DOE/EIS-0245-FS/SA2

Supplement Analysis

Alternate Fuel Transfer for the 105-KE Basin Spent Nuclear Fuel, 100 K Area, Hanford Site, Richland, Washington

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INTRODUCTION

The U.S. Department of Energy (DOE) is planning to transfer spent nuclear fuel (SNF) from the 105-KE Basin (KE) to the 105-KW Basin (KW) to package the SNF into multi-canister overpacks (MCOs) using existing equipment at KW. The MCOs would be transported to the existing Cold Vacuum Drying Facility (CVDF) at KW for vacuum drying and transferred to the 200 East Area Canister Storage Building (CSB). Approximately 1,200 metric tons (1,323 tons) of SNF are stored under water in 3,673 open canisters[1] at KE. Approximately 1,000 metric tons (1,102 tons) of SNF are stored under water in 3,817 closed containers at KW.

The environmental impacts of the management of SNF from the K Basins were analyzed in an environmental impact statement (EIS): DOE/EIS-0245F, *Management of Spent Nuclear Fuel from the K Basins at the Hanford Site, Richland, Washington*, issued in January 1996 (hereafter referred to as the K Basins EIS). In the *National Environmental Policy Act* (NEPA) *of 1969* Record of Decision (ROD, 61 FR 10736, March 15, 1996), DOE selected the preferred alternative that consists of "...removing the SNF from the basins, vacuum drying, conditioning and sealing the SNF in inert gas filled canisters for dry vault storage in a new facility, to be built at Hanford, for up to 40 years pending decisions on ultimate disposition. The K Basins will continue to be operated during the period over which the preferred alternative is implemented". The environmental impacts associated with the preferred alternative considered packaging the SNF at the respective basin.

When the DOE schedule for implementing the preferred alternative was delayed, activities to mitigate the potential to release radioactive substances from the K Basins to the environment were brought under the authority of the *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA) *of 1980*. A CERCLA Focused Feasibility Study (DOE/RL-98-66, *Focused Feasibility Study for the K Basins Remedial Action*, April 1999) adopted the analyses of environmental impacts provided in DOE/EIS-0245F. A CERCLA ROD was issued in September 1999 (*Record of Decision for the USDOE Hanford 100-KR-2 Operable Unit K Basins Interim Remedial Action*).

The purpose of this Supplement Analysis (SA), prepared in accordance with Section 1021.314 of the DOE NEPA regulations, is to provide a basis for a determination of whether or not a supplemental EIS is required before transferring the KE SNF to KW. The analysis in this SA incorporates the most current process knowledge and data, which reflect differences when compared with K Basins EIS analyses.

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

[1] This SNF has been stored for varying periods of time ranging from 8 to 24 years. The fuel is corroding and an estimated 50 cubic meters (1,800 cubic feet) of sludge, containing radionuclides and miscellaneous materials, have accumulated on the floor of KE. KE has leaked water and radionuclides to the soil beneath the basin.

whether a supplemental EIS is required, DOE will prepare a SA to support a DOE determination with respect to the criteria of 40 CFR 1502.9(c).

BACKGROUND

The environmental impacts of the disposition of K Basins SNF were analyzed in the K Basins EIS. The following is extracted from the NEPA ROD:

> *"The preferred alternative is referred to in the FEIS as 'drying/passivation (conditioning) with dry vault storage'. In addition to construction of a staging/storage building at the Canister Storage Building (CSB) site, the proposed series of operations to achieve the preferred alternative is presented below. The details of the processes and perhaps their order are expected to change somewhat as the designs evolve and as the results of ongoing testing become available. However, the impacts of the following steps bound those necessary to place the K Basins SNF in safe dry storage:*
>
> - *Continue K Basin operations until the removal of SNF, sludge and debris, and disposition of the water is completed. Make modifications to the K Basins, as necessary, for maintenance, monitoring and safety, and provide systems necessary to support the activities described below*
> - *Remove K Basin SNF from existing canisters, clean and desludge*
> - *Repackage the SNF into fuel baskets designed for multi-canister overpack (MCO) dimensions, that would include provision for water removal, SNF conditioning requirements, and criticality control*
> - *After loading SNF into the MCOs and draining the MCOs, dry the SNF under vacuum at approximately 50°C (120°F), flood the MCOs with inert gas, seal penetrations, and place in transportation casks*
> - *Transport the SNF (in MCOs) in these casks via truck to the Canister Storage Building (CSB) site in the 200 East Area, and provide for temporary vented staging as necessary."*

Subsequent process design analyses and characterization data resulted in a re-assessment of the SNF drying process. The aforementioned information was addressed in DOE/EIS-0245/SA1, *Supplement Analysis of Environmental Effects of Changes in DOE's Preferred Alternative for Management of Spent Nuclear Fuel from the K Basins at the Hanford Site, Richland, Washington* (August 1998). Included therein is a provision that at the CSB, MCOs will be removed from the transportation casks, weld-sealing a final cover on the MCOs containing the SNF in an inert gas, and placing the MCOs in dry interim storage in a vault for up to 40 years.

One of the alternatives analyzed in the K Basins EIS (but not selected in the ROD) was the 'Enhanced K Basins Storage Alternative', which involved consolidation of the SNF in KW for long-term, wet storage. One component of this alternative was the transfer of containerized fuel from the KE to KW. That is, existing canisters of KE SNF could be repackaged at KE after installation of appropriate equipment at KE. The containerized fuel would be placed within MCOs, loaded into a shipping cask, and transferred approximately 0.4 kilometer (0.3 mile) to KW.

Since the NEPA ROD was issued, the K West Fuel Removal System has been constructed and operated, successfully transferring SNF from KW to the CVDF and CSB. Ongoing evaluations aimed at reducing personnel exposure and cost and schedule have prompted DOE to reconsider SNF consolidation at KW.

DESCRIPTION OF PROPOSED KE BASIN TO KW BASIN SNF TRANSFER

The following is a summary of the proposed alternate fuel transfer, which is shown schematically in Figure 1.

As shown in Figure 1, sludge in SNF canisters in KE would be removed via vacuum and placed into containers and stored for eventual transport to T Plant[2]. The SNF canisters would be moved to the KE loadout location and placed into a cask. The cask would be loaded (and unloaded) underwater. For conservatism, it is assumed that the capacity of the transfer cask is 10 canisters of SNF (representing approximately 400 transfers to move all the KE SNF canisters to KW). The cask would be decontaminated to the degree practicable. The cask would be placed into a contamination boundary overpack to provide containment of contamination during transfers.

The cask/overpack would be transferred to an appropriate transfer vehicle (e.g., lowboy trailer). The cask/overpack would be moved overland approximately 0.4 kilometer (0.3 mile) to KW. The cask would be removed from the overpack and transferred to the receiving location in KW, where the SNF canisters would be removed and placed within KW for storage.

The process essentially would be reversed to decontaminate and remove the cask/overpack from KW and return the cask, empty, to KE for reuse.

It is expected that a substantial quantity of KW SNF will have been transferred to CVDF/CSB before initiation of the KE SNF transfers, thereby providing sufficient space to accommodate the KE SNF in KW. Consideration would be given to prioritizing the transfer of KE SNF to CVDF/CSB.

POTENTIAL ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

Estimates of the potential environmental impacts associated with management of SNF at the 105-K Basins are included in Chapter 5.0 ("Environmental Consequences") of the K Basin EIS.

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[2] Additional details regarding sludge are found in the aforementioned CERCLA ROD and in DOE/EA-1369, *Environmental Assessment, K Basins Sludge Storage at 221-T Building, Hanford Site, Richland, Washington* (June 2001).

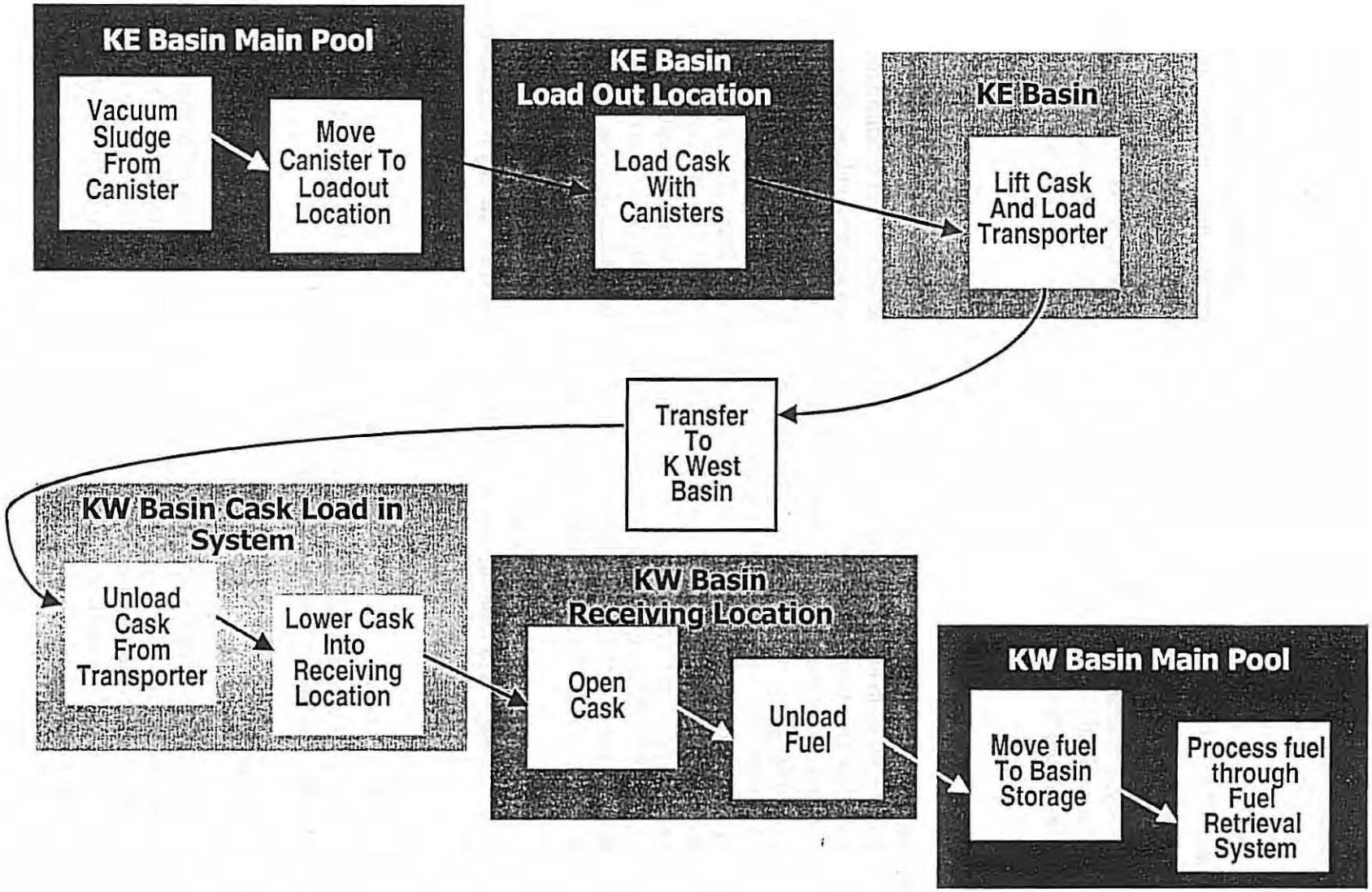

Figure 1. Proposed Alternate Fuel Transfer.

Environmental Impacts

Overall, no substantial changes in environmental impacts (as described in the K Basin EIS, Chapter 5.0, for the 'Enhanced K Basins Storage Alternative') are anticipated for the following: land use, socioeconomics, cultural resources, aesthetic and scenic resources, geologic resources, air quality and related consequences, water quality and related consequences, ecological resources, noise, transportation, site services, waste management, cumulative impacts including past and reasonably foreseeable actions, adverse environmental impacts that cannot be avoided, the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity, irreversible and irretrievable commitment of resources, potential mitigation measures, environmental justice, and the estimated 40-year storage and life-cycle costs. Specific impacts associated with construction, routine operations, and accident scenarios are addressed as follows.

- Construction

It is expected that construction activities at KE and KW to support the proposed action would be limited to minor modifications to existing equipment, or fabrication of similar fuel handling tools used at KW for use at KE. Modifications to the KE and KW crane/monorail systems and ancillary equipment would be required to ensure load capacity. Modifications and equipment-fabrications have been, and are being, conducted routinely on the Hanford Site and at 105-K Basins. These are typical commercial industrial activities, and would not be expected to provide substantial adverse environmental impacts beyond those addressed in the aforementioned K Basin EIS. In fact, the proposed action would eliminate the need for installation of a K East Fuel Removal System and K East Cask Loadout System, and would reduce the projected personnel dose. Preliminary engineering evaluation (SNF-7279, *Engineering Study of Alternative Fuel Transfer Strategy*) indicates that a potential personnel dose for construction activities associated with the proposed action could range between 32 person-rem and 64 person-rem.

A cask/overpack specifically designed for moving SNF between KE and KW would be constructed. The new cask would be designed to minimize the number of cask transfers, thereby minimizing operational dose.

- Routine Operations

Potential consequences from routine operations to the offsite individual, onsite personnel, and KE and KW personnel associated with the proposed action have been evaluated.

Offsite and onsite personnel

Radiological gaseous effluents from KE SNF removal and transfer were calculated in the K Basins EIS. As discussed therein (Section 5.7.1, specifically for fuel removal and transfer to the KW Basin in the 'Enhanced K Basins Storage Alternative'), the potential dose and consequences to the offsite resident and onsite personnel from containerization and removal of the entire inventory of SNF from KE were projected to be small.

For current operations, potential radiological airborne emissions from the K Basins have been documented in two approved air operating permits; i.e., notices of construction (NOC): DOE/RL-96-101, *Radioactive Air Emissions Notice of Construction Fuel Removal for 105-KE Basin* and DOE/RL-97-28, *Radioactive Air Emissions Notice of Construction Fuel Removal for 105-KW Basin.* Because KW has less sludge and overall lower levels of smearable contamination, the particulate emission estimates for KW was bounded by adopting the emission estimates associated with KE, even though the SNF in KW is in closed canisters versus the open canisters in KE. In the referenced NOCs, the resultant estimated abated total effective dose equivalent to the maximally exposed offsite individual was calculated as 2.6 x 10-3 millirem/year (the sum of KE and KW, current baseline). This dose was based on a total release of 4.8 x 10-3 curies[3], less tritium and krypton-85 that contribute less than one percent of the offsite dose. The proposed action would not result in an increase in estimated radioactive releases to the environment, and therefore, potential offsite doses would remain small and below regulatory guidelines.

K Basins Personnel

Total projected facility worker dose as presented in the K Basins EIS ranged from approximately 900 – 1500 person-rem, depending upon the alternative. Specifically, in the 'Drying/Passivation Alternative,' a range of radiological exposure to workers was estimated to be approximately 960 -1,200 person-rem. A portion of the total dose (approximately 365.6 person-rem) was attributed to KE/KW facility operations, fuel retrieval, fuel drying and fuel loading/transport. Those doses are summarized in Table 1, as extracted from WHC-SD-SNF-TI-013, *K Basins Environmental Impact Statement Technical Input.*

Table 1. Partial facility worker dose (person-rem) for specific activities associated with the 'Dry Storage Conditioning Alternative'*

Activity	KE	KW
Operations	40.6	2.0
Fuel retrieval	33.8	0.6
Load fuel into MCO	168.2	113.6
Transport fuel	3.4	3.4
Total facility worker dose	246.0	119.6

* Extracted from WHC-SD-SNF-TI-013, *K Basins Environmental Impact Statement Technical Input.*

For the proposed action discussed in this SA, preliminary K Basins personnel dose consequences associated with routine operations have been estimated. As discussed in SNF-7279, the K Basins personnel dose during operations could range between 86 and 133 person-rem. Therefore, as shown in Table 2, the maximum total estimated dose to K Basins personnel (construction plus retrieval/consolidation operations) for the proposed action is approximately 197 person-rem (the aforementioned 64 person-rem plus 133 person-rem). Additionally, packaging the KE SNF into MCOs (once at KW) and transferring to the CVDF would result in a maximum estimated K Basins personnel dose of 203 person-rem.

[3] Radionuclides included in the aforementioned NOC dose calculations are cobalt-60, strontium-90, ruthenium-106, cesium-137, plutonium-238, plutonium 239/240, plutonium-241, and americium-241.

Table 2. Projected Total K Basins Facility Worker Dose (Person-Rem) for Transferring KE Spent Nuclear Fuel to the Cold Vacuum Drying Facility.*

Activity	Baseline	Proposed alternative fuel transfer
Construction		
• 105 KE Basin Modifications**	250	64
Operations		
• Retrieve KE SNF, repackage SNF in MCOs in KE, transfer to CVDF	75	--
• Retrieve KE SNF, place existing canisters into cask, transfer to KW		133
• Retrieve KE SNF that was transferred to KW, repackage SNF in MCOs in KW, and transfer to CVDF		6
Total Estimated Construction and Operations Dose	325	203

*Extracted from SNF-7279, *Engineering Study of Alternative Fuel Transfer Strategy.*
**Facility worker dose from 105 KW modifications to support KE SNF transfer is not included in the construction impacts. Preliminary calculations indicate facility worker dose would be negligible (i.e., ~0.4 person-rem).

For comparison, the projected K Basins personnel dose associated with transfer of KE SNF to CVDF under the current baseline also is shown in Table 2. The baseline assumptions include modifying KE for MCO loading capability, and transferring loaded MCOs to the CVDF. The total estimated K Basins personnel dose (construction and operations) under baseline conditions is 325 person-rem.

Thus, while the K Basins personnel dose during operations is higher for the proposed alternate fuel transfer when compared to the current baseline, the total K Basins personnel dose is substantially smaller as a result of less construction. Further, the projected K Basins personnel dose of 203 person-rem for the proposed action is bounded by projected doses analyzed in the K Basins EIS (see Table 1).

SNF Transfer

SNF transfer impacts associated with routine operations would be bounded by those presented in the K Basins EIS. As stated therein (Section 5.11.1), for all SNF handling options, the expected number of fatalities, for both truck and rail, would be less than 4.8×10^{-7} (onsite) for the entire campaign. Current planning does not consider rail movement.

- Accident Scenarios

Accident scenarios were considered in the K Basins EIS for SNF removal. As stated in the aforementioned K Basins EIS, bounding plausible accidents for fuel removal from the K Basins are similar to those discussed in the no action alternative, except that larger quantities of fuel might be

handled in a single operation when transferring the fuel in MCOs. In the K Basin EIS (Section 5.15.5), a crane failure accident with a loaded MCO was evaluated, wherein an MCO in the process of placement or retrieval is dropped by lifting equipment or human failure. The MCO falls to the floor of the storage area. The drop causes a release of MCO contents (fuel, sludge, and water) to the staging area floor, resulting in an airborne release. The consequences of this accident in terms of dose and risk of latent cancer fatalities in the exposed population were calculated. In this scenario, the maximum individual dose is 0.78 rem for onsite personnel. The collective dose to the offsite population (i.e., 2,400 person-rem using 95 percent meteorology) would result in at most two latent cancer fatalities if the accident occurred. It would be expected that this accident scenario would bound potential consequences associated with the proposed action.

Additionally, an accident could occur during overland transfer between KE and KW. As stated in the K Basins EIS (Section 5.11.1), the onsite radiological impacts for both truck and rail are less than 3.0×10^{-4} latent cancer fatalities for the entire campaign. Further, the calculated dose to the maximally exposed individual [located 100 meters (328 feet) from the accident location] was 2.8 rem (1.1×10^{-3} latent cancer fatalities). The calculated dose to the maximally exposed individual onsite located 750 meters (2,460 feet) from the accident site was 0.9 rem (3.6×10^{-4} latent cancer fatalities). Nonradiological transportation impacts from accidents also were presented in the K Basin EIS (Section 5.11.1). These impacts, expressed as onsite fatalities, were calculated to be less than 6.6×10^{-5} for the entire campaign.

DETERMINATION

Based on the information presented in this Supplement Analysis, I determine that the proposed action does not constitute a substantial change in actions previously analyzed in the K Basins EIS, and that there are no significant circumstances or new information relevant to environmental concerns associated with the proposal. Therefore, no additional NEPA review is required.

Issued at Richland, Washington, this 01 day of August, 2001.

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REFERENCES

61 FR 10736, March 15, 1996, *Record of Decision: Management of Spent Nuclear Fuel from the K Basins at the Hanford Site, Richland, WA.*

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DOE/RL-97-28, *Radioactive Air Emissions Notice of Construction Fuel Removal for 105-KW Basin*, Revision 0D, March 2001.

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