DOE/EIS-0244-FS/SA6

Supplement Analysis

Disposition of Plutonium-Bearing Alloys at the Plutonium Finishing Plant, 200 West Area, Hanford Site, Richland, Washington

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May 2001

INTRODUCTION

The U.S. Department of Energy (DOE) is planning to continue to disposition plutonium alloys presently stored at DOE's Plutonium Finishing Plant (PFP) located on the Hanford Site near Richland, Washington. Less than 35 kilograms (77 pounds) of plutonium are contained in plutonium alloys. Less than 28 kilograms (62 pounds) of uranium also are present. Based on current planning, a portion of the plutonium alloys will be repackaged for shipment to the Waste Isolation Pilot Plant (WIPP).

The environmental impacts of the stabilization of alloys were analyzed in DOE/EIS-0244-F, *Final Environmental Impact Statement, Plutonium Finishing Plant Stabilization* (PFP EIS), issued in May 1996[1]. In the Record of Decision (ROD, 61 FR 36352, July 10, 1996), DOE selected two alternatives: 1) batch thermal stabilization, and 2) repackaging. At the time this strategy was developed, the preferred alternative was repackaging of the alloys, with batch thermal stabilization in air as an alternative. In both cases, the stabilized materials would be stored in the vault(s) at PFP and routinely monitored until final disposition.

The purpose of this Supplement Analysis (SA), prepared in accordance with Section 1021.314 of the DOE *National Environmental Policy Act of 1969* (NEPA) regulations, is to provide a basis for a determination of whether or not a supplemental environmental impact statement (EIS) is required before preparing the alloys for shipment to WIPP (with potential interim storage until transport). The analysis in this SA incorporates the most current process knowledge and data, which reflect differences when compared with PFP EIS analyses. There is no change in the total quantity of alloys to be managed; however, the ultimate disposition of a portion of the alloys addressed in this SA would be shipment to WIPP for disposal.

Section 1502.9(c) of the Council on Environmental Quality Regulation for Implementing the Procedural Provisions of NEPA (40 CFR 1500-1508) requires the preparation of a Supplemental EIS if: (1) the agency makes substantial changes in the proposed action that are relevant to environmental concerns or (2) there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. Section 1021.314(c) of the NEPA Regulations (10 CFR 1021, 61 FR 36222, July 9, 1996) provides that where it is unclear whether a supplemental EIS is required, DOE will prepare a Supplement Analysis to support a DOE determination with respect to the criteria of 40 CFR 1502.9(c).

[1] As stated in the PFP EIS (Chapter 3.1, "Description of Plutonium-Bearing Materials Potentially Suitable for Stabilization, Removal, and/or Immobilization"), the PFP Facility contains a variety of reactive plutonium-bearing materials. For analysis purposes, the reactive materials have been grouped into four inventory categories. Each group contains materials that are chemically and physically dissimilar to materials in the other groups. Section 3.1.1.3, "Metals and Alloys," addressed one such group: approximately 770 kilograms (1,698 pounds) of plutonium metals and alloys.

BACKGROUND

The environmental impacts of the packaging of plutonium alloys, containing approximately 35 kilograms (77 pounds) of plutonium, were analyzed in DOE/EIS-0244-F, *Final Environmental Impact Statement, Plutonium Finishing Plant Stabilization* (PFP EIS), issued in May 1996. In the ROD, DOE selected two alternatives: 1) batch thermal stabilization using muffle furnaces; and 2) repackaging. Potential environmental impacts associated with both alternatives were presented in the PFP EIS, based on 100 percent of the metals and alloys being stabilized via either method.

Ongoing reviews of alloy inventory records indicate that many of the items contain less than 30 weight percent plutonium plus uranium and exhibit hazards similar to the plutonium-bearing residues. As such, these items may be suitable for discard. An effort is underway to further characterize and confirm the item contents. Those items verified to be less than 30 weight percent plutonium plus uranium may be re-categorized as miscellaneous residues and dispositioned to WIPP[2]. Preliminary evaluation results are as follows.

- Forty-two (42) of the items could be stabilized similarly to the metals processing currently underway and placed into containers compliant with DOE-STD-3013. The containers will be placed into existing vault storage pending final disposition.
- Thirty-one (31) of the items have been sufficiently characterized to be placed directly into Pipe Overpack Containers (POCs) for ultimate disposal at WIPP.
- The remaining fifty-three (53) items will be characterized further. Based on the results of characterization those items suitable for direct placement into POCs would follow the same path as the aforementioned 31 items. Those items not suitable for direct placement into POCs would be stabilized as required, placed into POCs, and ultimately sent to WIPP.

The following discussion adresses activities associated with items identified for direct placement into POCs for WIPP disposal (see Figure 1).

Potential activities associated with repackaging items identified for direct placement into POCs would be expected to be similar to those presented in Section 3.2.1.3 of the PFP EIS, *Repackaging of the Metals and Alloys*. Those activities were based on three general unit operations: inventory retrieval and feed preparation; oxide removal and thermal stabilization; and repackaging. [Note: The proposed direct placement of the plutonium alloys for disposition to WIPP would not require oxide removal/thermal stabilization.]

As described in the PFP EIS (Section 3.2.1.3), the original concept was for materials to be stabilized to DOE-STD-3013. In the aforementioned description, plutonium alloys would be retrieved from the vault and transferred to an appropriate glovebox. The containers would be vented and the contents removed. The plutonium metal would be inspected for loose oxide that may have accumulated on the surface. Any loose oxide would be brushed from the metal and collected in a slip lid container (the oxide would be thermally stabilized).

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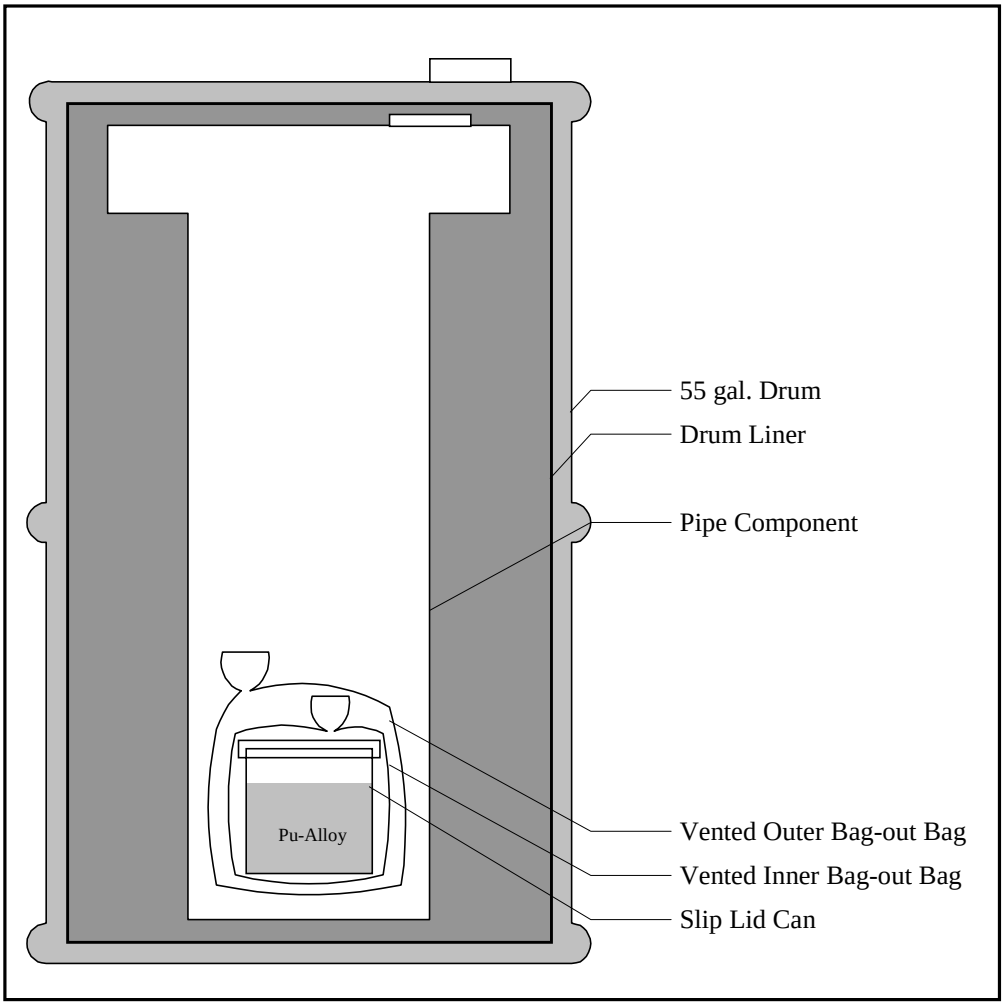
[2] *An Implementation Plan for Stabilization and Storage of Nuclear Material, The Department of Energy Plan in Response to DNFSB Recommendation 2000-1, Revision 1* (January 2001).

Figure 1. Plutonium-Bearing Alloy in WIPP Packaging.



The plutonium metal and alloy product would be packaged using a bagless transfer system[3]. Nondestructive analysis would be performed on the packaged product to determine the isotopic composition before transfer to the vault at PFP for storage.

As stated in the PFP EIS (Section 3.2.1.3), the repackaging process does not generate any offgases. However, small quantities of argon purge gas used during packaging would be removed by the glovebox ventilation system. Additional offgas would be generated during thermal stabilization of the removed oxides. This gas would include air, water, and entrained oxides. Filtered offgases would be released through the existing 291-Z-1 stack.

Solid transuranic waste generated during glovebox operations would be sent to the Hanford Site solid waste management facilities for storage. Repackaging would be accomplished at PFP using the aforementioned bagless transfer system.

COMPARISON OF CURRENT PLUTONIUM-BEARING ALLOYS DISPOSITION CONCEPT TO THE PFP EIS

Estimates of the potential environmental impacts associated with disposition of plutonium-bearing alloys at PFP are included in Chapter 5.0 ("Environmental Impacts") of the PFP EIS and are based on the total quantity of material to be stabilized at PFP. That is, the analysis in the PFP EIS considered the entire aforementioned 35 kilograms (77 pounds) of plutonium. There is no change in the total quantity of alloys (126 items) to be managed; however, the ultimate disposition of a portion of the alloys addressed in this Supplement Analysis would be shipment to WIPP for disposal.

The general unit operations proposed for disposition of the plutonium-bearing alloys are the same as presented in the PFP EIS, with the exceptions that: (1) oxide removal/thermal stabilization is not required for these items; (2) no inert atmosphere would be used for repackaging; and (3) the material would be packaged for disposition at WIPP rather than repackaging to DOE-STD-3013 for continued vault storage at PFP.

The proposed action would use an existing glovebox in the 234-5Z Building. Select alloys, based on existing inventory data, would be retrieved from the PFP vaults and transferred to the glovebox. The alloys would be removed from existing containers and placed into a slip lid can (Figure 1). The can would be bagged out of the glovebox, and the bagged can placed into a second vented bag. The double-bagged can would be placed into a pipe component, which would be inserted into a 216-liter (55-gallon) drum overpack. Appropriate non-destructive analysis (NDA) would be provided before placing in a POC. The package (i.e., POC) could be staged at PFP before transporting to the Hanford Site Central Waste Complex (CWC) in the 200 West Area for interim storage pending ultimate disposition at WIPP. Alternatively, the package could be immediately transported to CWC.

[3] The bagless transfer system is described in DOE/EIS-0244-FS/SA3, *Project W-460, Plutonium Finishing Plant Plutonium Stabilization and Packaging System, 200 West Area, Hanford Site, Richland, Washington* (March 2000).

Environmental Impacts

Overall, no substantial changes in environmental impacts (as described in the PFP EIS, Chapter 5.0, Section 5.1) are anticipated for: geology, seismology, and soils; water resources and hydrology; noise and sound levels; ecosystems; population and socioeconomic; local economy, employment, and income; population; housing; local infrastructure; environmental justice and equity; transportation; land use; and cultural resources. Specific impacts associated with construction, routine operations and accident scenarios are addressed as follows.

- Construction

It is expected that any construction activities to support packaging of plutonium-bearing alloys would be limited to minor modifications (e.g., electrical hookups) supporting glovebox operations. Similar facility modifications have been, and are being, routinely conducted on the Hanford Site and PFP. These are not atypical of commercial industrial activities, and would not be expected to present unique environmental impacts during routine construction activities or postulated accident scenarios. These minor modifications would not be expected to provide substantial impacts beyond those addressed in the PFP EIS.

- Routine Operations

A summary of potential routine operational environmental impacts associated with the current concept, compared to those presented in the PFP EIS, is shown in Table 1.

Gaseous effluents from packaging activities would be limited to glovebox air. Gaseous effluents would be released through the existing 291-Z-1 stack. As stated in the PFP EIS, from a standpoint of criteria pollutants, environmental impacts to air quality appear to be insignificant.

Table 1. Comparisons of Potential Environmental Impacts
Offgases and Effluents from the Repackaging of Metals and Alloys

Component	PFP EIS* (for entire inventory of metals and alloys	Current Concept (for 31 items)
Air quality: Releases of PM_{10} (assumed to be plutonium oxides)	0.0056 grams (1.2×10^{-5} pounds)	No brushing activities would be conducted that would generate airborne oxide.
Solid waste	Solid transuranic waste may include feed packaging material, and would not exceed design capacities of existing waste management facilities	An increase in transuranic waste would be expected because the packaged materials would be sent to WIPP for disposal.

*Extracted from PFP EIS, Chapter 3.0, Section 3.2.1.3 (based on entire inventory of metals and alloys).

Routine radiological dose consequences to the PFP Facility worker, the onsite worker, and the maximally exposed offsite individual have been considered and compared to consequences presented in the PFP EIS. The doses and calculated latent cancer fatalities (LCF) are shown in Table 2. As discussed in the PFP EIS, minimal releases to the environment of radiological constituents are anticipated due to the extensive filtration systems used at PFP. From a health effects standpoint, there would be no meaningful effect on Hanford Site workers, the public, or the environment. No change in the total inventory of plutonium-bearing alloys to be subjected to packaging in the 234-5Z Building is anticipated; therefore, the emissions through the 291-Z-1 stack would not be expected to increase as a result of the proposed action. Radioactive air emissions have been addressed in DOE/RL-96-79, Revision 0E, *Radioactive Air Emissions Notice of Construction for Stabilization of Plutonium Metal and Oxides in the Muffle Furnaces at the Plutonium Finishing Plant.*

Further, it would be expected that potential doses to PFP Facility workers would be no greater than those projected in the PFP EIS. Specifically, as noted in Table 2, worker doses projected in the PFP EIS were 180 person-rem for repackaging the entire inventory of metals and alloys. A recent dose assessment for repackaging the aforementioned 31 items (*Enhanced ALARA Committee [EAC] Report for the Room 170 residues Feed Material Change to Plutonium-Aluminum Alloy Residues*) estimated the cumulative whole-body exposure at 1.5 person-rem.

As stated earlier, 53 items require further characterization. It would be expected that, if as a result of characterization, any/all of the aforementioned 53 items are deemed suitable for direct placement in POCs, potential impacts would be very small. That is, assuming a linear relationship, the additional estimated cumulative whole-body PFP Facility Worker exposure for the 53 items would be approximately 1.7 times the calculated exposure for the 31 items, or 2.6 person-rem.

Table 2. Comparison of Potential Environmental Impacts
Radiological Dose Consequences from Repackaging Metals and Alloys, Routine Operations

	Doses			Latent cancer fatalities		
	Hanford Site worker population dose (5 workers) (person-rem)	Max. site boundary Individual (rem)	PFP Facility Worker (person-rem)	Hanford Site worker population dose (5 workers)	Max. site boundary Individual	PFP Facility Worker
PFP EIS[a] (ALL metals and alloys)	4.6×10^{-5}	1.7×10^{-6}	180	1.9×10^{-8}	8.5×10^{-10}	0.072
Current Concept[b] (for 31 items)	No change anticipated	No change anticipated	1.5	No change anticipated	No change anticipated	0.0006

a PFP EIS, Section 5.1.10.1; entire inventory of metals and alloys.
b *Enhanced ALARA Committee [EAC] Report for the Room 170 residues Feed Material Change to Plutonium-Aluminum Alloy Residues*; 31 items.

- Accident Scenarios

Accident scenarios were considered in the PFP EIS for metals and alloys. It was noted therein (Section 5.1.10.2) that repackaging of plutonium metals and alloys to DOE-STD-3013 would present the lowest accident-related risk of all the stabilization activities presented in the PFP EIS. Nevertheless, with the exception of an explosion, all of the accident scenarios and frequency of occurrence information for muffle furnace operations also were applicable to repackaging (due to thermal stabilization of the brushed oxide powder). Thus, the bounding accident scenario was postulated to be an explosion and/or fire during muffle furnace operations. The total amount of material at risk in the process glovebox during the repackaging step was considered to be 1,400 grams (3.1 pounds) of plutonium. Extrapolation based on a muffle furnace accident scenario resulted in a dose to a PFP Facility worker of 52 rem (equating to 0.04 latent cancer fatalities[4]).

For the current concept, the bounding accident scenario for packaging alloys is considered to be a spill of plutonium oxide as described in the *Plutonium Finishing Plant Final Safety Analysis Report* (FSAR, HNF-SD-CP-SAR-021, Rev. 2). [Alloys are much less dispersible than plutonium oxide; thus, the use of powder bounds the potential consequences associated with alloys.] For the purpose of the FSAR it was assumed that the entire contents of a 2.5 kilogram (5.5 pound) container containing plutonium oxide powder spilled onto the floor outside a glovebox. In that analysis it was assumed that 0.003 kilograms (0.007 pounds) becomes airborne immediately. As stated in the FSAR, given the existing ventilation system, only 1.5×10^{-6} kilograms (3.3×10^{-6} pounds) of plutonium would be released from the main exhaust stack. This is below the 2×10^{-5} kilogram (4.4×10^{-5} pound) acceptance criteria for a stack release per DOE guidelines established and documented in HNF-SD-CP-SAR-021, Rev. 2 (Section 9.4.2.1).

[4] The information in the PFP EIS incorrectly provided 0.02 latent cancer fatalities. The correct conversion of 52 rem PFP Facility worker dose equates to 0.04 latent cancer fatalities (ICRP 60, 1990, *Recommendations of the International Commission on Radiological Protection*, page 20 [paragraph 83], Pergamon Press, New York, 1991).

CONCLUSION

The proposed action for packaging plutonium-bearing alloys at PFP for disposition at WIPP is not changed substantially in matters relevant to environmental concerns from the packaging process analyzed in the PFP EIS. There are no significant circumstances or new information relevant to environmental concerns associated with the proposal. Therefore, no supplemental EIS is necessary, and no additional NEPA review is required.

Issued at Richland, Washington, this 4th day of May, 2001.

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REFERENCES

10 CFR 1021, "National Environmental Policy Act Implementing Procedures," *Code of Federal Regulations.*

40 CFR 1500, "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act," *Code of Federal Regulations*, as amended.

42 U.S.C. && 4321 et seq., "National Environmental Policy Act of 1969," *United States Code*, as amended.

61 FR 36352, July 10, 1996, *Record of Decision for Plutonium Finishing Plant Stabilization Final Environmental Impact Statement, Hanford Site, Richland, WA.*

DOE/EIS-0244-F, *Final Environmental Impact Statement, Plutonium Finishing Plant Stabilization.*

DOE/EIS-0244-FS/SA3, *Project W-460, Plutonium Finishing Plant Plutonium Stabilization and Packaging System, 200 West Area, Hanford Site, Richland, Washington.*

DOE/RL-96-79, Revision 0E, *Radioactive Air Emissions Notice of Construction for Stabilization of Plutonium Metal and Oxides in the Muffle Furnaces at the Plutonium Finishing Plant.*

DOE-STD-3013-96, *Criteria for Safe Storage of Plutonium Metals and Oxides* [current standard dated 2000].

FH 2001, *Enhanced ALARA Committee [EAC] Report for the Room 170 residues Feed Material Change to Plutonium-Aluminum Alloy Residues*, April 4, 2001.

HNF-SD-CP-SAR-021, Rev. 2, *Plutonium Finishing Plant Final Safety Analysis Report*, February 2001, Fluor Hanford, Richland, Washington.

ICRP 60, 1990, *Recommendations of the International Commission on Radiological Protection*, page 20 [paragraph 83], Pergamon Press, New York, 1991).

U.S. DOE 2001, *An Implementation Plan for Stabilization and Storage of Nuclear Material, The Department of Energy Plan in Response to DNFSB Recommendation 2000-1, Revision 1*.