EEG-56

UNRESOLVED ISSUES FOR THE DISPOSAL OF REMOTE-HANDLED TRANSURANIC WASTE IN THE WASTE ISOLATION PILOT PLANT

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Unresolved Issues for the Disposal of Remote-Handled Transuranic Waste in the Waste Isolation Pilot Plant

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FOREWORD

The purpose of the New Mexico Environmental Evaluation Group (EEG) is to conduct an independent technical evaluation of the Waste Isolation Pilot Plant (WIPP) Project to ensure the protection of the public health and safety and the environment. The WIPP Project, located in southeastern New Mexico, is being constructed as a repository for the disposal of transuranic (TRU) radioactive wastes generated by the national defense programs. The EEG was established in 1978 with funds provided by the U.S. Department of Energy (DOE) to the State of New Mexico. Public Law 100-456, the National Defense Authorization Act, Fiscal Year 1989, Section 1433, assigned EEG to the New Mexico Institute of Mining and Technology and continued the original contract DE-AC04-79AL10752 through DOE contract DE-ACO4-89AL58309. The National Defense Authorization Act for Fiscal Year 1994, Public Law 103-160, continues the authorization.

EEG performs independent technical analyses of the suitability of the proposed site; the design of the repository, its planned operation, and its long-term integrity; suitability and safety of the transportation systems; suitability of the Waste Acceptance Criteria and the generator sites' compliance with them; and related subjects. These analyses include assessments of reports issued by the DOE and its contractors, other federal agencies and organizations, as they relate to the potential health, safety and environmental impacts from WIPP. Another important function of EEG is the independent environmental monitoring of background radioactivity in air, water, and soil, both on-site and off-site.

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EXECUTIVE SUMMARY

The purpose of the Waste Isolation Pilot Plant is to dispose of 176,000 cubic meters (6.2 million cubic feet) of transuranic (TRU) waste generated by the defense activities of the United States Government (U.S. Congress, 1992). The envisioned inventory contains approximately 6 million cubic feet (850,000 drum equivalents) of contact-handled transuranic (CH TRU) waste and 250,000 cubic feet (about 7,100 cubic meters) of remote handled transuranic (RH TRU) waste. CH TRU emits less than 0.2 rem per hour at the container surface. Of the 250,000 cubic feet of RH TRU waste, five percent by volume (12,500 cu ft) can emit up to 1000 rem per hour at the container surface. The remainder of RH TRU waste must emit less than 100 rem per hour (U.S. Congress, 1992; State of New Mexico and the U.S. DOE, 1984).

There are major unresolved problems with the intended disposal of RH TRU waste in the WIPP:

1) The WIPP design requires the canisters of RH TRU waste to be emplaced in the walls (ribs) of each repository room. Each room will then be filled with drums of CH TRU waste. However, the RH TRU waste will not be available for shipment and disposal until after several rooms have already been filled with drums of CH TRU waste. RH TRU disposal capacity will be lost for each room that is first filled with CH TRU waste. The DOE has identified this problem (U.S. DOE, 1991a) and has suggested exploring design modifications to the WIPP. However, there are unresolved problems with each suggested modification. Furthermore, modification to the facility or to the disposal plans could affect the performance assessment analyses and the EPA review and certification for safe disposal at the WIPP.

2) Complete RH TRU waste characterization ***data*** will not be available for performance assessment because the facilities needed for waste handling, waste treatment, waste packaging, and waste characterization do not yet exist. Recent estimates indicate that the Waste Handling and Packaging Plant proposed for Oak Ridge will not be operational until 2002 and the

Waste Receiving and Processing Facility Module 2 proposed for the Hanford Site will not be operational until 2005. Moreover, the DOE does not yet have a nondestructive assay system to estimate the radionuclide inventory for much of the RH TRU waste. Calculation of the repository performance may rely heavily on process knowledge, where it is available. Uncertainty in the radionuclide inventory and in the physical and chemical characteristics of the RH TRU waste introduces additional uncertainty into the calculated long term behavior of the repository. An assay is also needed to determine compliance with the WIPP Waste Acceptance Criteria.

3) The DOE does not have a transportation cask for RH TRU waste certified by the U.S. Nuclear Regulatory Commission (NRC). The NRC certification is required by the Second Modification to the Consultation and Cooperation (C&C) Agreement (State of New Mexico and U.S. DOE, 1987) and the 1992 WIPP Land Withdrawal Act (U.S. Congress, 1992).

In addition to obtaining certification of compliance for disposal from the EPA Administrator, the DOE must also comply with other terms of the WIPP Land Withdrawal Act (U.S. Congress, 1992). The Department of Energy may not begin disposal of transuranic waste at the WIPP until the DOE also:

1 submits to Congress comprehensive recommendations for the disposal of ***all*** transuranic waste, under the control of the Secretary, including a timetable for the disposal of such waste (U.S. Congress, 1992, Section 7(b)(5)).

2) identifies by survey, with notice and opportunity for public comment, all the TRU waste types at all sites from which wastes are to be shipped to WIPP (U.S. Congress, 1992, Section 7(b)(6)).

The first requirement is a substantial challenge to identify all TRU waste including RH TRU, inventory the waste, make recommendations for disposal, and establish a timetable by January 1998.

1 INTRODUCTION

The Waste Isolation Pilot Plant (WIPP) is intended to serve as a repository for the safe disposal of transuranic waste generated by the defense activities of the United States Government. The disposal facility is located 26 miles east of Carlsbad, New Mexico and is sited at a depth of 2,150 feet in a bedded salt formation.

For the DOE to proceed with disposal, the U.S. Environmental Protection Agency (EPA) Administrator must certify that the projected release of radionuclides to the accessible environment from the repository over the next 10,000 years will comply with EPA Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes, 40 CFR 191 (U.S. EPA, 1993) and the migration of other hazardous constituents will comply with EPA Land Disposal Restrictions, 40 CFR 268 (U.S. EPA, 1986). As part of the analyses, the DOE will submit performance assessment calculations. These calculations require an estimate of the radionuclide inventory.

By definition, transuranic waste contains alpha-emitting radionuclides with atomic numbers greater than 92, half-lives greater than 20 years, and a radionuclide concentration greater than 100 nCi/g of waste. CH TRU waste has a maximum dose rate of 0.2 rem per hour at the waste container surface. The external gamma dose rate of RH TRU waste can reach 30,000 rem per hour[1], with a thermal output of a few hundred watts per container although the radiation levels of most RH TRU waste is below 100 rem per hour (U.S. DOE, 1982, p. 3). The DOE FEIS (U.S. DOE, 1980) specified a maximum dose rate of 100 rem per hour. To accommodate the need to dispose of RH TRU waste in excess of 100 rem per hour, it was agreed that up to 5% (12,500 cubic feet) of RH TRU waste above 100 rem per hour could be emplaced in the WIPP, but no defense RH TRU waste with a surface dose in excess of 1000 rem per hour could be shipped to WIPP (State of New Mexico and U.S. DOE, 1984; U.S. Congress, 1992).

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[1]While the Roentgen measures gamma radiation absorbed in air, this report uses the term interchangeably with rem, which measures the absorption of gamma or beta emitters assuming a quality factor of one.

Initially, the anticipated inventory included a maximum of 176,000 cubic meters (6.2 million cubic feet or 850,000 drum equivalents) of contact-handled transuranic (CH-TRU) waste and about 7,100 cubic meters (250,000 cubic feet or 8000 canisters) of remote-handled transuranic (RH TRU) waste (U.S. DOE, 1980, p. 1-5). There was a slight reduction in the volume capacity of the WIPP when the 1992 WIPP Land Withdrawal Act (U.S. Congress, 1992, Section 7(a)(3)) limited the total capacity, including both CH TRU and RH TRU waste, to 6.2 million cubic feet of transuranic waste. In addition to volume restrictions, the amount of RH TRU waste that can be emplaced in the WIPP is limited to 5.1 million curies (U.S. Congress, 1992). The maximum activity level of RH TRU was specified in the C&C Agreement as 23 curies per liter (State of New Mexico and U.S. DOE, 1984, p. 3).

The DOE recently estimated the total radioactivity in CH TRU waste as 4.2 million curies and the total radioactivity in RH TRU waste as 3.5 million curies (U.S. DOE, 1991b, p. 2). This DOE estimate indicates that the RH TRU inventory constitutes about 45% of the total TRU inventory by radioactivity.

However, the RH TRU inventory has changed considerably in the last several years (Sandia, 1992, vol 3, sec. 3.4.2). Figure 1 shows the disparity in the various estimates by the DOE of the radioactivity of the RH TRU radionuclide inventory intended for emplacement in the WIPP.

The 1994 Baseline Inventory Report (U.S. DOE, 1994b) describes a proposed methodology for eliciting, from the DOE generator/storage sites, estimates of the amount of hazardous materials and the amount of radioactivity in CH TRU waste and RH TRU waste retrievably stored at each site. It appears the baseline inventory will rely, in part, on process knowledge. Process knowledge requires an evaluation of existing records on the production history of the waste. However, as observed by previous studies at generator/storage sites, records on RH TRU waste are scarce, even more scarce than records on CH-TRU waste (Jensen and Wilkinson, 1983 p. 91) and actual data on stored RH TRU waste are minimal (Stewart et al., 1989, p. 5).

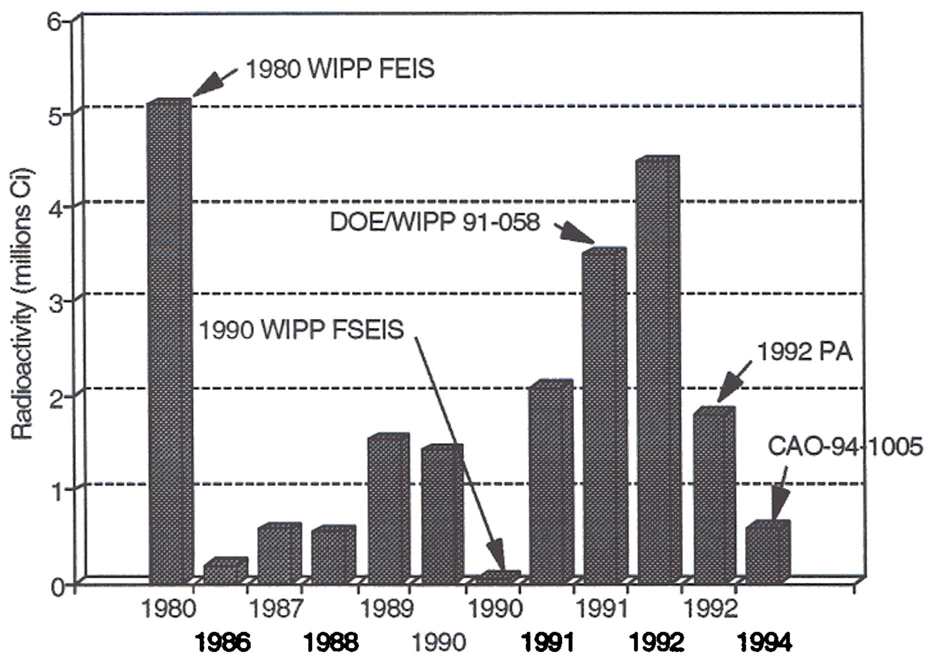

Fig. 1 Estimated RH TRU inventory for emplacement in WIPP. Estimates based on U.S. DOE Integrated Data Base (U.S. DOE, 1986, 1987, 1988c, 1989, 1990d, 1991d, 1992) except where noted.

Table 1 shows, in detail, the disparity between the RH TRU radionuclide inventory from the 1994 DOE Baseline Inventory Report (U.S. DOE, 1994b, section 5.4 and Table 5-3) and the 1994 DOE Compliance Status Report (U.S. DOE, 1994c, Section 4.1.5 and Table 4-4). The 1994 DOE Baseline Inventory Report[2] was based on the 1993 IDB for reporting data. The 1994 Compliance Status Report gives the RH TRU inventory "assumed" by the 1992 performance assessment effort (U.S. DOE, 1994c, sec. 4.1.5). That inventory relies on the data call for the 1991 IDB (U.S. DOE, 1991d) for stored and future generated waste (Peterson, 1992, p. A-135-140). The radioactive daughter of Sr-90, which is Y-90,

[2]The 1994 DOE Baseline Inventory Report estimates a total of 585,000 curies of RH TRU waste (U.S. DOE, 1994b, Appendix I), of which 470,000 curies are intended to supercede the 1.79 million curie total used in the performance assessment calculations (U.S. DOE, 1994b, Section 5.4).

should have an identical number of curies shown since the radioactivity of this much shorter half life daughter is equal to the parent in secular equilibrium. Hence the PA calculations should include 57,000 curies of Y-90.

Table 1. Comparison of RH TRU Inventories (in curies) for 1992 performance assessment reported in 1994 DOE Compliance Status Report (U.S. DOE, 1994c) and 1994 DOE Baseline Inventory Report (U.S. DOE, 1994b).

Radionuclide	US DOE, 1994c	US DOE, 1994b
Sr-90	522,000	57,500
Cs-137	569,000	29,400
Pm-147	536,000	1,110
Th-232	5.66	0.33
U-233	199	1,040
U-235	0.613	367
U-236	0.00559	****
U-238	1.8	2.3
Np-237	0.92	0.766
Pu-238	27,300	61,700
Pu-239	8,500	40,800
Pu-240	2,280	9,980
Pu-241	120,000	178,000
Pu-242	2.94	0.948
Am-241	1,060	89,800
Cm-244	4,260	****
Cf-252	86.3	11.0

The portrayal of the RH TRU inventory as "assumed" by the 1992 PA (U.S. DOE, 1994c, sec. 4.1.5) must be viewed with caution. It appears the RH TRU inventory was not actually included in the 1992 PA transport calculations. Rather, the RH TRU was included only in the cuttings release to the surface. The 1992 PA transport calculations were limited to nine radionuclides from the CH TRU waste inventory (Sandia, 1992, vol. 3, section 3.3.3).

2. RH TRU DISPOSAL CAPACITY AT THE WIPP

With respect to the volume of the RH TRU inventory, there are two distinct issues. First, the anticipated inventory of RH TRU waste already exceeds the design capacity of the repository by 21 percent (U.S. DOE, 1994b, section 5.3). The DOE has agreed to limit the total volume of RH TRU waste to 250,000 cubic feet (State of New Mexico and U.S. DOE, 1984). The 1992 WIPP Land Withdrawal Act (U.S. Congress, 1992) specifies an RH TRU curie limit of 5.1 million curies, but not an RH TRU volume limit.

Second, the total RH TRU capacity of the repository will be reduced as the rooms are first filled with CH TRU waste. RH TRU waste will not be available for shipment and emplacement in the walls of the rooms until an unspecified number of the rooms have already been filled with CH TRU waste. As each room is filled with CH TRU waste, the walls in that room will not be available for the emplacement of RH TRU waste. Utilizing the full, agreed upon, RH TRU capacity of the WIPP will require modification of the facility and/or disposal plans.

2.1 Volume of RH TRU Waste Exceeds WIPP Capacity

The First Modification to the Consultation and Cooperation Agreement between the State of New Mexico and the DOE agreed to emplace a maximum of 250,000 cubic feet (7,079 m^3) of RH TRU waste in the WIPP. For a canister with a design volume of 0.89 m^3, this would amount to 7,954 canisters. The DOE design of individual boreholes on eight foot centers in the walls of the repository would thus permit the emplacement of 6,566 canisters (U.S. DOE, 1988a, p. 21). If the north south drifts (not the cross drifts) are also included as available wall space, the WIPP could accommodate a total of 7,900 canisters on eight foot centers (U.S. DOE, 1991a, p. 4-1). While two-thirds of the CH TRU waste has yet to be generated, DOE maintains that enough RH TRU waste has already been generated to exceed the full WIPP capacity (U.S. DOE, 1994b, section 5-3).

The 1987 Integrated Data Base submission identified a total need for disposing of 4828 canisters of RH TRU inventory. The 1990 WIPP FSAR (U.S. DOE, 1990a, Section 3.1.1.4.2) and the 1990 WIPP No-Migration Variance Petition to the EPA (U.S. DOE, 1990b, Section 3.2.2) estimated that 4,000 to 5,000 canisters of RH TRU waste would be placed in the repository. The 1991 Integrated Data Base stated that approximately 8,000 canisters would be available for disposal (U.S. DOE, 1991d, p. 78). Another DOE report specified a need to dispose of 8,070 canisters (U.S. DOE, 1991b, Attachment B, p. 17), or slightly more than the RH TRU design capacity.

By 1992, the anticipated inventory of RH TRU waste exceeded the design capacity of the WIPP. The 1992 Integrated Data Base stated that approximately 9200 canisters of RH TRU waste would be available for disposal (U.S. DOE, 1992, p. 78). These figures do not include the 34,000 m^3 (38,200 canister equivalents or 1.2 million cubic feet) of uncharacterized waste at Hanford that will probably be RH TRU waste (U.S. DOE, 1992, p. 108).

2.2 Alternatives to Accommodate Panel Space Loss

The RH TRU Task Force (U.S. DOE, 1991a) noted that the current design of the WIPP requires that the RH TRU waste is emplaced first in the walls followed by the backfilling of the rooms with CH TRU waste. This task force recommended exploring alternate emplacement techniques to accommodate the inventory increase and the panel space loss as a result of first emplacing CH TRU waste. The DOE task force (U.S. DOE, 1991a, pp. 6-3 to 6-4) suggested that the RH TRU waste might be placed:

1) on a tighter borehole spacing
2) vertically in the floor of the repository
3) as multiple canisters in a longer borehole
4) in an entirely new and separate horizon at WIPP
5) in drums instead of canisters

There are inherent difficulties with each option that have not been resolved.

2.2.1 Tighter Borehole Spacing

Decreasing the spacing between the boreholes from the current design of eight feet decreases the factor of safety for criticality. The DOE (U.S. DOE, 1991a, p. 6-3) identifies a minimum distance of 5.63 feet based on the current WIPP Criticality Safety Analysis Report (U.S. DOE, 1988b). Additionally, the project must also consider the stability of the walls (ribs). The calculated stability of the walls, particularly at higher thermal loadings, is sensitive to the spacing between the boreholes (Argüello and Beraún, 1987).

Vertical Emplacement

Emplacing the RH TRU canisters in vertical holes in the floor of the facility represents a major design modification and there are obvious problems. Ten foot long canisters weighing 8,000 pounds would have to be lowered into a vertical cavity using a yet to be designed hoist operating in a room with a 13-foot ceiling. In terms of performance assessment, the calculations would have to consider the placement of the canisters in shafts intersecting anhydrite layers.

Deeper Boreholes with Multiple Canisters

The wall stability is not sensitive to a deeper borehole length (Argüello and Beraún, 1987), thus suggesting that each borehole be made sufficiently deep to store two or more canisters. Emplacing multiple canisters in each borehole would require analyses of the safety of emplacement operations, of retrievability[3], and of criticality, as well as a modification of the performance assessment to be submitted to EPA for approval.

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[3]For disposal operations the 1990 WIPP FSAR maintains that easy retrieval is not necessary (U.S. DOE, 1990a, p. 1.3-2). However, in the event of a non-compliance determination during the disposal phase, the WIPP LWA requires the DOE to retrieve, to the extent practicable, any transuranic waste from the WIPP underground (U.S. Congress, 1992, Section 9 (c)(2)(B).

A Separate Disposal Horizon

The concept of creating an entirely new horizon for the disposal of RH TRU waste would require new safety analyses, criticality analyses, and a complete modification of the performance assessment calculations.[4] The DOE has also indicated that mining an entirely new horizon would probably require additional legislative action (U.S. DOE, 1991a, p. 6-4) although it is not clear as to why this might be necessary.

RH TRU Disposal in Drums

The drum configuration concept for disposal of some quantities of RH TRU waste was recommended by the RH TRU Task Force (U.S. DOE, 1991a, p. 1-4). The identified advantages for the generator sites included simpler non-destructive assay equipment, lower costs, and reduced handling requirements. However, the use of drums instead of canisters for some quantities of RH TRU waste would require major modification to the design of the RH TRU handling facilities and would require transportation safety analyses, criticality analyses, operational safety analyses, retrievability analyses, etc. The DOT type A drums are designed to keep the lid intact for a 36-inch drop. Spilling the contents of a drum with RH TRU could result in a serious contamination incident. Furthermore, any change in the geometry of the facility and the waste form or package could influence the performance assessment calculations. That information may be required as part of the performance assessment package prior to EPA approval for disposal.

Subsequent Redesign of the WIPP

While the DOE recognizes these problems could take several years to resolve, the DOE has suggested that disposal could proceed for several years using the existing design. Meanwhile, the DOE could redesign the remaining facility geometry and obtain approval for the modifications to the facility several years after obtaining

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[4]The original WIPP design provided for two horizons with RH TRU disposal intended for the lower horizon (U.S. DOE, 1979, p. 8-15, vol. 1).

the disposal decision (U.S. DOE, 1991a, p. 6-5). However, if the DOE intends to change the design of the facility for the disposal of RH TRU, then it seems prudent for the EPA to require the DOE to include the modifications in the performance assessment analyses for evaluation and certification of the facility by EPA.

3. STATUS OF THE GENERATOR AND STORAGE SITES

RH TRU waste activities at the generator/storage sites and at WIPP have been low priority (U.S. DOE, 1991a, p 1-1). Most of the activities have focused on CH TRU waste (U.S. DOE, 1991a, p. 1-1) and WIPP's preparation for receipt of CH TRU waste for the experimental test phase (U.S. DOE, 1991a, p. 3-1).[5] Hence, there are key unresolved issues for the characterization and packaging of RH TRU waste. This section summarizes the status of activities and issues at each of the six identified sites slated to send RH TRU waste (U.S. DOE, 1991a) to WIPP.

3.1 Oak Ridge National Laboratory (ORNL)

Several reports state that the inventory at ORNL accounts for more than 90% of the RH TRU waste (Stratton, 1988; Stewart, 1989; Mason, 1990; Mason, 1991; U.S. DOE, 1988a; U.S. DOE, 1990a; U.S. DOE, 1991a, p. 4-2). As other sites identified additional inventory, the fractional contribution of ORNL to the RH TRU inventory has declined slightly. A recent estimate indicates that ORNL may account for 79% of the volume of existing retrievable RH TRU waste and 72% of the existing retrievable inventory by alpha radioactivity (U.S. DOE, 1993).

The RH TRU waste at ORNL has two different forms. There are roughly 316 cubic meters of solid RH TRU waste retrievably stored in 284 concrete casks and 1900 cubic meters (500,000 gallons) of TRU contaminated liquids and sludges. The solid waste consists of cloth, paper, glass, rubber, plastic, and metal primarily packaged in 1-gallon cans and sealed in plastic buckets. The liquids and sludges are contained in underground tanks (U.S. DOE, 1991a, p. 4-2). The Waste Acceptance Criteria (WAC) precludes acceptance of any liquid waste. Treatment of the sludges, by concentration and solidification (U.S. DOE, 1991a, p. 4-2) will yield approximately 1,150 cubic meters of RH TRU waste for shipment to WIPP (Mason, 1991). The 1993 Integrated Data Base (U.S. DOE, 1994a, Tables 3-1,

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[5]On October 21, 1993, the DOE revised its WIPP strategy and decided to conduct tests with radioactive waste in laboratories instead of at WIPP and chose to devote resources to disposal certification issues (Grumbly, 1993).

3-2) indicates a total volume of retrievably stored RH TRU waste of 1,144 m^3 with a total radioactivity of 177,700 curies.

There is a need for a facility to process, characterize, package and certify RH TRU waste at ORNL (U.S. DOE, 1991a, p. 4-2). However, the Waste Handling and Packaging Plant (WHPP) proposed for construction at ORNL has experienced several delays. Initially, an operational date of 1996 was anticipated (U.S. DOE, 1988a, p. 2; Stratton, 1988). In 1990, Mason revised the projected operational date to 2000 noting that the facility was a 1993 fiscal year capital line item project. In 1991, Mason identified the proposed facility as a fiscal year 1994 capital line item project estimated to cost $240 million with the operational date slipped to 2002.

The construction delays introduce serious problems for WIPP certification as a disposal facility. The proposed ORNL RH TRU waste characterization facilities will not be operational and available before the year 2002. The DOE must characterize the radionuclide and hazardous waste content of RH TRU waste by March 1996 for inclusion in the final performance assessment calculations scheduled for submission to the EPA in December 1996 (Dials, 1994). It is not clear how this will be accomplished if the WHPP characterization facility at ORNL will not be operational until the year 2002. Without these facilities, it is also not clear how the DOE intends to identify by survey, with notice and opportunity for public comment, all the TRU waste types at all sites shipping wastes to WIPP and how the DOE can submit comprehensive recommendations to Congress for the disposal of all transuranic waste including a timetable for the disposal of such waste as required by the 1992 WIPP Land Withdrawal Act. Also, the DOE has argued that delays in the construction and operation of the ORNL facility and the proposed Waste Receiving and Processing (WRAP) Module II facility at the Hanford Site could be disastrous to the waste emplacement rate at WIPP (U.S. DOE, 1991a, p. 1-2).

3.2 Hanford Site

The Hanford Site is designing a facility to retrieve, identify, process, characterize, and package its RH TRU waste. In 1988, Louie (1988) indicated that the Waste Receiving and Processing Facility (WRAP) would be operational in 1996. Later that year, Roberts (1988) suggested that the WRAP 2 module would not be operational until September 1998. Guercie and Lipinski (1991) stated that the WRAP Module 2 would be proposed as a fiscal year 1993 line item and would not initiate operations until 1999. According to Peterson (1993) the WRAP Module 2 facility, which will process, characterize, and prepare the RH TRU waste for shipment to WIPP, is scheduled for initial operation in the year 2005 (Peterson, 1993).

Despite the long recognized need for radionuclide information for performance assessment data (Roberts, 1988), the DOE acknowledges that there will be no data available on the chemical and radionuclide content of the RH TRU waste until Hanford has a facility for processing the waste (U.S. DOE, 1991a, p. 4-5). It appears that the RH TRU waste data needed for performance assessment may not be available until after 2005. Until that time, the performance assessment effort has to rely heavily on engineering judgment and process knowledge where it is available.

3.3 Los Alamos National Laboratory (LANL)

In 1991, the DOE estimated that approximately 25 m^3 (28 canisters) of RH TRU waste would be generated by LANL for disposal in the WIPP (U.S. DOE, 1991a, p. 4-6). The more recent 1993 Integrated Data Base (U.S. DOE, 1994a, Tables 3.1, 3.2) shows an inventory of 3,460 curies contained in 78.4 m^3 of RH TRU waste.

The efforts at LANL had focused on developing and building a nondestructive assay system to estimate the radioactivity of material in one-gallon cans. The nondestructive assay system is needed to support WIPP waste certification (U.S.

DOE, 1991a, p. 1-2). Development of the system was stopped due to a shortage of funding (U.S. DOE, 1991a, p. 4-6).

3.4 Idaho National Engineering Laboratory (INEL)

INEL has interim storage facilities that have provided storage since 1976 for RH TRU waste generated by Argonne National Laboratory-East, Argonne National Laboratory West, the INEL Chemical Processing Plant, and the INEL Naval Reactor Facility. The Intermediate Level Transuranic Storage Facility (ILTSF) was established to store waste emitting between 0.2 rem per hour and 4500 rem per hour (U.S. DOE, 1991a, p. 4-5). The 1993 Integrated Data Base indicates an inventory of 10,530 curies of radioactivity in a total volume of 75 cubic meters of retrievably stored RH TRU waste (U.S. DOE, 1994a, Table 3.1).

3.5 Argonne National Laboratory-East (ANL-E)

ANL-E has no facilities for placing RH TRU waste in canisters. It is the intention of the DOE to send packaged waste from ANL-E to INEL for placement in canisters. Any waste generated by ANL-E that requires repackaging will be sent to either the WHPP at ORNL or the WRAP Module 2 at Hanford once these facilities are operational (U.S. DOE, 1991a, p. 4-6). The 1993 Integrated Data Base (U.S. DOE, 1994a, Tables 3-1, 3-2) indicates that there is no retrievably stored RH TRU waste at ANL-E.

3.6 Argonne National Laboratory-West (ANL-W)

In 1991, ANL-W was generating approximately two canisters of RH TRU waste a month. It was anticipated that beginning in 1992, the ANL-W Integral Fast Reactor Program would generate approximately 50 m^3 of waste per year (U.S. DOE, 1991a, p. 4-7).

3.7 Summary of Status of Generating/Storage Sites

The status reports strongly suggest that waste characterization ***data*** for RH TRU waste will not be available for performance assessment because the facilities needed for waste handling, waste treatment, waste packaging, and waste characterization do not yet exist. Recent reports indicate that the Waste Handling and Packaging Plant proposed for Oak Ridge will not be operational until 2002 and the Waste Receiving and Processing Facility Module 2 proposed for the Hanford Site will not be operational until 2005. The DOE does not yet have a nondestructive assay system to estimate the radionuclide inventory for much of the RH TRU waste. Uncertainty in the radionuclide inventory could make it difficult to complete, with reasonable assurance, analyses of the calculated behavior of the repository in the long-term future. The DOE may have to rely heavily on engineering judgment and process knowledge where it is available.

4. STATUS OF RH TRU SHIPPING CONTAINER

In order to transport RH TRU waste to WIPP (State of New Mexico and U.S. DOE, 1987; U.S. Congress, 1992, Section 16(a)), the DOE must obtain a certificate of compliance from the NRC for a shipping container that meets NRC 10 CFR 71 regulations (U.S. NRC, 1983). The DOE must also fabricate shipping containers that have been determined by the Nuclear Regulatory Commission to satisfy its quality assurance requirements.

The NuPac 72B has been proposed as the shipping container for transportation of RH TRU waste to WIPP (U.S. DOE, 1990c, vol. 3, p.111). The proposed cask has a payload capacity of 8000 pounds and would contain one RH TRU canister. Each canister is approximately 121 inches long, 26.5 inches in diameter and contains up to three 30-gallon or three 55-gallon drums of RH TRU waste. A more detailed description can be found in U.S. DOE, 1990c, vol. 2, pp. L-18 to L-21.

While the commitment for NRC licensing was made in 1987, the schedule has slipped. In 1988, Weaver reported a tentative revised schedule for delivery of the NuPac B2 cask. The Safety Analysis Report for Packaging (SARP) was to be submitted to the Nuclear Regulatory Commission by August 1989 for a certificate of compliance by May 1990. Road Casks were to be delivered by July 1990 (Weaver, 1988).

In 1989, Lott identified a new completion date of September 30, 1990 (Lott, 1989). As of August 1994, there is not a certified container for the shipment of RH TRU despite the long recognized need for such a shipping container (State of New Mexico and U.S. DOE, 1987). Current plans are to obtain NRC approval of the RH TRU Safety Analysis Report for Packaging (SARP) in January 1996 (Dials, 1994). The DOE provided EEG with the four volume SARP for the RH TRU Waste Shipping Package in June, 1994.

In 1988, a dual carrier system was recommended (U.S. DOE, 1988a, p. 3). The canister was to be used for the then anticipated demonstration phase[6] that would require that the RH TRU canisters be retrievable from the WIPP underground. The envisioned second carrier system would transport lower surface dose rate RH TRU waste in 55-gallon drums. A Defense Remote-Handled Transuranic Waste Cost/Schedule Optimization Study (RH C/SO) concluded that transporting RH TRU waste in drums rather than in canisters would be more cost effective (U.S. DOE, 1988a, p. 6). It was intended that the new shielded drum cask would be capable of transporting waste with surface dose rates up to approximately 100 R/hr and would be operational by 1994, the anticipated date corresponding to routine waste shipments.

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[6]The project is no longer considering an operational demonstration phase with either CH TRU or RH TRU waste.

5. CONCLUSIONS

By design, the canisters of RH TRU waste are to be emplaced in the walls (ribs) of the repository rooms. Each room will then be filled with CH TRU waste. However, the RH TRU waste will not arrive at WIPP until after several of the rooms have already been filled with drums of CH TRU waste. Hence, the rooms will not be available for RH TRU waste disposal. The DOE has identified this problem (U.S. DOE, 1991a) and has suggested exploring design modifications to the WIPP. But modification to the facility or to the disposal plans could effect the performance assessment analyses and the EPA review and certification for safe disposal at the WIPP.

Complete RH TRU waste characterization *data* will not be available for performance assessment because the facilities needed for waste handling, waste treatment, waste packaging, and waste characterization do not yet exist. The performance assessment will have to rely heavily on engineering judgment and process knowledge where it is available. Recent estimates suggest that the Waste Handling and Packaging Plant proposed for Oak Ridge will not be operational until 2002 and the Waste Receiving and Processing Facility Module 2 proposed for the Hanford Site will not be operational until 2005. Furthermore, the DOE does not yet have a nondestructive assay system to estimate the radionuclide inventory for much of the RH TRU waste. Uncertainty in the radionuclide inventory and in the physical and chemical characteristics of the RH TRU also makes it difficult to complete, with reasonable assurance, analyses of the calculated behavior of the repository in the long-term future.

The DOE does not have an NRC certified transportation cask for RH TRU waste that is required by the Second Modification to the Consultation and Cooperation Agreement (State of New Mexico and U.S. DOE, 1987) and by the 1992 WIPP Land Withdrawal Act (U.S. Congress, 1992).

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7. LIST OF ACRONYMS

ANL-E	Argonne National Laboratory-East
ANL-W	Argonne National Laboratory-West
C&C	Consultation and Cooperation
CH TRU	Contact handled transuranic
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FEIS	Final Environmental Impact Statement
FSAR	Final Safety Analysis Report
DOT	Department of Transportation
IDB	Integrated Data Base
ILTSF	Intermediate TRU Storage Facility
INEL	Idaho National Engineering Laboratory
LANL	Los Alamos National Laboratory
LWA	Land Withdrawal Act
ORNL	Oak Ridge National Laboratory
NRC	U.S. Nuclear Regulatory Commission
RH TRU	Remote handled transuranic
SARP	Safety Analysis Report for Packaging
SNL	Sandia National Laboratories
TRU	Transuranic
WAC	Waste Acceptance Criteria
WHPP	Waste Handling and Packaging Plant
WIPP	Waste Isolation Pilot Plant
WRAP	Waste Receiving and Processing

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