

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

March 23, 1994

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: J. Kent Fortenberry

SUBJECT: Initial Review of Fuel Encapsulation Activities at the Hanford K-East Basin (March 15-17, 1994)

- 1. Purpose:** This trip report documents the initial review of the fuel encapsulation activities at the Hanford K-East Basin by the Defense Nuclear Facilities Safety Board (DNFSB) technical staff (K. Fortenberry and S. Stokes) on March 15-17, 1994.
- 2. Summary:** Although previous evaluations by DOE Headquarters (HQ) and the DNFSB technical staff have identified concerns with encapsulation and the continued wet storage of fuel, the DOE Richland Operations Office (DOE-RL) and the contractor are still pursuing a June 30, 1994 target date for starting encapsulation activities. However, as a result of the concerns identified by DOE-HQ and the DNFSB, short-term assessments of the engineering alternatives to fuel encapsulation are being performed. The results of these assessments are scheduled to be completed in May 1994 and might affect the current plans to encapsulate the K-East Basin fuel.

In addition, longer-term activities are in progress to apply a systems approach to the disposition of fuel in the K-East Basin. These activities will not yield results until after the proposed start date for encapsulation. Given the current status of the facility, the staff believes that it will be extremely difficult to demonstrate readiness to encapsulate fuel by June 30, 1994.

As a result of this initial review, the staff has some concerns with the encapsulation process. Specifically, the seal conveyor is a potential source of contamination and airborne radioactivity, there are no criteria for water clarity, and there is no water balance for expected water use during the encapsulation campaign.

- 3. Background:** The K-East Basin was constructed in 1951 and was refurbished in 1975 for storage of N Reactor fuel. The basin currently stores about 50,000 fuel assemblies. These fuel assemblies are in open canisters and are corroding. Sludge has accumulated on the basin floor and contains uranium, plutonium, and fission product oxides; as well

as concrete grit, iron oxide particles, and sand. The amount of sludge contained in the canisters has been estimated to be as much as twice that observed in the basin.

DOE currently plans to encapsulate the fuel assemblies for underwater storage. This encapsulation process is to begin on June 30, 1994, in accordance with a Tri-Party-Agreement target milestone date.

The Board's staff has recently initiated a comprehensive review of both the K-East Basin facility as well as the proposed fuel encapsulation activity. This review will follow up on several previous trip reports which identified deficiencies in the facility operation and in the engineering approach that resulted in the current fuel encapsulation plans.

4. **Discussion:** The intent of this initial review was to get an overview of the K-East Basin and the proposed fuel encapsulation activity. One third of the visit was spent in facility walkdowns; the remaining time was spent in briefings and discussions covering a wide range of topic areas.

The proposed encapsulation of the fuel in the K-East Basin is driven primarily by a Tri-Party-Agreement milestone. DOE-HQ, as well as the DNFSB, has raised concerns with the proposed fuel encapsulation. Two short-term activities are in progress to assess engineering alternatives to fuel encapsulation. This includes a Westinghouse Hanford Company (WHC) assessment to be completed May 1, 1994, and an independent assessment to be completed May 31, 1994. The results of these short-term assessments might affect the current plans to encapsulate the K-East Basin fuel.

Longer-term activities are in progress to apply a systems approach to the disposition of fuel in the K-East Basin, but these activities will not yield results until after the proposed start date for encapsulation. These activities include:

- Hanford Spent Nuclear Fuel (SNF) Characterization Plan - to be completed June 30, 1994
- First-cut systems engineering effort for Hanford SNF - to be completed July 31, 1994
- Integrated SNF Disposition Project Plan - to be issued August 30, 1994
- Hanford Fuel Consolidation Study - to be completed September 30, 1994
- DOE Spent Nuclear Fuel (SNF) Programmatic Environmental Impact Statement (EIS) - to be completed June 1995
- Hanford Spent Nuclear Fuel EIS - to be completed June 1996

The contractor expects to declare "readiness" on April 15, 1994. As of March 17, 1994, the following activities were incomplete:

- Encapsulation equipment design (dump table vacuum system not designed)
- Encapsulation equipment installation and testing
- QA Plan for Encapsulation
- ALARA Plan for Encapsulation
- System Assessments (to be used for component lists, training information, labeling needs, preventative maintenance requirements, etc)
- Drawing verifications (50% of essential drawings have been field verified)
- New Work Control Procedure
- Revised Waste Plan
- Encapsulation Project Management Plan
- Leak Contingency Plan
- Maintenance Implementation Plan (not planned for completion prior to encapsulation)
- Interim Safety Basis (not planned for completion prior to encapsulation)

Several observations were made concerning the encapsulation process. A seal conveyor is used to lower canister lids to the loaded canisters. The intended operation of this conveyor is to be pulled up out of the water to receive new lids. Constant passage of the conveyor tray and cabling in and out of the basin water during the encapsulation process represents a significant source of contamination and airborne radioactivity. At basin water conditions in November 1991, one eye-dropper of basin water would result in a contamination spot of about 8000 dpm beta-gamma.

There are currently no criteria for water clarity. The encapsulation activities depend on manual activities and visual verifications. Encapsulating with degraded water clarity would affect canister seal verification as well as canister loading. There are currently no water clarity restrictions on performing encapsulation.

The encapsulation activity will require that water be added to the basin for such activities as decontamination and high-pressure cleaning. The total expected water usage has not been estimated. The basin has no surge capacity and a high water level would require that the encapsulation be stopped until evaporation reduces the water level.

5. **Future Staff Actions:** The staff intends to conduct a comprehensive review of the K-East Basin facility and the proposed fuel encapsulation activity during the next three months. A primary focus of this review will be those systems engineering activities conducted to resolve the K-East Basin spent nuclear fuel issue.