

SNL 2003



National Nuclear Security Administration

Sandia Site Office

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Albuquerque, New Mexico 87185-5400



DEC 17 2003

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. John E. Kieling, Program Manager
RCRA Permits Management Program
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505



Subject: Petition for a Site-Specific Treatability Variance From the Land Disposal Restrictions Treatment Standards Applicable to Spark Gap Tubes and Manufactured Radioactive Sources at Sandia National Laboratories/New Mexico

Dear Mr. Kieling:

The purpose of this letter is to request a site-specific treatability variance, under 20.4.1.800 New Mexico Administrative Code (NMAC), incorporating 40 CFR 268.44 (h), from the Resource Conservation and Recovery Act (RCRA) Land Disposal Restrictions (LDR) treatment standards for two similar mixed wastes managed at Sandia National Laboratories, New Mexico (SNL/NM). This facility is owned by the United States Department of Energy (DOE) and operated for the DOE by Sandia Corporation (Sandia). The mixed wastes addressed are specifically described as Spark Gap Tubes (SGT) and Manufactured Radioactive Sources (MRS). These are small manufactured items, less than debris-sized, containing a radioactive source and potentially being externally contaminated by radioactive materials, as well as exhibiting the toxicity characteristic for cadmium, chromium, lead, and/or silver.

Under the LDR program, a restricted hazardous waste must meet the applicable treatment standards before it can be land disposed. Debris-sized wastes that contain toxicity characteristic metal constituent(s) in excess of the LDR standard must generally be treated to meet the concentration-based standards in 20.4.1.800 NMAC, incorporating 40 CFR 268.40. As the enclosed petition explains, the applicable LDR treatment standards for the less than debris-sized radioactive SGT and MRS wastes would also be concentration-based and would require the Best Demonstrated Available Technology (BDAT) of stabilization (microencapsulation) to achieve and verify that the treatment standard has been met.

The DOE and Sandia believe that the physical properties of the SGT and MRS wastes differ significantly from the types waste used in developing the concentration-based LDR treatment standard. Further, the DOE and Sandia suggest that applying the existing LDR treatment standard based on a Best Demonstrated Available Technology (BDAT) to the SGT and MRS wastes is inappropriate due to the potential increase in

radiation exposure to workers associated with waste preparation, treatment, and confirmation sampling. This petition proposes that macroencapsulation as defined in 20.4.1.800 NMAC, incorporating 40 CFR 268.45, is an acceptable alternative treatment technology that would effectively immobilize the toxicity characteristic metals while reducing the potential for increased radiation exposure to workers. The DOE and Sandia will manage the treated waste as mixed waste pending final disposition at a subtitle C facility.

In accordance with 20.4.1.800 NMAC, incorporating 40 CFR 268.44(h), the DOE and Sandia request that the New Mexico Environment Department consider the enclosed petition and approve the alternative LDR treatment standard proposed for SGT and MRS wastes. If you have any questions regarding the petition please contact Dave Rast at 845-5349.

Sincerely,

Sincerely,



Ms. Karen L. Boardman
Manager
U.S. Department of Energy
National Nuclear Security Administration
Sandia Site Office
Owner and Co-Operator



Mr. Donald H. Blanton
Vice-President
Human Resources & Protection Services
Sandia Corporation
Albuquerque, New Mexico
Co-Operator

Enclosures

cc w/enclosure:

W. P. Moats, NMED HWB, MS 1087
R. Greene, USEPA Region VI
D. Rast, DOE/NNSA, MS 0184
H. Seeley, SNL, MS 1151, 3125
A. Reiser, SNL, MS 1151, 3125
J. Thompson, SNL, MS 1151, 3125

**Request for Site-Specific Treatability Variance from the Hazardous Waste Land Disposal
Restriction Standards for Spark Gap Tubes and Manufactured Radioactive Sources**

Petitioner and Facility Information

Petitioner Name(s) and Address(es)

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Petitioner Primary Points of Contact Name(s) and Telephone Number(s)

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Statement of Interest in the Proposed Action

The Department of Energy (DOE) and Sandia Corporation (Sandia) request a site-specific treatability variance from the Hazardous Waste Land Disposal Restriction (LDR) standards, in accordance with 20.4.1.800 New Mexico Administrative Code (NMAC), incorporating 40 Code of Federal Regulations (CFR) 268.44(h), for two similar wastes that are 1) manufactured items, 2) less than debris size (< 60 millimeters (mm)), 3) containing one or more toxicity characteristic metals, and 4) containing radioactive material as well as potentially being externally contaminated by radioactive materials. The wastes are collectively described as spark gap tubes (SGTs) and manufactured radioactive sources (MRSs). These items are more descriptively defined below in the section entitled *Waste Description*.

A site-specific treatability variance may be approved when the properties of the wastes at issue are physically or chemically different from the properties of the wastes evaluated in establishing the generally applicable treatment standard and, as a result, the generally applicable standard cannot be achieved. Further, a site-specific treatability variance may also be approved when the generally applicable treatment standard is based on a Best Demonstrated Available Technology (BDAT) that is inappropriate for the waste in question. See 20.4.1.800 NMAC, incorporating 40 CFR 268.44(h) and Federal Register, Volume 61, page 55717 (61 FR 55717) dated October 28, 1996. The language specifying approval of a site-specific variance based on an inappropriate BDAT was further clarified in 62 FR 64504, at 64505-6 as "imposition of BDAT treatment, while technically possible, remains unsuitable or impractical from a

technical standpoint” or “imposition of the otherwise applicable treatment standard could result in a net environmental detriment by discouraging aggressive remediation.”

In this instance, the DOE and Sandia believe that the properties of the SGTs and MRSs differ significantly from the properties of the waste evaluated to establish the existing LDR treatment standard. In addition, imposition of the existing LDR treatment standard that is based on a BDAT, while technically possible, is inappropriate for the SGT and MRS wastes, as it remains unsuitable or impractical from a technical standpoint. Therefore, an alternate treatment standard is proposed herein that will effectively immobilize the hazardous constituents present in the waste while reducing the potential for ionizing radiation exposure to operating personnel associated with the treatment of the waste.

Waste Description

Sandia National Laboratories/New Mexico (SNL/NM) engages in a variety of experimental and applied research related to nuclear weapons surety, energy and critical infrastructure, non-proliferation and materials control, and emerging national security threats. During the course of these activities, two similar mixed wastes, SGTs and MRSs, may be generated.

Spark gap tubes are small glass tubes with two or more electrodes that present very high impedance to a circuit until they are operated, becoming a near short circuit. SGTs are commonly used as switching devices, voltage regulators, and initiation devices. These wastes may include but are not limited to krytron tubes, spark gaps, switch tubes, electron tubes, or over-voltage gap tubes. The hazardous component is typically lead or silver present in solder. The radioactive component is either nickel-63 or cesium-137 plated on material within the tube or krypton-85 gas sealed within the tube. The glass tubes are typically between 0.75 and 1 inch in length with some variation.

Manufactured radioactive sources generally consist of a radioactive element(s) in the form of a solid or foil, or plated to a backing material. MRSs are employed in a variety of hardware configurations, experimental applications, and routine operations. The hazardous materials typically present are lead from solder and/or silver contained in solder or used as a backing material. Other hazardous materials that may be incorporated into the source include cadmium and chromium. The radioactive components may vary but are typically cesium-137, radium-226, strontium-90, nickel-63, or uranium isotopes. The MRSs generally range in size from 2.25 inches to less than 1 inch.

During the course of activities at SNL/NM, the SGTs and MRSs may become externally contaminated by other radioactive materials. Because of their small size and shape, removal of surface contamination is difficult, and it is not generally possible to achieve a reasonable confidence level that the items are free of external radioactive contamination. Based on manufacturing information and generator knowledge of the waste, the following toxicity characteristic metal(s), along with the applicable EPA hazardous waste code may be present:

Toxicity Characteristic Metal	EPA Hazardous Waste Code
Cadmium	D006
Chromium	D007
Lead	D008
Silver	D011

These wastes are defined as a mixed waste because they exhibit a toxicity characteristic and because they contain a radioactive material and/or are contaminated by radioactive materials.

Besides being characterized as mixed waste, the SGT and MRS wastes do not achieve the regulatory definition of debris by virtue of the manufactured items being smaller than 60 mm in size. Debris is defined in 20.4.1.800 NMAC, incorporating 40 CFR 268.2(g), as follows:

“*Debris* means solid material exceeding a 60 mm particle size that is intended for disposal and that is: A manufactured object; or plant or animal matter; or natural geological material. However, the following materials are not debris: Any material for which a specific treatment standard is provided in Subpart D, Part 268, namely lead acid batteries, cadmium batteries, and radioactive lead solids; Process residuals such as smelter slag and residues from the treatment of waste, wastewater, sludges, or air emission residues; and Intact containers of hazardous waste that are not ruptured and that retain 75% of their original volume. A mixture of debris that has not been treated to the standards provided by § 268.45 and other material is subject to regulation as debris if the mixture is comprised primarily of debris, by volume, based on visual inspection.”

Hazardous debris is defined in 20.4.1.800 NMAC, incorporating 40 CFR 268.2(h), as follows:

“*Hazardous debris* means debris that contains a hazardous waste listed in subpart D of part 261 of this chapter, or that exhibits a characteristic of hazardous waste identified in subpart C of part 261 of this chapter. Any deliberate mixing of prohibited hazardous waste with debris that changes its treatment classification (i.e., from waste to hazardous debris) is not allowed under the dilution prohibition in § 268.3.”

Waste minimization is an important part of the DOE strategy for managing the generation of mixed waste. Waste minimization efforts include requiring permission to generate mixed waste, the use of non-hazardous components where possible, and the segregation of mixed waste during sorting operations (e.g., physical disassembly of experimental hardware). In light of these efforts, the DOE and Sandia currently estimates that a total of approximately 0.42 cubic meters (m³) of SGT (0.37 m³) and MRS (0.05 m³) wastes are in the inventory of wastes requiring treatment and disposal. The projected generation rate for each waste is expected to be less than one cubic meter per year. While not representing a large volume of waste, SGT and MRS wastes represents a waste disposal problem for the DOE and Sandia. The existing LDR concentration-based treatment standards are inappropriate given the potential risk of personnel exposure to radiation during the specified treatment and the lack of viable off-site treatment options. Off-site treatment and disposal facilities that can accept the radioactivity levels of most of these waste items are currently not available. Envirocare of Utah, Inc. (EOU) does not accept radioactive sources for treatment and disposal and, as with MRSs, EOU considers SGTs to be sources. Finally, recycling is not an option given the radioactivity levels associated with these wastes.

Basis for Variance Request

Hazardous waste that meets the definition of debris must be treated either by the waste-specific treatment standards for the waste contaminating the debris or the alternative treatment standards as specified in 20.4.1.800 NMAC, incorporating 40 CFR 268.45. Under existing LDR treatment standards, as specified in 20.4.1.800 NMAC, incorporating the 40 CFR 268.40 table entitled *Treatment Standards for Hazardous Wastes*, debris that is hazardous by virtue of containing a toxicity characteristic metal must generally be treated to meet a concentration-based treatment standard. Current non-wastewater concentration-based treatment standards are 0.11 milligrams per liter (mg/l) Toxicity Characteristic Leaching Procedure (TCLP) for cadmium, 0.60 mg/l TCLP for chromium, 0.75 mg/l TCLP for lead, and 0.14 mg/l TCLP for silver in the wastes. Although wastes subject to treatment standards based on concentration limits can be treated by any technology, the concentrations of hazardous constituents in any treatment residues cannot be higher than those obtained using BDAT. The BDAT to achieve and verify these concentration-based LDR treatment standards is stabilization (microencapsulation) to reduce the leachability of the metal contaminants. Stabilization is accomplished using Portland cement to form a solidified mass, thereby reducing the mobility of the hazardous constituents of the waste.

Macroencapsulation (one of the alternative treatment standards specified in 20.4.1.800 NMAC, incorporating 40 CFR 268.45) would be the ideal alternative treatment standard to reduce the mobility of the characteristic metal(s) contaminating the SGT and MRS wastes, as described in detail at the end of this section. However, because the SGT and MRS wastes do not meet the definition of debris, the use of alternative treatment standards is not an option. As the SGT and MRS wastes are less than debris-sized (or smaller than 60 mm) items that contain radioactive material and may also be externally contaminated by radioactive materials, the DOE and Sandia believe that 1) the physical and radioactive properties of the SGT and MRS wastes differ significantly from the properties of the waste evaluated to establish the stabilization technology and 2) the use of stabilization as a treatment technology for the SGT and MRS wastes is inappropriate due to the increased potential risk of radiation exposure to personnel.

In the final hazardous debris rule [57 FR 37194, at 37223 (August 18, 1992)], effective on November 16, 1992, the EPA provides several reasons for increasing the particle size breakpoint for debris to 60 mm, including in V.B.1.c.(1) that:

“...(b) fine grain materials are likely to be amenable to the treatment technologies that were the basis for the LDRs for the waste contaminating the material; (c) fine grain materials, unlike large particle materials, can be reasonably sampled for analysis to document compliance with the concentration-based LDRs for the waste contaminating the material; ...”.

Also, in the final rule [57 FR 37194, at 37223], the EPA provides rationale for applying the particle size criterion to all debris, stating in V.B.1.c.(2) that:

“The Agency has broadened the particle size test to apply to all debris, not just geologic debris as proposed. We believe that the reasons enumerated above for increasing the particle size to 60 mm apply equally to applying the particle size to all debris (e.g., small particle size objects – e.g., glass, metal fragments – can be readily sampled representatively to document compliance with the LDRs for the waste contaminating the material).”

The SGT and MRS wastes described in this variance request could not be considered a fine grain material. In the final debris rule [57 FR 37194, at 37223], Section V.B.1.c.(1)(a), the EPA gives examples of fine grain materials as being soil or glass cullet. The SGT and MRS wastes subject to this variance request are heterogeneous, varying in shape and ranging in size from approximately 0.5 to 2.25 inches. The examples of small particle size objects, given in paragraph Section V.B.1.c.(2) as stated above, are glass or metal fragments, suggesting a waste that is no longer intact or that has been subjected to size reduction. The SGT and MRS wastes subject to this variance request are intact manufactured items that should not be subjected to size reduction processes because of the potential radiation exposure to personnel.

We agree that fine grain and small particle-sized waste is amenable to treatment by stabilization, having a large surface area to interact with the stabilizing agent. However, merely mixing one or more SGTs or MRSs in Portland cement does not seem to meet the intent of the stabilization treatment. Such waste should be subject to size reduction by grinding or shredding, prior to stabilization, to increase the effective surface area of the waste and reduce the leachability of the metal contaminants. The EPA seems to intimate such size reduction in the final debris rule [57 FR 37194, at 37235], stating:

“If the treater reduces the particle size of debris to make it amenable to microencapsulation so that the debris no longer meets the 60 mm minimum particle size limit for debris, such material is subject to the waste-specific treatment standards for the waste contaminating material...”.

Prior to changing the debris breakpoint to 60 mm, the EPA seems to also intimate that size reduction may be necessary for stabilization treatment in the Third-third rule preamble [55 FR 22520, at 22556 (June 1, 1990)] by defining debris in Section III.A.3.a.(2) as:

“nonfriable inorganic solids that are incapable of passing through a 9.5 mm standard sieve that require cutting, or crushing and grinding in mechanical sizing equipment prior to stabilization...” and “Note: The 9.5 mm requirement on sieve is based on a similar requirement for pretreatment of samples that are to be analyzed using the TCLP.”

However, the SGT and MRS wastes subject to this variance request do not lend themselves to cutting, grinding, crushing, or shredding. The radioactive sources are enclosed within the items and grinding or shredding the waste would result in release and dispersal of radioactive material. Therefore, the SGT and MRS wastes, if treated by the existing LDR treatment standard, would significantly increase the risk to human health by increased exposure of radiation to workers.

We agree that fine grain materials “can be reasonably sampled for analysis to document compliance with the concentration-based LDRs...” after stabilization treatment. However, the levels of radioactivity and the physical forms associated with the SGT and MRS wastes do not readily allow for safe and representative verification sampling and analysis. Sample collection entails breaking off a sufficient sample volume from the solidified mass, potentially releasing some or all of the radioactive material and subjecting the workers to increased radiation exposure. The laboratory performing the analytical work may also be subject to increased radiation exposure during sample preparation steps that do include size reduction. Additionally, without size reduction prior to stabilization, the waste material may not be evenly distributed within the stabilized mass, making representative sampling difficult to achieve.

Description of Proposed Waste Treatment Process

Accordingly, the DOE and Sandia are requesting approval of a site-specific treatability variance for the treatment of the SGT and MRS mixed wastes managed (i.e., generated, treated, or stored, now and/or in the future) at SNL/NM by the alternate LDR treatment standard of macroencapsulation, as defined in 20.4.1.800 NMAC, incorporating 40 CFR 268.45 for hazardous debris. The DOE and Sandia submit that macroencapsulation offers an acceptable alternative LDR treatment standard to effectively immobilize the toxicity characteristic metals. This site-specific variance request applies only to manufactured items, less than debris-sized, exhibiting the toxicity characteristic for metal(s), containing a radioactive material and potentially being externally contaminated by radioactive materials. It does not apply to other non-debris waste materials such as soils, powders, or particulates. Although this treatment strategy does not represent BDAT as promulgated for D006, D007, D008, and D011 nonwastewaters, it substantially diminishes the toxicity of the waste and substantially reduces the likelihood of migration of hazardous constituents from the waste as required by the Resource Conservation and Recovery Act (RCRA) section 3004(m).

Macroencapsulation provides the following treatment benefits:

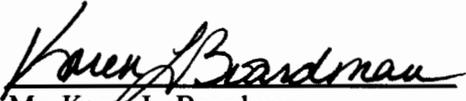
1. effectively immobilizes the toxicity characteristic metals;
2. reduces potential radiation exposure to workers through reduced handling, sampling, and analysis;
3. maintains the integrity of the item containing dispersable radioactive material;
4. requires no size reduction for effective treatment; and,
5. provides a safer transportation waste form for final land disposal.

The DOE and Sandia currently utilize on-site macroencapsulation at SNL/NM to treat hazardous debris and the technology can be successfully applied to treat the existing SGT and MRS wastes. The DOE and Sandia will manage the treated SGT and MRS wastes as mixed waste pending final disposition at a subtitle C facility.

In conclusion, the DOE and Sandia believe that the existing required LDR treatment standard for SGT and MRS wastes is technically inappropriate and unacceptably increases the risk of worker exposure to radiation. The DOE and Sandia, in accordance with 20.4.1.800 NMAC, incorporating 40 CFR 268.44(h), request a site-specific variance approving macroencapsulation, as defined in 20.4.1.800 NMAC, incorporating 40 CFR 268.45 for hazardous debris, to be an alternative to the concentration-based LDR treatment standard for SGT and MRS items.

Petitioner Certification

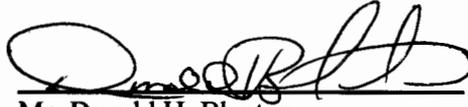
I certify under penalty of law that I have personally examined and am familiar with the information submitted in this petition and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.



Ms. Karen L. Boardman
Manager
U.S. Department of Energy
National Nuclear Security Administration
Sandia Site Office
Owner and Co-Operator

12-17-03

Date



Mr. Donald H. Blanton
Vice-President, Human Resources & Protection Services
Sandia Corporation
Albuquerque, New Mexico
Co-Operator

12/03/03

Date