


DEFENSE NUCLEAR FACILITIES SAFETY BOARD

September 18, 1992

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: David C. Lowe 

SUBJECT: Fernald Environmental Management Project - UNH Neutralization Project

1. **Purpose:** The purpose of this report is to describe the results of a DNFSB staff visit to the Fernald Environmental Management Project (FEMP) on September 9-11, 1992. DNFSB Technical Staff members on the visit were David Lowe and Walter Moore. The purpose of the visit was to observe the conduct of uranyl nitrate hexahydrate (UNH) precipitation operations.
2. **Summary:** The DNFSB staff believes that the Department of Energy Fernald Field Office (DOE-FN) and its management and operations contractor, the Westinghouse Environmental Management Company of Ohio (WEMCO) are operating in a deliberate and conservative manner. However, there are still problems in fostering a new conduct of operations culture.
3. **Background:** On shutdown of production operations in July 1989, approximately 220,000 gallons of UNH solution containing a nominal 100 metric tons of uranium in enrichments of 0.951% to 1.290% U-235 remained in 20 storage tanks in the refinery area. The UNH neutralization project will process the material in a series of blending, precipitation and filtering steps to convert the uranium to a more stable solid form (magnesium uranate) for final storage.

Members of the DNFSB staff visited FEMP on three separate occasions in March, April, and August 1992. These visits concentrated primarily on training, operations, radiological protection, and lessons-learned with regard to start-up of the UNH neutralization project.

The UNH neutralization project System Operability Test (SOT) was initiated on July 6, 1992. The purpose of the SOT is to process a single batch of UNH to determine the effectiveness of the process, equipment, procedures, and personnel. Actual transfer of UNH began on July 12. During the transfers, unexpected high levels of NO₂ occurred and a worker was overexposed to NO₂. The UNH neutralization project SOT was halted pending the outcome of a critique and identification and implementation of corrective actions. The UNH neutralization project SOT was

reinitiated on September 3rd and precipitation operations began on September 9th.

4. Discussion:

a. **DOE-FN Facility Representative:** Two DOE-FN personnel and a support contractor monitor the UNH neutralization project on a part-time basis. However, there is no DOE-FN person assigned to fulfill the role of the Facility Representative as defined in DOE Order 5480.19 *Conduct of Operations Requirements for DOE Facilities*.

b. **Operations Organization:** The UNH neutralization project team appears to be well integrated, with the operations and matrixed support organizations (industrial safety and radiological protection) working together towards a well defined goal. However, the operational organization of the project team needs to be reviewed. The precipitation operation is conducted by two "teams" of four personnel each on a hourly shift schedule. The four personnel consist of the team supervisor, engineering support, and two operators. The area supervisor and the shift supervisor (operations line management) were both on the same "team", with the area supervisor filling the role of engineering support and the shift supervisor filling the role as the team supervisor. In this capacity, they maintained positive control of the operation during their "shift", but they were not in a position to assert control over the other "shift" during the precipitation process or in controlling other required operations (mixing, material transfer, filtering, etc.) which may be conducted in parallel. This situation is not a major concern during the SOT because only a single UNH batch is being processed in series, but during full operations there may be several operations being conducted in parallel. Therefore, it would be prudent to have an appropriate line manager/supervisor in an overview position controlling the entire process and not restricted to a single unit operation.

c. **Conduct of Operations:** In general, conduct of operations for the UNH neutralization project needs improvement. The following paragraphs discuss some examples of problem areas.

1. **Communications:** Communications within the "team" conducting the operation were informal and crude. Communications were difficult because of the personnel protective clothing requirements and the location of personnel. To overcome these difficulties, "team" personnel improvised by using hand signals and employing the supervisor as a "runner" between personnel on the upper level and the operator on the lower level. Additionally, communications between the test coordinator and the team supervision were irregular. On one occasion, the test coordinator was to be informed when the "team" was ready to transfer UNH to the precipitation tank. But, the test coordinator was not informed until after the transfer had been completed and then only after the test coordinator requested the status.

2. **Procedure Use:** Observation of actual precipitation operations revealed that use of, or reference to, the procedure was lacking. Reference to the procedure was limited to the

test coordinator, who does not have line management responsibility and who was not in close proximity (but within radio contact) of the personnel conducting the precipitation operation.

3. **Pre-Shift Briefings:** A pre-shift briefing was conducted for all involved project personnel at the beginning of each workday. The area supervisor conducted the briefing and expected plant operations were discussed in some detail. However, at both pre-shift briefings observed, there was no reference to the applicable procedure and the procedure was not referenced during the briefing.

4. **Qualified Supervisor/Operator List:** The current list of qualified supervisors and operators was reviewed and compared to the personnel assigned to the teams conducting the precipitation operation. The supervisor in-charge of a "team" was not on the list. Upon further questioning, we were told that the supervisor was qualified but the approved list was in error. The error purportedly occurred because of improper transfer of information from training course attendance sheets to the master training records.

5. **Tagout/Lockout System:** The Plant 2/3 tagout/lockout log was reviewed. There is no place in the log for the appropriate supervisor/manager to indicate approval or authorize removal of the lockout/tagout as required by DOE Order 5480.19 Chapter IX.

d. **NO₂ Mitigation Efforts:** The precautions and NO₂ monitoring taken by the project appear to be appropriate for the SOT precipitation operations. The precipitation operations observed by the DNFSB staff did not produce high levels of NO₂. The NO₂ levels were lower than anticipated which may have been due to the low UNH temperature in the precipitation tank. The low temperature resulted from delays in the precipitation operations caused by equipment problems.

e. **Thorium Nitrate Inventory:** The DNFSB team was informed by DOE-FN personnel that approximately 7700 gallons of thorium nitrate liquid is stored in two tanks on-site. The disposition of this material is being reviewed by DOE-FN, but a neutralization process similar to the UNH process may be required. However, the radiological protection requirements will be greater because of the higher radiation levels associated with the thorium nitrate.