DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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October 30, 1992

The Honorable Leo P. Duffy
Assistant Secretary for
Environmental Restoration and
Waste Management
U.S. Department of Energy
Washington, DC 20585

Dear Mr. Duffy:

In the course of conducting several broad-based reviews at the Hanford Site this year, the Board's staff members and outside experts have reviewed activities at the K-East (KE) and K-West (KW) Fuel Storage Basins. The Board's staff has collected the issues relative to the KE-Basin and has prepared a composite report; a copy of the report is enclosed.

This report indicates that little, if any, progress has been made on KE-Basin fuel encapsulation since the Board's tour of the KW-Basin in September 1990. After you have had an opportunity to review this report, please let me know if you need additional information.

Sincerely,

John T. Conway
Chairman

Enclosure

c:
Hon. Richard A. Claytor, DP-1
Hon. Paul L. Ziemer, EH-1
Mr. Steven M. Blush, NS-1
Dr. Mario Fiori, DR-1

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DEFENSE NUCLEAR FACILITIES SAFETY BOARD

October 2, 1992

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: Paul F. Gubanc
Hanford Site Team Leader

SUBJECT: Composite Trip Report - Review of KE-Basin Fuel Encapsulation Program, Summer 1992

1. Purpose: This memorandum provides a compilation of observations and concerns of the Defense Nuclear Facilities Safety Board (DNFSB) Technical Staff in the summer of 1992 relative to the KE-Basin Fuel Encapsulation Program at the Hanford Site.

2. Summary: Westinghouse Hanford Company (WHC) and Department of Energy Richland (DOE-RL) Field Office facility managers have, for at least the last two years, recommended the expeditious encapsulation of KE-Basin fuel to reduce worker exposure and environmental risk. Apparently, however, the encapsulation program has not received a corresponding level of senior management support since the encapsulation program has not yet commenced and NEPA documentation for this work was in process from 1990 until June 1992. A consequence of this lack of priority is that the level and quality of operator training, engineering support, conduct of operations and operational readiness review (ORR) planning at the Hanford KE-Basin are significantly below average. In discussions with WHC and DOE facility management, they expressed their position that correction of the above deficiencies, while desirable, was not fully supported by existing resources and represented an unacceptable delay to executing this safety improvement program.

3. Background: The Hanford K-Basins consist of the K-East (KE) and K-West (KW) Basins, which provide underwater storage of irradiated fuel in open pools. The KE-Basin contains 1145 metric tons-uranium (MTUs) of fuel elements that are in direct contact with the water in the pool. The cladding of 6% of the fuel elements in this basin has been breached and, as a result, the fuel material is slowly being oxidized by the surrounding water with a corresponding release of fission products. In contrast, the KW-Basin houses fuel in sealed containers. Due to the low enrichment of the fuel in both basins, the possibility of an inadvertent criticality is considered extremely low. Operations at the K-Basins presently include surveillance, maintenance and fuel monitoring.

Preparations are underway to encapsulate the KE-Basin fuel in sealed containers, similar to those used in the KW-Basin. This will essentially eliminate the oxidation of fuel and release of fission products into the pool and consequently eliminate a source of radiological contamination and worker dose. The K-Basins are classified as a High Hazard facility, although the Fuel Encapsulation effort is classified as a Low Hazard operation.

4. Discussion: The DNFSB staff has reviewed different elements of the KE-Basin program on three separate visits to the Hanford Site: K-Basins training, June 1992; KE-Basin tour and fuel encapsulation ORRs, August 1992; KE-Basin cleanup review, September 1992. The following comments and observations are presented in order of perceived importance (vice chronologically).

a. Radiological Hazards to Workers: Approximately 6% of the fuel in the KE-Basin has sustained visible loss of cladding integrity and roughly 50% shows evidence of corrosion. As a result, radionuclide concentrations in the KE-Basin are three to four orders of magnitude greater than in the KW-Basin and annual worker exposures are 15-17 manrem/year compared to 1 manrem/year at the KW-Basin. Roughly 200 curies are removed by the KE-Basin water purification system each month.

b. Environmental Hazards: The KE-Basin was constructed in 1951 (with a 20 year design life) and in 1974 was verified to be leaking. Repairs were completed in 1980 after an estimated 2500 curies (Sr-90, Cs-137) had leaked into the soil. Encapsulating the KE-Basin fuel will provide a second, more reliable barrier to environmental release (the basin is adjacent to the Columbia River) and facilitate cleanup of the KE-Basin sludge (discussed below).

c. Facility Observations and Engineering: The following observations were made during a tour of the KE-Basin on August 13, 1992 and discussed again with DOE-RL and WHC management on September 24, 1992.

- The floor of the KE-Basin water pool is covered with a thin layer (piles in some areas) of oxidized fuel and fission products, which is referred to as "sludge." Also present are small pieces of debris such as gloves, tools and assembly clips from damaged fuel elements. As a prerequisite to encapsulation, a large sludge pile (covering an area of approximately 8 feet by 30 feet to a depth of up to 14 inches) must be removed from the "chute area" of the pool to permit the installation of encapsulation equipment.

  A prior attempt to package the sludge into empty canisters for storage failed due to the highly dispersible nature of the sludge (disturbing the sludge resulted in the generation of an opaque underwater cloud). WHC now intends to hydrovac the pile and redeposit the sludge in an alcove off of the main body of the pool. WHC acknowledged that this will require dealing with the same sludge again at a later date, but WHC believes that this disadvantage is outweighed by the need to eliminate the further release of fission products into the pool by corroding fuel.

WHC acknowledged that they had not performed, or obtained from independent sources, formal engineering assessments of: (a) alternatives for sludge relocation and packaging, (b) anticipated effects of redistributing the sludge pile, or (c) risk-benefit analysis of how best to sequence dealing with the sludge pile versus encapsulation. WHC acknowledged that such assessments would be desirable but were not available at this time due to resource constraints.

- The following deficiencies in conduct of operations at the KE-Basin were identified: (a) extensive debris (e.g., scrap pipe) and empty fuel storage canisters randomly scattered throughout the pool, including above stored fuel, (b) utilization of "instruction" tags to identify out-of-commission equipment, local instruments that are inoperable, and as operator aids, and (c) a water filter differential pressure limit (70 psid) that is beyond the scale of the control room indicator (60 psid maximum), and which does not reflect actual practice (30 psid nominal due to radiological concerns during filter replacement).

d. K-Basin Operator Training: As detailed in the staff's trip report on Hanford training of July 6, 1992, the K-Basins training program is a remnant of the N-Reactor training program, which was shut down five years ago. The training program is acknowledged by WHC as not being in compliance with DOE Order 5480.20, *Personnel Selection, Qualification, Training and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities.* The WHC 200 Area Training Improvement Program, presented to the DNFSB on September 16, 1992, does not include the K-Basins.

e. WHC ORR: The WHC ORR of the KE-Basin encapsulation program is in compliance with existing WHC and DOE directives, although it does depart from the "features of an acceptable ORR" identified in DNFSB Recommendation 92-6 in the following areas. (As of the date of this report, the Secretary of Energy has not yet accepted Recommendation 92-6.)

- The WHC ORR Team is composed of the N-Reactor Manager (WHC ORR Chairman and startup approval authority), the N-Reactor Deputy Manager, the N-Reactor Engineering Manager and the N-Reactor Operations Assurance Manager. Each of these managers has significant line management responsibility for the KE-Basin and is therefore not independent. For example, one member of the KE-Basin WHC ORR Team accepted (as the lead ORR reviewer) an affidavit *he had signed* as the responsible line manager.

- The WHC ORR has been in progress since June 1992. Preparation of the encapsulation area and installation of the encapsulation equipment has not yet been completed. The encapsulation activity was therefore not ready for startup prior to initiation of the WHC ORR.

- There are 55 individual acceptance criteria in the WHC ORR plan, each of which is one sentence long. Most of these criteria are qualitative in nature and require the facility management to certify equipment "functional operability," actions as

"completed acceptably," "issues resolved," et cetera. These acceptance criteria do not define an objective, measurable level of acceptable performance.

- During a discussion of the WHC ORR, neither the DOE-RL nor the WHC management representatives could identify who was the DOE approval authority to commence encapsulation.

The latest schedule from WHC states that encapsulation will commence in November 1992, although the start date has slipped numerous times in the past.

f. DOE ORR: A formal plan for conducting a DOE ORR of the KE-Basin encapsulation does not currently exist, although an ORR, led by DOE-RL, is planned.