maintenance. Requirements for packaging and labeling incorporate Department of Transportation (DOT) regulations for both and differ to the extent that DOT requirements differ. In addition, the NRC regulations allow packaging liquids in absorbent, a practice Congress seeks to eliminate in the disposal of hazardous wastes. The NRC regulations also require external identification of waste type, a rule that is not quite analogous to labeling and placarding hazardous wastes. Record-keeping, reporting, and manifesting requirements are very similar in intent and closely similar in practice. Both regulations seek to keep track of shipments and to ensure that the shipments are delivered and disposed of by the intended recipients. Both contain provisions for identifying and tracking any shipments that might go astray. Inspection and surveillance requirements seek to detect releases from disposal areas and do not differ significantly. Both regulations require that persons operating a waste disposal site have sufficient training to operate the site safely and to deal with expected emergencies. Training programs are mandated and records must clearly indicate the level of training employees have received. Both regulations require segregation of certain wastes, although the reasons for segregation may differ. For example, RCRA regulations require that ignitable wastes be separated and protected from sources of ignition and that reactive wastes be isolated from sources of reactions. Disposal of such wastes is prohibited at sites licensed under 10 CFR Part 61. The intent in segregating low-level radioactive wastes is to isolate those materials that may be expected to undergo biological decay and, consequently, lead to instability in the disposal unit. Both sets of regulations contain requirements for the design and operation of facilities to cope with natural events and operational accidents and for monitoring for and response to releases from the disposal unit. The container management provisions deal with different aspects of waste management, but the provisions do not contain conflicting requirements.

### Minor inconsistencies

The two sets of regulations also contain differences we judged to be greater than those described in the preceding section, but sufficiently minor so that an operator faced with complying with dual regulation would not be in a technical or legal dilemma. This is not to say that agencies would readily agree on the apportionment of authority. The first inconsistency, licensing and regulation, is just that sort of occurrence.

No government agency seeks to be regulated by another. The AEA gives DOE exclusive control over its own radioactive waste management activities; that exclusivity could be compromised by EPA regulation of the hazardous component of mixed wastes. While such considerations should not lead to an impasse, they could be the stimulus for careful and deliberate negotiation between the two agencies.

The regulations also differ on the issues of land ownership and the length of the institutional control period following site closure. Hazardous waste sites must be monitored and maintained for a minimum of 30 years after the site is closed. If there are no apparent reasons to do otherwise, the site may be released for other uses. There are no restrictions on ownership, but there are provisions for identifying the site as a hazardous waste site on the deed and in zoning records, and future use is restricted to those activities that will not disturb the buried waste. Shallow-land burial sites for low-level radioactive wastes must be government owned and controlled for 100 years following closure. The 100-year limit was chosen primarily because longer periods might exceed the life expectancy of institutions charged with care of the sites. The 100-year institutional control period allows time for radioactive decay to reduce the hazard, while state or federal ownership ensures that no occupation or improper use of the site occurs. Passive controls are relied upon beyond the institutional control period.

The requirements for waste analysis and verification by the disposal operator also are somewhat different. Disposers of hazardous waste are required to inspect shipments received and to analyze them if the shipment appears to contain waste different from that specified on the manifest. Radioactive waste management emphasizes limiting radiation exposures and discourages the opening of shipping containers. Shipments may be inspected externally, including the use of radiation detection equipment, but disposal sites are not equipped for remote handling and chemical analysis. Thus, opening a suspect shipment for chemical analysis would lead to increased radiation exposure.

RCRA requires a separate permit for storage if a material is stored for more than 90 days. An exception goes into effect on June 20, 1985, which will allow generators to accumulate up to 55 gallons of hazardous wastes, or up to one quart of an acutely hazardous waste, in containers at or near the point of waste generation for indefinite time periods, without a permit or interim status. 10 CFR Part 61 does not address storage of low-level wastes.

RCRA also provides for treatment and disposal alternatives to landfilling. For the most part, such provisions are not applicable to low-level wastes, since no treatment can destroy the radioactivity and alternatives to shallow-land burial are more variations on a theme than they are actual alternatives.

### Major inconsistencies

The major inconsistencies between the regulations for hazardous wastes and those for low-level radioactive wastes appear to stem from their having been written to deal with the management of basically different hazards. Low-level radioactive wastes will decay away given sufficient time. The objectives of land disposal regulations are to guard against intrusion until the danger is past and to control releases so that the wastes will not migrate to a sensitive receptor in concentrations that would lead to excessive exposure. By contrast, time is not expected to reduce the danger of hazardous wastes.

significantly. Prudent management requires that intrusion or release never occur. Under RCRA, the protection of groundwater relies on liners in disposal units equipped with monitoring systems to detect leaks. Liners may not be incompatible with low-level waste disposal, but they do represent an increased cost without a significant enhancement of protection from radiation.

Because no liner can be expected to last forever, and because eternal surveillance is also unrealistic, Congress has directed the EPA to examine alternatives to land disposal of hazardous wastes. It is generally expected that substitutions, recycling, and treatment will eventually minimize the amount of hazardous wastes requiring disposal. A ban on landfilling may hasten the adoption of these practices. DOE sites consider shallow-land burial not only to be adequate but also to be the lowest cost option for disposal of low-level wastes.

#### RECONCILIATION OF TECHNICAL AND REGULATORY ISSUES

Comparison of the regulations indicates that there are few technical issues to be resolved. Probably the greatest technical issue to be resolved, at least in the number of dollars that will be needed, is that of waste analysis and verification. This is a technical issue rather than a regulatory one because it has a technical solution: install remote handling, sampling, and chemical analysis equipment at disposal sites receiving mixed wastes.

A second technical issue may entail the construction and operation of facilities to treat mixed wastes for their hazardous components so that the residue may be handled as a low-level waste, or at least as a reduced-volume mixed waste. The direction taken here will depend strongly on EPA's decision relative to banning land disposal of hazardous wastes.

The regulatory issues are being addressed by a committee comprising representatives of EPA and DOE. Among the issues to be discussed are those of national security, the role of states, legal constraints, and responsibilities of the two agencies. One of their major tasks is to establish a clear demarcation between the authorities of the AEA and RCRA. Their work will result in a rulemaking by EPA that will specifically guide DOE in its compliance with RCRA.

#### STATUS AND SUMMARY

EPA is preparing amendments to 40 CFR Parts 124, 260, 261, 264, 265, 270, and 271 that will deal specifically with DOE facilities. This approach integrates the regulation of DOE facilities with general RCRA regulations, rather than establishing a separate part under 40 CFR. A draft of the proposed rule has been circulated within DOE for comment, and is expected to be published in the second quarter of the fiscal year. While it would not be appropriate to discuss the proposed rules before they are published, it is possible to discuss some of the principles contained in them.

First, RCRA contains an exemption for inconsistencies with the AEA. This principle will be carried forward in the regulation. What this means is that source, byproduct, and special nuclear

materials will be exempt from RCRA, regardless of whether they contain materials that would otherwise be regulated under RCRA. Source and special nuclear materials are easily defined, identified, and exempted. Defining byproduct materials has proven to be more difficult, and the joint committee has devoted considerable effort to framing a definition that will serve both RCRA and the AEA, and that will allow for unambiguous regulation. Mixed wastes that contain byproduct material will be regulated by DOE, while those that do not will be regulated by EPA.

DOE will provide appropriate security clearances for the regulatory agencies, including states that have EPA-authorized programs. These security clearances will allow the regulators to carry out their responsibilities under the Act.

The regulations will recognize the added risks of radiation exposure and will formalize procedures for dealing with conflicts that might arise in pursuing hazardous chemical waste goals. The regulations will also establish compliance dates for DOE facilities.

#### DEFINITIONS

The following definitions are taken from Chapter 2 of the Atomic Energy Act of 1954:

"The term 'byproduct material' means any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material.

"The term 'source material' means (1) uranium, thorium, or any other material which is determined by the Commission pursuant to the provisions of section 61 to be source material; or (2) ores containing one or more of the foregoing materials, in such concentration as the Commission may by regulation determine from time to time.

"The term 'special nuclear material' means (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Commission, pursuant to the provisions of section 51, determines to be special nuclear material, but does not include source

material; or (2) any material artificially enriched by any of the foregoing, but does not include source material."

#### REFERENCE

1. Jacobs, Donald G., and John W. Lynch. "Comparison of Regulations for Low-level Waste Disposal and Hazardous Waste Disposal." DOE/HWP-7, Hazardous Chemical Defense Waste Management Program, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831 (1985).