

# CURRENT DOE DIRECTION IN LOW-LEVEL WASTE MANAGEMENT\*

Elmer L. Wilhite\*\*  
Savannah River Laboratory

Max R. Dolenc  
Idaho National Engineering Laboratory  
EG&G Idaho, Inc.

Melvin W. Shupe  
Department of Energy  
Idaho Operations Office

LeAnn C. Waldo  
Department of Energy  
Defense Waste Transportation Management

## ABSTRACT

The U. S. Department of Energy (DOE) is implementing revised DOE Order 5820.2A "Radioactive Waste Management. Chapter III of the revised Order provides prescriptive requirements for managing low-level waste and is the subject of this paper.

The revised Order requires that all DOE low-level radioactive and mixed waste be systematically managed, using an approach that considers the combination of waste management practices used in waste generation reduction, segregation, treatment, packaging, storage, and disposal. The Order defines performance objectives for protecting groundwater, for protecting against intrusion, and for maintaining adequate operational practices. A performance assessment will be required to ensure that waste management operations comply with these performance objectives.

DOE implementation of the revised Order includes work in the areas of leach testing, waste stabilization, waste certification, facility monitoring, and management of unique waste streams. This paper summarizes the status of this work and the current direction DOE is taking in managing low-level waste under DOE 5820.2A.

## INTRODUCTION

The Department of Energy is revising a number of DOE orders to reflect the changing philosophy behind regulatory requirements being imposed upon the nuclear industry. One of these orders is DOE Order 5820.2A, "Radioactive Waste Management." Chapter III of the Order, which has been significantly revised, addresses the management of low-level waste (LLW) and is the subject of this paper. The revision provides a comprehensive set of prescriptive requirements which DOE is to follow in managing LLW.

The Order was revised to reflect the prescriptiveness of 10 CFR 61, the Nuclear Regulatory Commission's regulation concerning the management of DOE low-level waste; performance objectives similar to those in 10 CFR 61 are incorporated into DOE 5820.2A. DOE's intent is to ensure that the DOE system meets the same, or more restrictive, criteria as those being imposed upon the commercial

nuclear industry. The following discussion summarizes changes made in the Order.

## HIGHLIGHTS OF THE NEW ORDER

### Systematic Approach to Managing LLW

DOE Order 5820.2A requires that all DOE solid low-level radioactive and mixed waste be managed in a systematic manner. Operators of DOE facilities are now required to evaluate the way in which waste is handled, from generation through disposal. By using this approach, DOE intends to ensure the health and safety of the public, while maximizing the use of current technology for waste handling and treatment, and minimizing the volume of waste. This policy will require each facility to employ the most appropriate combination of waste generation reduction, segregation, treatment, and disposal practices in a cost effective manner.

### Performance Objectives

The performance objectives of DOE Order 5820.2A are designed to protect the public health and safety, taking into account both current disposal practices and long-term impacts, such as intrusion into the waste. Flexibility has been designed into the Order to allow for ongoing rulemaking

\* Work supported by the U.S. Department of Energy, Idaho Operations Office under DOE Contract No. DE-AC07-76ID01570.

\*\* On temporary assignment to the U.S. Department of Energy, Washington, D.C.

related to protecting groundwater, while being prescriptive in terms of protecting the public from exposure. Current proposed rulemaking by the Environmental Protection Agency (EPA) concerning groundwater is also acknowledged in DOE 5820.2A. The Order sets the following performance objective concerning groundwater protection: "Protect groundwater resources, consistent with Federal, State, and local requirements." A limit of 25 mrem per year (effective dose equivalent) has been established for external exposure resulting from releases into surface water, groundwater, soil, plants, and animals. The effective dose equivalent for continuous exposure to an intruder, after loss of active institutional control (100 years), has been set at 100 mrem per year; 500 mrem is the limit for a single acute exposure.

#### Performance Assessment

In order to demonstrate compliance with the performance objectives, the revised Order requires that site-specific, waste-specific performance assessments be prepared for disposed waste. Monitoring is required to either validate or modify the performance assessment model. An oversight and peer review panel composed of DOE and contractor personnel and other specialists will ensure consistency and a high level of technical quality in the performance assessments throughout the DOE system. The Order allows the development of waste classification limits on a site-specific basis, taking into consideration engineered modifications for specific waste types and compositions, and if operationally useful in determining how specific wastes should be stabilized and packaged for disposal.

#### Waste Acceptance Criteria

Waste acceptance criteria are required for each LLW treatment, storage, and disposal facility. The criteria are similar to those already in place at DOE disposal facilities. The revised Order includes the requirement that a waste certification program be established. This includes a requirement for an audit agreement between the generator and the disposal site operator, ensuring that generators are meeting the waste management facility waste acceptance criteria.

#### Waste Treatment, Long-term Storage, and Shipment

Three items not addressed in the 1984 version of the Order were waste treatment, long-term storage, and shipment. These three important elements of waste management are now addressed as separate requirements in the Order. Waste treatment and long-term storage must now meet the performance objectives, and must be supported by appropriate National Environmental Policy Act (NEPA) and safety documentation. Treatment is intended to prolong the life of the disposal facility and to improve stability of the waste. Storage will provide space for the waste to be kept while it undergoes radionuclide decay and/or provide a place for those wastes that require storage until approved methods of disposal can be determined and employed. Transporting waste within the DOE system is to be kept to a minimum. Waste that must be transported off site must meet the acceptance criteria of the disposal facility, and

must receive advance approval from the receiving facility before transport.

#### Disposal, Closure, Monitoring, Quality Assurance, and Records

Some topics in the 1984 Order have not changed significantly. Disposal is one area that was thoroughly addressed in the original Order. However, portions have been added concerning waste stability requirements and special waste cases such as tritium, carbon-14 and technetium. The revised Order allows engineered disposal systems (e.g., abovegrade vaults), particularly if these systems are necessary to meet the performance objectives.

The requirements for disposal site closure have also undergone only minor changes. Closure plans, which must conform to NEPA requirements, are required for both new and existing disposal sites. Changes necessary to reflect conformance with the Resource Conservation and Recovery Act have also been included.

The monitoring requirements of DOE 5820.2A comprise a new section, although the 1984 Order did recommend monitoring. Conformance with DOE Order 5484.1, "Environmental, Safety, and Health Protection Information Reporting Requirements", for all operating and nonoperating treatment, storage, and disposal facilities is now required. In addition, specific requirements concerning monitoring parameters and effluent detection are identified.

Quality assurance, consistent with DOE Order 5700.6B and ANSI/AME NQA-1, has been included as one of the requirements of DOE 5820.2A. A section on records and reports has also been added. The records section is specifically aimed at developing and maintaining a waste manifest and recordkeeping system to show how the waste is classified, treated, stored, shipped, and/or disposed of.

### **CURRENT MAJOR ACTIVITIES**

The revised Order will require some adjustments in the way DOE manages its LLW, necessitating some new activities. A summary of some of these new activities is presented in the following sections.

#### Implementation Plans

In response to DOE 5820.2A, all DOE field offices are in the process of developing implementation plans to determine the costs and schedules necessary to bring each facility under their jurisdiction into compliance with the revised Order. These plans are to be submitted to DOE Headquarters in April of 1989. The plans will enable the Defense Waste Transportation Management organization of DOE to determine how soon and at what cost the DOE LLW system can be in total compliance with the Order.

#### Technical Guidance

Concurrent with preparing implementation plans, work is progressing on technical guidance to support the Order. The Defense Low-Level Waste Management Program is coordinating work on this technical guidance with other DOE facilities. This guidance, following the format of Branch Technical Position Papers of the NRC, is designed

to assist facility operators in developing programs to comply with the revised Order. It is also designed to allow new technologies and applications to be applied with the best quality, as soon as possible. Guidance topics closely follow the requirement listings of the Order and include waste characterization, performance assessment, waste certification, disposal, closure, etc.

Some of the topics, such as waste stabilization and leach testing, are in draft form because research in these areas is being completed. Research is continuing on the modeling of engineered barrier systems which allow credit for the attenuation and containment of radioactive leachates in conducting performance assessments. A plan is also being prepared for a national lysimeter network at the DOE disposal sites to provide uniform data input for performance assessment validation in a cost effective manner. Waste certification guidance is being prepared by the Defense Low-Level Waste Management Program and will be available for waste generators and receivers to use in ensuring that waste meets the waste acceptance criteria of the receiving facility.

The Defense Low-Level Waste Management Program is upgrading technical guidance to include the monitoring of mixed waste disposal systems. Mixed waste will be considered as a subset of LLW as addressed in the guidance. Past work has concentrated on the radioactive aspects of disposal, storage, and treatment; only recently has minor monitoring work been conducted to determine the characteristics of mixed wastes at DOE sites. The updated guidance should be available later this year.

DOE recognizes the need to address the implications of long-lived radionuclides in the waste generated by the Defense system and has formed task groups made up of DOE contractor members to address the problems presented by the presence of these unique waste streams. A uranium task group was formed in 1988 to consider solutions to the depleted uranium waste issues, and other such groups are scheduled to begin work later this year.

#### New or Modified Facilities

In order to conform with both DOE 5820.2A and NEPA requirements, some DOE sites are in the process of designing new or modifying existing waste facilities to accommodate disposal. Planning at these sites is ongoing to ensure that the results of the performance assessment have been integrated with the cost effectiveness of treatment and enhanced disposal waste forms.

DOE's Savannah River Operations Office plans to have a new LLW disposal/storage facility in operation by FY 1991. This facility will replace the present subsurface disposal facility. Savannah River will convert the soluble LLW fraction of its high-level processed waste material into saltstone (a cement/flyash waste form), which will then be disposed of in concrete disposal vaults. Solid LLW will also be disposed in concrete vaults.

The Oak Ridge Operations Office is also considering treatment and disposal technologies as part of its

Low-Level Waste Disposal Development and Demonstration Program. Included among the considerations for disposal is a tumulus disposal unit for high-activity LLW. Oak Ridge should have a new disposal facility operational by the mid-1990s. During FY 1988, the Oak Ridge incinerator that was designed to incinerate substances falling under the auspices of the Toxic Substances Control Act became operational for handling nonradioactive PCB liquids, waste oils, and contaminated soils.

Last year, the Grout Treatment Facility at Hanford began processing liquid LLW (which had been stored in double shelled tanks at that site) into a cement-based slurry, which is then pumped into concrete vaults to solidify. Consideration is also being given to constructing an engineered barrier system for disposal of other LLW.

The Idaho National Engineering Laboratory (INEL) continues to improve its waste treatment capabilities as part of a major effort to reduce the overall volume of LLW requiring disposal. Preliminary studies have been conducted at the INEL to evaluate the cost and feasibility of constructing and operating a state-of-the-art LLW segregation, treatment, and disposal facility; such a facility would have the advantage of co-locating the waste handling and waste disposal operations, enhancing disposal integrity and minimizing costs.

The Nevada Test Site has been granted interim status from the State of Nevada for disposal of Rocky Flats pondcrete, which is a mixed waste. This is the only site in the DOE system where mixed waste can currently be disposed. Generally, mixed waste is being stored in compliance with applicable regulations.

#### SUMMARY

The new orders being developed in the Department of Energy include a revised order for waste management, DOE Order 5820.2A. The requirements of this order ensure that the health and safety of the public is protected through a performance assessment-based system which is independently verified by an oversight and peer review panel. With the systems approach being required by the new order, more thought and consideration of economics and policy will be required in the evaluation of the entire waste management process. New technologies are being developed where needed to meet the requirements of the Order. The applications of existing technologies and waste management philosophies are being uniformly coordinated through guidance documentation.

With this approach to the management of LLW, the DOE will be moving toward the end of this century with an improved program of ensuring a sound and safe means of handling waste for the nuclear defense industry.