



THE CHANGING ARENA—NEW DOE WASTE MANAGEMENT ORDERS

by

E. L. Albenesius and A. F. Kluk

E. I. du Pont de Nemours and Company
Savannah River Plant
Aiken, SC 29808

SRL
RECORD COPY

A paper for presentation at the
Waste Management '88 meeting
Tucson, AZ
February 29-March 3, 1988

and for publication in the proceedings

The information contained in this article was developed during the course of work under Contract No. DE-AC09-76SR00001 with the U. S. Department of Energy. By acceptance of this paper, the publisher and/or recipient acknowledges the U. S. Government's right to retain a nonexclusive, royalty-free license in and to any copyright covering this paper, along with the right to reproduce and to authorize others to reproduce all or part of the copyrighted paper.

THE CHANGING ARENA--NEW DOE WASTE MANAGEMENT ORDERS

E. L. Albenesius
Savannah River - DuPont
Aiken, SC 29801

A. F. Kluk
U.S. Department of Energy
Washington, D.C. 20545

There are five orders that address waste management within the Department of Energy (DOE); three of these orders are being revised, which emphasizes the rapidly changing Arena in which the Department is contending in this field. The need to change the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Order arose from the Superfund amendments of 1986 (SARA) with its hammer provisions in Section 120 for compliance at Federal facilities. The need to change the Hazardous and Mixed Waste Management Order was accelerated by the promulgation by DOE of the new mixed waste rule on May 1, 1987, (1) and cancellation of the obsolete existing order on October 5, 1987. The new rule requires coregulation of all DOE mixed waste with the Environmental Protection Agency (EPA) and the respective authorized States.

The need to revise DOE 5820.2, the "Radioactive Waste Management" order, became evident in 1986 in the face of mounting criticism of the ability of the DOE to self-regulate. In some of the more pointed criticism, (2) DOE 5820.2 was singled out as an example of a weak regulatory order, not at all comparable to the performance objective/prescriptive styles of the Nuclear Regulatory Commission's (NRC) 10 CFR 61 or the EPA's Resource Conservation and Recovery (RCRA) regulations. The Department resolved to heed this criticism and began an effort early in 1986 to revise the chapter dealing with low-level waste (LLW). At the end of 1986, the scope was widened to include revision of chapters on High-level waste (HLW) and Transuranic (TRU) waste, which, along with the LLW Chapter, were receiving the brunt of the criticism of the weakness of the order. The remaining chapters, (Management of Waste Contaminated with Naturally Occurring and Accelerator Produced Nuclides and Decommissioning of Contaminated Facilities) also are being revised, but relatively few changes were required of these simpler and less controversial topics. A demanding goal was established to distribute the concurrence copy of the revised order by October 1987, initiating the formal review process which, hopefully, will culminate in issuance of the approved revised order by May 1988.

The revision of 5820.2, like the existing order, addresses the management of the radioactive characteristic of the Department's waste, but not the management of waste that is mixed (i.e., with both radioactive and conventionally hazardous constituents). The Department elected to address the mixed waste issue separately through revision of 5480.2, "Hazardous and Radioactive Mixed Waste Management," which was to proceed concurrently with 5820.2. However, the promulgation of the new mixed waste rule on May 1, 1987, has caused a delay in the 5480.2 revision until the details of implementation of coregulation of HLW and TRU are developed in negotiations with EPA and State regulatory bodies over the next year. The Department determined,

however, that the revision of 5820.2 should proceed on the accelerated schedule that was established initially because under the new mixed waste rule, the Department will continue to regulate the radioactive component of its waste, and needs the order to be revised in a more prescriptive manner, and to do so convincingly.

The principal changes in the revision of the individual chapters are summarized below:

Chapter I - Management of High-Level Radioactive Waste.

From the beginning of the production of nuclear materials for military defense purposes, the unique hazard of HLW was recognized by the predecessors of the Department. Conservative waste management practices were instituted based on containment and long-term storage. These practices, although designed for intensely radioactive liquid waste, anticipated in many ways the practices now required under RCRA for the storage of conventionally hazardous chemical waste. Following its survey of the Department's HLW facilities (November 1986 to February 1987), the EPA Mixed Energy Waste Study task force reported in March 1987 that the HLW facilities were, in the main, equal to or superior to RCRA requirements. The details of compliance with RCRA for the chemically hazardous constituents in HLW are being negotiated with EPA Headquarters and with the individual regional offices of EPA as well as the respective State regulatory authorities. Addressing the coregulation of the chemical side of HLW is beyond the scope of this revised chapter. Instead, the operational requirements the Department places on itself in the management of the radioactive constituents of HLW are addressed.

The chapter is expanded substantially compared to the present chapter with its abbreviated handling of interim storage, treatment, and disposal. The new chapter addresses design requirements for new facilities, design review of existing facilities, waste characterization, storage and transfer operations, monitoring and leak detection, contingency plans, training, administrative controls and waste minimization and treatment. In addition, wherever possible to do so, references are cited to other applicable DOE orders, EPA and NRC regulations, and public laws that form a network of regulation which strengthens the solid base on which the order is founded and promotes credibility for the DOE HLW management system.

The definition of HLW is unchanged from that in the present Order 5820.2. A change in the definition should emerge from a rulemaking action initiated by NRC on February 27, 1987. This action will modify the definition of HLW in 10 CFR 60 to follow more closely the Nuclear Waste Policy Act of 1982, and to base the definition on risk rather than source. The Department is providing input to this process and, accordingly, recently issued ORNL/TM-10298 by D. C. Kocher and A. G. Croff, "A Proposed Classification System for High-Level and Other Radioactive Wastes," June 1987. The rulemaking should be completed in 1988.

Chapter II - Management of TRU

The Waste Isolation Pilot Plant (WIPP) is a research and development facility authorized to demonstrate the safe disposal of radioactive defense waste and scheduled to begin operation in October 1988. If the demonstration is successful, the facility can become a repository for the disposal of the Department's TRU waste. The driving force in the management of TRU waste by DOE is the desire to advance from long-term retrievable storage at six sites to final disposal at the WIPP. The revision of Chapter II emphasizes the detailed requirements of waste certification, packaging, and shipping that must be met for TRU waste to enter the WIPP demonstration. These requirements, as prescriptive as those of the EPA RCRA regulations, are supported by a network of documented criteria and are critiqued by independent oversight. The balance of the revised chapter addresses policies and procedures for interim storage, waste minimization, waste classification, and management of old disposal sites, and references the applicable laws, orders, and regulations that strengthen and support these requirements.

Chapter III - Management of Low-Level Waste (LLW)

The revision of the HLW and TRU chapters of this order was a straightforward task because of the excellent management practices that were already in place throughout the complex. Revising these major parts of the order was simply a matter of translating actions into words. The revision of the LLW chapter, however, was somewhat more difficult. The Department has long held and continues to hold a leadership position in its management of HLW and TRU. On the other hand, the Department does not enjoy a monopoly position in the management and disposal of LLW. In LLW technology, although the Department has maintained a leadership position in research and development, it has not maintained as strong a position in disposal practice (e.g., there is large commercial LLW sector, regulated by the NRC and the respective States; there are regional groups of States (compacts) grappling with siting, disposal site design, disposal technology, passing laws and rulings prohibiting shallow land burial; outside the U.S., there is a strong direction from Western Europe and Japan toward geologic disposal of LLW or toward a French style engineered system that is protective of the ground water.)

The new LLW chapter requires that the disposal systems move toward conformance with the NRC requirements for commercial LLW disposal facilities. Following the lead of environmental protection orders, the new chapter also addresses ground water protection. The changes in the LLW chapter are consistent with directions within the Department over the past several years toward modernization of land disposal practices. The guidance of the Idaho Operations Office (the lead site for LLW technology development) toward conformance with the spirit of the NRC's LLW regulations, the internal studies that point to the need for conservation of disposal resources, compliance with shipment and disposal standards, and the requirement of protection of ground water and soils in the draft of environmental protection orders are all examples of this trend.

In the operation of DOE LLW shallow land burial facilities as well as in the commercial LLW sector, it has become clear that the controlling issue in modern LLW disposal technology is ground water protection. The NRC regulation for land disposal of LLW permits limited contamination of ground water beneath a disposal facility provided concentrations of radionuclides in a water well at the boundary of a disposal site would not give an annual dose of more than 25 mrem/year to a user of that water. RCRA regulations of the EPA, which apply to hazardous waste but not LLW, require absolute containment of potential chemical pollutants by the disposal system with no degradation of ground water permitted. The trend in the RCRA amendments of 1984 are even more stringent in that they describe landfilling as the disposal option of last resort, favoring instead waste minimization, detoxification, and recycle. The EPA has adopted an interim primary drinking water standard for radionuclides which limits the annual dose to a user of water from a community water system to 4 mrem/year. Frequently, this number is referred to as a reference level for the protection of ground water and is used by some States for that purpose. The EPA is engaged in a rulemaking action to develop a standard for ground water protection applied to the disposal of LLW. This effort will result in promulgation of 40 CFR 193, hopefully in 1988. The likely outcome of the rulemaking may be a graded standard ranging from no degradation of ground water to 4 mrem/year to 25 mrem/year, depending on the quality and quantity of the specific water resource. Reinforcing the point that ground water protection is a national priority, legislation has been introduced into both the House of Representatives and the Senate that would mandate development of criteria for ground water quality and direction by EPA to the States in establishing nondegradation standards for ambient ground water.

At the western sites, where landfills are effectively isolated from the deep aquifers, performance objectives of the revised LLW chapter can be achieved by conforming to requirements equivalent to those of 10 CFR 61, which comprises regulations of the Nuclear Regulatory Commission (NRC) for management of commercial LLW disposal facilities. Additional isolation of LLW by engineered barriers is necessary in order to meet this requirement at humid sites. For these sites, decoupling of LLW from contact with the soil environment is necessary to insure protection of the ground water whether the standard is 4 mrem/year or 25 mrem/year. Such protection can be provided by packaging the waste in durable concrete containers that provide a diffusion barrier for soluble radionuclides, or by emplacing the waste in concrete vaults.

This additional isolation at humid sites is based on the Department's waste management research over the past several years. (3)(4)(5) The results of this work contradict a long-held and widely followed assumption that the rate of migration of radionuclides from stabilized waste into soil was dependent on the water content of the soil, and that protection of waste from contact with saturated soil would retard the rate of migration substantially. The research findings show that stabilized waste in contact with unsaturated soil at a moisture content characteristic of humid sites like Savannah River and Oak

Ridge, leaches radioactivity at the same rate as it would if immersed in water. Field data from a large scale test at Savannah River verify these laboratory findings. In addition, extensive controlled experiments in the field over the past 7 years with unstabilized LLW (i.e., actual waste as generated) without protective packaging show comparable concentrations of radioactivity in water that has been in contact with the waste whether unsaturated or saturated conditions prevailed.

The increased expense for upgrading disposal practices makes waste volume reduction more favorable. Consequently, the revised order addresses the need to reduce the volume of waste by generation avoidance, waste segregation, compaction, and incineration. Protecting the high activity fraction of LLW against intrusion leads to the cost-driven need for a waste classification system. In addition, accountability issues (e.g., waste acceptance and waste certification) are addressed in more detail in the proposed revision.

Chapter IV - Management of Waste Contaminated with Naturally Occurring and Accelerator Produced Radionuclides

The revision of Chapter IV has been coordinated closely with the Office of Nuclear Energy (NE) which provided the first draft and to which the chapter has greatest application. The revision covers essentially the same area that was covered by the existing chapter, but adopts the term Naturally Occurring and Accelerator Produced Radioactive Material (NARM), a term developed and used by EPA and which EPA is addressing in its LLW standards (40 CFR 193). The requirement for management activities to be in compliance with RCRA/CERCLA has also been added. Materials specifically excluded from coverage under CERCLA (byproduct material - AEA, Section 11e(2)) are covered by the Uranium Mill Tailings Radiation Control Act.

Chapter V - Decommissioning of Contaminated Facilities

Chapter V, formerly titled "Decontamination and Decommissioning of Surplus Facilities," is being renamed, "Decommissioning of Contaminated Facilities," and is being revised to reflect changes in departmental policies with regard to management of these facilities. At the request of the Office of Nuclear Energy, the name has been changed to reflect the fact that policy is needed for all contaminated facilities, not just those that are surplus. A general section has been added to provide a clear statement of current departmental policy for managing contaminated facilities, whether they are on the surplus list or not. Also, there is a statement in the general section that permits exchange of facilities among the involved program secretarial officers. This is an important deviation from the previous chapter, which required all contaminated facilities that were declared surplus after 1976 to be decommissioned by the responsible operating program. Finally, the Decommissioning Operations section has been revised to parallel more closely the project phases required for RCRA/CERCLA remedial action projects.

Future Actions:

This revision of 5820.2 should serve the Department well into the indefinite future. The principal gap remaining in the Department's Waste Management Orders is the revision of 5480.2, "Hazardous and Radioactive Waste Management." Work on this revision is awaiting completion of negotiations with the Regions of EPA and the affected States on the details of implementation of coregulation.

For the long term, it may be that the Department will choose to combine these two orders, when implementation of the mixed waste rule is not only complete but its practice routine and comfortable.

References

1. Radioactive Waste; Byproduct Material 10 CFR 962 May 1 (1987).
2. B. A. Finamore, "Regulating Hazardous and Mixed Waste at Department of Energy Nuclear Weapons Facilities: Reversing Decades of Environmental Neglect" Harvard Environmental Law Review 9, 83 (1985).
3. E. L. Albenesius and E. L. Wilhite, "Establishment of New Disposal Capacity for the Savannah River Plant", Proceedings of the Eighth Annual DOE Low-Level Waste Management Forum at Denver, CO, September 23-25, 1986. Session VIII 19 (1986).
4. E. L. Wilhite, "Concept Development for Saltstone and Low-Level Waste Disposal," Proceedings of the Symposium on Waste Management at Tucson, AZ, March 1-5, 1987, Vol. 2 63 (1987).
5. S. B. Oblath, "Leaching from Solidified Waste Forms under Saturated and Unsaturated Conditions," DP-MS-87 117, Savannah River Laboratory (1987).