DOE/EIS-0244-FS/SA4

Supplement Analysis

Changes to the Immobilization Alternative, Plutonium Finishing Plant, 200 West Area, Hanford Site, Richland, Washington

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INTRODUCTION

The U.S. Department of Energy (DOE) is considering restart of activities to immobilize bulk plutonium-bearing materials presently stored at DOE's Plutonium Finishing Plant (PFP) located on the Hanford Site near Richland, Washington. Some of the material may be immobilized by cementation as described in DOE/EIS-0244-F, *Final Environmental Impact Statement, Plutonium Finishing Plant Stabilization* (PFP EIS). However, DOE is considering an alternate method (direct packaging of plutonium-bearing materials in the pipe-container-in-drum [i.e., 'pipe-and-go']) for packaging all or part of the material.

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 start of the pipe-and-go process at PFP.

Section 1502.9(c) of the Council on Environmental Quality Regulation for Implementing the Procedural Provisions of NEPA, Title 40 Code of Federal Register (CFR) Parts 1500-1508, requires the preparation of a supplemental environmental impact statement (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 DOE 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).

BACKGROUND

The environmental impacts of the immobilization alternative for approximately 3,800 kilograms (8,400 pounds) of bulk materials were analyzed in DOE/EIS-0244-F, *Final Environmental Impact Statement, Plutonium Finishing Plant Stabilization* (PFP EIS), which was issued in May 1996. This represents approximately 0.3 metric tonnes (600 pounds) of plutonium. Two sources of plutonium-bearing materials potentially suitable for immobilization were identified in the PFP EIS:

- some materials currently stored in the PFP vaults
  - oxides less than 50 weight percent plutonium;
  - process residues (ash; sand, slag and crucible); and
  - miscellaneous/other combustibles.

- readily retrievable hold-up materials
  - material removed from ductwork;
  - material removed from piping; material removed from gloveboxes; and
  - material removed from the canyon area.

In the Record of Decision (61 FR 36352, July 10, 1996), DOE determined that "Plutonium-bearing material having low plutonium content (less than 50 weight percent) and meeting criteria established by DOE may be immobilized through a cementation process at the PFP Facility. All immobilized material will be transferred to solid waste management facilities at the Hanford Site and, as a consequence, will be

removed from safeguards control." In addition, it was stated in the Record of Decision that "The immobilization process will include a cementation step which will fix the plutonium-bearing material into a solid matrix, packaging the cemented materials into appropriate shipping containers, and transporting the containers to a Hanford Site solid waste management facility for storage."

Approximately 220 kilograms (484 pounds) of bulk plutonium-bearing materials (sand, slag, and crucible) were immobilized during a 3-month period between October 1996 and January 1997. The product was contained in sixteen 208-liter (55-gallon) metal drums. In January 1997, DOE suspended PFP fissile material movement operations, which included cementation processing.

Immobilization, as described in Chapter 3 and Appendix E of the PFP EIS (DOE/EIS-0244-F), consists of cementing candidate plutonium-bearing materials (containing approximately 0.3 metric tonne of plutonium), packaging the cemented materials in appropriate ship ping packages, and transporting the packages to a Hanford Site solid waste management facility. The analysis in Appendix E focused on a pipe-container-in-drum packaging method, which would result in cemented cans of waste stacked three high in a pipe centered in a 208-liter (55-gallon) drum. It was projected that approximately sixteen hundred 208-liter (55-gallon) drums would result from this packaging method. An upper limit of approximately 200 grams (0.44 pound) of plutonium could be placed in a single drum (administrative limits reduced this to approximately 170 grams [0.37 pound]). At the time, it appeared that the pipe-container-in-drum was the best packaging method. This method was proposed (in the PFP EIS) because it is desirable to minimize the number of packages for a number of reasons: (1) less handling is required with fewer drums, thereby reducing worker exposure; (2) both onsite and offsite transuranic waste storage capacities are limited; and (3) the costs associated with handling, shipping, and storing the packages are reduced.

In the PFP EIS, alternative methods for packaging cemented plutonium-bearing materials also were considered by DOE. Potential packages included 208-liter (55-gallon) drums, standard waste boxes, 208-liter (55-ga llon) drums overpacked in standard waste boxes, and pipe-container-in-drums. Any of these packages could meet the waste acceptance criteria for packaging. In 1997, DOE prepared a supplement analysis specifically to address potential impacts of packaging cemented material directly in a 208-liter (55-gallon) drum without a pipe component. DOE concluded that this alternative packaging method did not change the impacts to the environment compared to the pipe-container-in-drum (DOE/EIS-0244-FS/SA1, *Supplement Analysis for the Immobilization of Plutonium-Bearing Materials at the Plutonium Finishing Plant, Hanford Site, Richland, Washington*, March 1997).

As stated in the PFP EIS (Appendix E, Section E.4), appropriate immobilization and packaging methods were selected based on their ability to satisfy waste acceptance criteria as well as worker safety and economic considerations. From the PFP EIS (Appendix E, Section E.4.1):

> "A cement system would be a reasonable immobilization method because: 1) it meets the Hanford Site solid waste acceptance criteria; 2) the ingredients are inexpensive, safe, and readily available; 3) the equipment required can be very simple; 4) the final waste form has proven stability; and 5) the method has been used extensively at the Hanford Site for immobilizing wastes."

Since the preparation of the PFP EIS, changes in waste acceptance criteria have provided new opportunities for packaging plutonium-bearing materials for ultimate disposition to the Waste Isolation Pilot Plant (WIPP). For example, a primary driver for cementation of materials was to meet a particle size requirement that has since been removed from the WIPP waste acceptance criteria. Additionally, nondestructive analyses (providing data necessary to satisfy safeguards/WIPP requirements) are more

efficient when the plutonium is not in a cementatious matrix.[1] Cementation would continue to provide appropriate treatment for any plutonium-bearing materials exhibiting the waste characteristic of reactivity and ignitability. A technical evaluation, *Pipe-and-Go vs. Cementation Technical Evaluation* (dated February 17, 1999), has been prepared which addresses WIPP requirements for storage, transfer and disposal of material directly packaged without the cement matrix.

PIPE-AND-GO PROCESS FOR IMMOBILIZATION OF PLUTONIUM-BEARING MATERIALS

The pipe-and-go process would be conducted at the PFP Facility. The PFP Facility is located in the 200 West Area of the Hanford Site. The PFP Facility is approximately 11 kilometers (7 miles) from the Columbia River, the nearest natural watercourse. The nearest population center is the city of Richland, about 51 kilometers (32 miles) away.

Detailed descriptions for both cementation and pipe-and-go are provided in *Engineering Study Providing the Dose for the Plutonium Finishing Plant Residues Project Based on Current Facility Design* (HNF-6719, Revision 0). The pipe-and-go process involves transferring candidate feed materials to glovebox, sieving/size reduction (as appropriate), and blending with a chemically compatible diluent. Such a diluent (e.g., a mixture of solid silica and graphite) is intended to meet safeguard requirements for waste materials. The blended material would be placed into appropriate containers, which would be transported to a Hanford Site solid waste management facility for storage, with requisite safeguards and security in place. A simplified schematic of the pipe-and-go process is provided in Figure 1.

COMPARISON OF THE CURRENT IMMOBILIZATION ALTERNATIVE CONCEPT TO THE PFP EIS

Estimates of the potential environmental impacts associated with immobilization of the plutonium-bearing materials at PFP are included in Chapter 5 of the PFP EIS ("Environmental Impacts").

In addition to adding the pipe-and-go process to the immobilization alternative, there is a change in the total quantity of material to be immobilized and stored onsite in an existing solid waste management facility. The PFP EIS (and ROD) addressed oxides consisting of less than 50 weight-percent plutonium content as a candidate material suitable for immobilization. DOE presently is considering only those oxides less than 30 weight-percent plutonium as candidate material.[2] This represents a decrease of approximately 0.1 metric tonne (200 pounds) of plutonium for immobilization. It would be expected that the decrease of material to be discarded would reduce the number of 208-liter (55-gallon) drums resulting from immobilization; i.e., the PFP EIS projection of 1,600 drums provides a bounding scenario.

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[1] The pipe-and-go process would include performance of a safeguards-accepted and WIPP-certified nondestructive assay (NDA) for plutonium content prior to final packaging of the plutonium-bearing materials. By performing this assay before final packaging, the NDA error is reduced which would allow higher quantities of plutonium to be placed in each container. This would reduce the number of containers needed. Cementing material that can be repackaged via pipe-and-go can introduce potential error in plutonium content due to material gain or loss during handling. The material needs to be assayed before it is cemented because of the inability to obtain an accurate count of the cemented material.

[2] The 30-weight percent plutonium distinction for material disposition is considered in DOE Standard DOE-STD-3013-99, *Criteria for Safe Storage of Plutonium Metals and Oxides*.

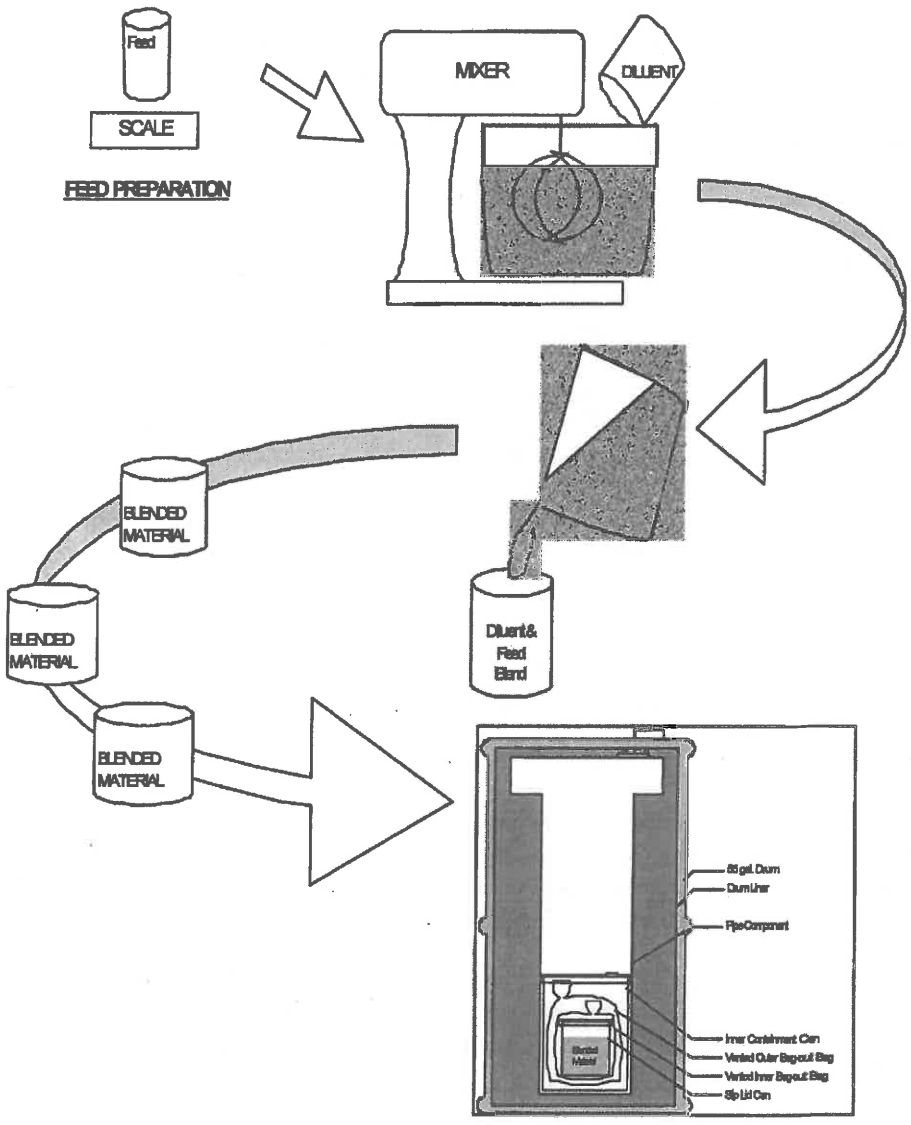

Figure 1. Schematic of Pipe-and-Go Process.

Minor modifications to PFP might be required to ensure sufficient storage for drums before transport to an onsite waste management storage facility. Modifications could include (but not be limited to): tie-ins to existing electrical/security/fire utilities; application of sealant to floors; and appropriate placarding.

Minor modifications to the Hanford Site Central Waste Complex may be required to implement appropriate safeguards, consistent with actions identified in *Vulnerability/Risk Analysis Summary for Theft of Package Residues at PFP* (FH-0003943). Such actions are being undertaken to provide enhanced capabilities for material storage at the Central Waste Complex. Modifications could include (but not be limited to): installation of security barriers; tie-ins to and extension from existing electrical/security utilities; and upgrades to facility access systems.

The receipt and storage of waste at the Central Waste Complex, including the PFP materials addressed herein, are consistent with ongoing and planned operations. Environmental impacts associated with waste acceptance, waste handling, Central Waste Complex environmental monitoring or storage operations are not expected to change; however, appropriate safeguards and security will be provided consistent with the aforementioned vulnerability assessment summary.

Overall, no substantial changes in environmental impacts (as compared to the description provided in the PFP EIS, Chapter 5, Section 5.1) are anticipated for geology, seismology, and soils; water resources and hydrology; air quality; 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 PFP impacts associated with construction, routine operations, and an accident scenario are discussed in the following text.

Construction Impacts

Minor modifications (e.g., utility tie-ins) to the existing PFP would be provided. These are not atypical of commercial industrial activities, and would not be expected to present significant environmental impacts.

Routine Operations Impacts

As discussed in the PFP EIS, minimal releases to the environment of radiological constituents are anticipated because of 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. As stated earlier, the total inventory of material to be immobilized would decrease when compared to the PFP EIS.

As shown in Table 1, the total projected PFP EIS worker dose for routine operations was estimated to be approximately 74 person-rem. This value was calculated based on detailed assumptions provided in Appendix E of the PFP EIS. As noted earlier, materials suitable for immobilization included both vault and readily retrievable hold-up materials.

A recent dose study (*Engineering Study Providing the Dose for the Plutonium Finishing Plant Residues Project Based on Current Facility Design* [HNF-6719, Revision 0]) evaluated immobilization scenarios for the following vault materials[3]: ash (approximately 1,000 kilograms bulk weight); <30 weight percent oxide (approximately 325 kilograms bulk weight); compounds, combustibles, and miscellaneous materials (approximately 33 kilograms bulk weight); and sand, slag and crucible (approximately 2,400 kilograms bulk weight). The study considered current PFP requirements (e.g., requisite non-destructive analysis testing) and conditions (e.g., current background radiation levels and personnel

[3]Readily retrievable hold-up materials were not considered in HNF-6719.

requirements). This study shows that for a given category of material, the PFP Facility worker dose is a factor of approximately 1.3 less using the pipe-and-go method versus cementation. Specifically, as shown in Table 2, the total potential PFP Facility worker dose for pipe-and-go of candidate materials is estimated to be approximately 61 person-rem; cementing the same inventory would result in a calculated PFP Facility worker dose of approximately 89.5 person-rem. It is expected that, while both estimates are comparable to the projection in the PFP EIS, the pipe-and-go scenario best represents the potential path forward. Thus, while radiological risks would continue to be present under routine immobilization operations scenarios (cementation or pipe-and-go), the risks would remain small. Table 2 also shows potential latent cancer fatalities which would be expected as a result of the proposed action.

Accident Scenario Impacts

Accident scenarios were analyzed in the PFP EIS for immobilization activities. The bounding accident scenario was postulated to be an explosion and/or fire during immobilization. For example, an explosion occurring during a glovebox operation could over-pressurize the glovebox and result in the release of plutonium and americium to the room (refer to PFP EIS, Appendix E, Section E.5.1.2, for detailed discussion of immobilization accident scenario). Table 1 shows the projected impacts from a bounding accident associated with an event during immobilization, which has not changed since the PFP EIS was issued. No new information has been identified regarding potential accident scenarios associated with the proposed immobilization scenarios.

Table 1. Estimated Doses and Health Effects from Immobilization Activities; PFP EIS Routine Operations and Accident Scenario*.

	Doses (effective dose equivalent)			Latent Cancer Fatalities		
	Maximum Onsite Hanford Worker (rem)	Maximum. Site Boundary Individual (rem)	PFP Workers (person-rem)	Maximum Onsite Hanford Worker	Maximum Site Boundary Individual	PFP Workers
Routine operations	1.2×10^{-4}	2.3×10^{-5}	74	4.8×10^{-8}	1.2×10^{-8}	3.0×10^{-2}
Accident scenario	1.6×10^{-4}	5.7×10^{-5}	210	6.4×10^{-8}	2.8×10^{-8}	8.4×10^{-2}

* From PFP EIS, Appendix E, Tables E-3 and E-4.

Table 2. Estimated Doses and Health Effects from Immobilization Scenarios from HNF-6719; PFP Facility Workers, Routine Operations.

Material type	Cementation		Pipe-and-go	
	Dose (person-rem)	Latent cancer fatalities	Dose (person-rem)	Latent cancer fatalities
Ash	~31.1*	1.2×10^{-2}	23.9	9.6×10^{-3}
Oxides (<30 weight percent plutonium)	19.4	7.8×10^{-3}	15.1	6.0×10^{-3}
Compound residues	0.6	2.4×10^{-4}	0.5	2.0×10^{-4}
Combustibles residues	0.5	2.0×10^{-4}	0.4	1.6×10^{-4}
Miscellaneous residues	1.3	5.2×10^{-4}	1.0	4.0×10^{-4}
Sand, slag and crucible	36.6	1.5×10^{-2}	20.4	8.2×10^{-3}
Total	89.5	3.6×10^{-2}	61.3	2.5×10^{-2}

*Current planning does not consider ash a candidate for cementation. Dose obtained by increasing pipe-and-go value by a factor of 1.3 (i.e., 23.9 x 1.3 = 31.1).

CONCLUSION

The proposed action for immobilizing candidate plutonium-bearing materials (i.e., by cementation or pipe and go) at PFP substantially is not changed in matters relevant to environmental concerns from the immobilization process analyzed in the PFP EIS. There are no significant circumstances or new information relevant to environmental concerns associated with the proposal, which would preclude immobilizing candidate materials by either cementation or pipe and go, individually or collectively. Therefore, no supplemental EIS is necessary, and no additional NEPA review is required.

Issued at Richland, Washington, this 15 day of August, 2000.

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