

STATUS OF LOW-LEVEL RADIOACTIVE WASTE REQUIREMENTS DEVELOPMENT IN THE DEPARTMENT OF ENERGY

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ABSTRACT

The Department of Energy (DOE) manages its low-level radioactive waste in accordance with the policies, guidelines and requirements specified in DOE Order 5820.2A, "Radioactive Waste Management," issued in 1988. Since that time, DOE has reorganized its waste management programs, instituted new policies with emphasis on environmental protection, safety and health protection, and strengthened the management of hazardous waste. An evaluation of DOE Order 5820.2A has shown the need to revise the Order in light of recent organizational and operational policies. In addition, the Order should be more comprehensive, clarify organizational responsibilities, and be more compatible with similar Federal regulations. A revision could also integrate recent interim guidance for management of low-level waste (LLW), such as determination of material as radioactive waste, management of naturally-occurring radioactive material, use of commercial disposal facilities, and the management of special case waste that is unique to DOE.

INTRODUCTION

The U.S. Department of Energy (DOE) is authorized by the Atomic Energy Act of 1954 (1), to "prescribe regulations and orders as it may deem necessary . . ." to "provide safe storage, processing, transportation and disposal of . . . radioactive waste" resulting from the operations of the Department. The Low-Level Radioactive Waste Policy Amendments Act of 1985 (LLRWPA) (2), specifically makes it the responsibility of the Federal Government to dispose of low-level waste (LLW) owned or generated by DOE. In September 1988, the Department issued DOE Order 5820.2A, "Radioactive Waste Management (3), Chapter III, Management of Low-Level Waste, that established policies, requirements, and guidelines for managing DOE solid LLW.

Policies in DOE Order 5820.2A for managing LLW include:

- DOE-low-level waste operations shall be managed to protect the health and safety of the public, preserve the environment of the waste management facilities, and ensure that no legacy requiring remedial action remains after operations have been terminated.
- DOE-low-level waste shall be managed on a systematic basis using the most appropriate combination of waste generation reduction, segregation, treatment, and disposal practices so that the radioactive components are contained and the overall system cost effectiveness is maximized.
- DOE-low-level waste shall be disposed of on the site at which it is generated, if practical, or if on-site disposal capability is not available, at another DOE disposal facility.
- DOE-low-level waste that contains non-radioactive hazardous waste components (mixed waste) shall conform to the requirements of this order, applicable EH Orders, and shall also be regulated by the appropriate regional authorities under the Resource Conservation and Recovery Act.

The Order specifies that DOE LLW that had not been disposed of prior to issuance of the Order shall be managed in accordance with the following performance objectives:

- Protect public health and safety in accordance with standards specified in applicable EH Orders and other DOE Orders.
- Assure that external exposure to the waste and concentrations of radioactive material which may be released into surface water, ground water, soil, plants and animals results in an effective dose equivalent that does not exceed 25 mrem/yr to any member of the public. Releases to the atmosphere shall meet the requirements of 40 CFR 61. Reasonable effort should be made to maintain releases of radioactivity in effluents to the general environment as low as reasonably achievable.
- Assure that the committed effective dose equivalents received by individuals who inadvertently may intrude into the facility after the loss of active institutional control (100 years) will not exceed 100 mrem/yr for continuous exposure or 500 mrem for a single acute exposure.
- Protect ground water resources, consistent with Federal, State and local requirements.

Discussed below are considerations for revision of the DOE Order on radioactive waste management, management of waste with very low levels of radioactivity, DOE use of commercial facilities for disposal of low-level waste, and disposition of special case waste.

CONSIDERATIONS FOR REVISION OF THE RADIOACTIVE WASTE MANAGEMENT ORDER

A number of changes in the past few years and new waste management requirements will contribute to any future revision of the Order. Among these are integration of DOE waste management programs, focus on strategic and long-range planning, assessments of the need for better clarity and

specificity of the Order, recommendations from the operational users of the Order, new interim directives on management of waste, and a recognition that a number of improvements are needed to provide a comprehensive, effective, and compatible basis for managing DOE LLW.

Since the Order was issued in 1988, DOE has undergone a major organizational change, has increased the visibility of environmental protection and safety, and has instituted new management tools. One aspect of the reorganization was the consolidation of waste management responsibilities in the Office of Environmental Restoration and Waste Management. Along with this new organization came new planning tools in the form of the Environmental Restoration and Waste Management Five-Year Plan (4), supporting Site-Specific Plans, a supporting technology development program and the development of roadmaps. Roadmaps are issue-based planning documents designed to establish the course of action for meeting environmental restoration and waste management objectives at a site, to identify significant "roadblocks" to achieving objectives, and to devise ways to overcome the "roadblocks".

In view of current and near-term needs for comprehensive policies for managing DOE waste, the Order has been assessed and user opinions solicited in order to identify areas where improvements are essential. In doing this, the structure and content of the Order were compared to the Nuclear Regulatory Commission (NRC) radioactive waste regulations and relevant Environmental Protection Agency (EPA) regulations, including hazardous waste and radioactive waste regulations. These evaluations and recommendations have resulted in numerous areas that will require resolution during a revision of the Order. The following are examples of the areas that should be addressed:

- compatibility and definitions consistent with external regulations;
- classifications of waste material
- consistency among the Order chapters in the level of detail provided in policy statements and requirements;
- performance-based policies and requirements and supporting guidance documents;
- contingency planning requirements

Some of those commenting have proposed that the Order be revised so that it is more consistent in structure and content to the RCRA regulations. There are two points made in these proposals. One is that the management of radioactive mixed waste should be fully integrated into the waste management Order, rather than included by passing reference. The other is that the organization could be made more consistent with the RCRA regulations by addressing waste management activities (e.g., characterization, treatment, disposal, etc.) rather than waste types. Although the hazardous component of a mixed waste is subject to RCRA regulations, the current opinion is that, as a radioactive waste management Order, 5820.2A should concentrate on regulating the radioactive component of the waste. This maintains the broad applicability of the Order to all DOE radioactive waste management sites without being constrained by individual State requirements promulgated under State RCRA programs.

Meeting the performance objectives for LLW disposal systems is central to the entire system for managing DOE

LLW. Therefore, radiological performance assessments are required for each operating disposal facility. The assessment is a systematic analysis of the potential risks posed by waste management systems to the public and the environment, and a comparison of those risks to established performance objectives. In order to improve the quality of radiological performance assessments for LLW disposal sites, DOE has empaneled a Performance Assessment Task Team. The team, comprising performance assessment practitioners and regulators from the DOE complex, is charged with identifying issues and recommending resolutions that would establish a more consistent and reliable basis for conducting the performance assessments.

Based on internal evaluations and on the input of users, the Order should require prescriptive guidance that is consistent for the entire spectrum of waste types. More detailed requirements can be expected in each of the functional areas of waste minimization, characterization, packaging, storage, treatment, transportation and disposal. Each of these basic functions of waste management should be addressed in a similar level of detail.

A set of guidance documents for implementing the policies and requirements of the Order should be developed. The common theme that should pervade these documents is that for all the waste management functions there are two fundamental drivers: safe operation and effective disposal. All functions required for managing waste, from the initial characterization of waste material received from a generator through treatment, packaging, storage, transportation and disposal, should be designed and implemented with paramount consideration of how these management steps can contribute most to meeting the performance objectives of the disposal facility over its designed lifetime.

MANAGEMENT OF VERY LOW LEVELS OF RADIOACTIVITY

Recently, interim criteria for regulating waste with very low levels of radioactive contamination have been instituted. This action was taken after determining that various surrogate standards were being used by the sites for declaring a waste to be nonradioactive. Using these surrogate standards, some sites have released waste contaminated with minute amounts of radioactivity to commercial facilities that do not hold radioactive material licenses.

The interim criteria are to provide a single definition for a radioactive waste, and conversely a nonradioactive waste, to be applied consistently across all of DOE. The criteria for a radioactive waste are:

- waste with a measurable increase in radioactivity above background in bulk or volume due to DOE activities, and/or
- waste with surface contamination exceeding guidelines in DOE Order 5400.5 (5) (these guidelines are derived from NRC guidance documents (6, 7), but includes a requirement to perform an as low as reasonably achievable (ALARA) analysis to reduce the amount of radioactivity released).

Wastes which are below these criteria are to be managed as nonradioactive. Additional guidance and assessment is needed to define the proper application of both of these criteria. Planning is underway for work groups to address

these issues, such as defining the acceptable level of detection for waste samples.

Along with these interim criteria, administrative controls on making and documenting radioactive determinations of waste are required. To assure that these controls are in place, each site is to submit procedures to DOE-Waste Management for review. The purpose is to assure that requirements exist to use the above criteria, train people in their use, document decisions on waste determinations, and store those documents in a recoverable manner.

Recognizing the potential for over-regulation of hazardous waste with very low levels of residual radioactive materials, the feasibility of simplifying regulation of such wastes is being evaluated. This idea is based on the fact that there are specific, stringent controls on the manner of treatment, storage and disposal of wastes regulated under the RCRA and the Toxic Substances Control Act (TSCA). A comparative analysis of the risks associated with the hazardous/toxic component and the risk associated with a low concentration of radioactivity is being performed. The purpose of the analysis is to determine if, and at what level of radioactivity, the regulatory requirements provided by the RCRA/TSCA regulations are adequate to provide radiological protection of the worker and public. Time and motion data are being collected at typical treatment, storage and disposal facilities to allow assessments of the dose resulting from routine waste management operations. Additionally, technical information in support of this proposal is being exchanged with the NRC and the EPA.

A recent waste management issue that has arisen relates to the management of naturally-occurring radioactive material (NORM). Certain technologies used for environmental restoration, such as organic vapor extraction from the soil, have the potential for concentrating NORM. The Department is only one of many industries that employs technologies or undertakes activities that may concentrate NORM. However, there are very limited Federal or State regulations for these materials. Similarly, the lack of information on radiological risks from these materials indicates that dose assessments from their management have not been performed.

Therefore, an interim policy for regulating NORM has been established. NORM-containing wastes can be released only if the releasing site performs an assessment of the potential radiation dose resulting from the unrestricted release of the waste, an analysis demonstrates that this dose is as low as reasonably achievable, and the site determines and documents compliance with State regulations.

USE OF COMMERCIAL DISPOSAL FACILITIES

For over 10 years, it has been DOE policy to dispose of its low-level waste at a DOE facility. Recent decisions have provided interim guidance that may allow disposal of wastes with low levels of radioactivity at licensed commercial facilities. DOE sites with large volumes of slightly contaminated (low specific activity) bulk waste and commercial enterprises capable of disposing of this type of waste have been exploring disposal options. DOE recognizes its responsibility for disposing of DOE LLW, as prescribed in the LLRWPA (2), and its responsibility to assist the States and compact regions in developing disposal capability for their LLW. As a condition for DOE using a commercial disposal facility, the facility

operator must obtain the approval of its site's host State or regional compact, as appropriate.

The disposal of slightly contaminated DOE waste at commercial facilities is dependent on meeting a number of additional conditions. First, this allowance is only intended to accommodate slightly contaminated bulk waste. Wastes that would qualify are typified by waste from the Formerly Utilized Sites Remedial Action Program (FUSRAP), the Uranium Mill Tailings Remedial Action Program, or similar bulk waste from demolition or cleanup activities. The Department of Transportation limits for low specific activity waste (LSA) are used as the criterion for "slightly contaminated."

Secondly, the DOE sites that propose to dispose of LLW at a commercial facility must obtain from Headquarters Waste Management an exemption from the DOE Order 5820.2A policy for onsite disposal of DOE LLW. Such an exemption is contingent on demonstrating that the above conditions on waste type, radionuclide content and State or regional compact acceptance are met, and demonstrating that an equivalent level of radiological protection and controls as provided by DOE Order 5820.2A are provided by disposal at the commercial facility. In addition, any applicable regulatory requirements, such as preparing National Environmental Policy Act documentation, must be met.

SPECIAL CASE WASTE

There are a number of LLW streams for which disposal technologies or facilities have not yet been identified. These include DOE LLW that is equivalent to NRC greater-than-class-C LLW, but are not appropriate for shallow land disposal. Also there is a yet-to-be-identified population of LLW that site-specific radiological performance assessments indicate are not acceptable for disposal using currently available sites and technologies. An assessment of the types and amounts of special case waste that exist within the DOE complex was completed in 1990. This waste represents a small portion of all of DOE's LLW inventory. Specific requirements and plans for management and disposal of special case waste need to be formulated.

CONCLUSION

Specific requirements and plans for revising the LLW requirements contained in DOE Order 5820.2A, "Radioactive Waste Management," are being considered. Evaluations of DOE Order 5820.2A, both internally and from users in the field, conclude that there is a need to develop a more comprehensive Order that reflects current management organization and philosophy, to improve its consistency and comparability with other regulations, and to require more definitive guidance on how DOE wants the policies and requirements to be met. These could be addressed by a revision of the Order and development of a comprehensive set of guidance documents. Such documents could be updated periodically to incorporate interim guidance requirements, recommendations on use of new technologies, improvements in quality assurance, and new or revised procedures that will improve environmental protection, safety and health protection in the management of DOE LLW.

REFERENCES

1. Atomic Energy Act of 1954, as amended, 42 U.S.C 2011 et seq., 1954.

2. Low-Level Radioactive Waste Policy Amendments Act of 1985, as amended, 42 U.S.C. 2021b et seq., 1985.
3. U.S. Department of Energy, "Radioactive Waste Management," *DOE Order 5820.2A*, September 26, 1988.
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