DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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July 8, 1992

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

Dear Mr. Duffy:

Enclosed for your consideration and action, where appropriate, are a number of observations concerning preparations to conduct the uranyl nitrate stabilization run at the Fernald Environmental Management Program (FEMP). These observations were developed by our technical staff and outside experts during a visit, March 31 - April 1, 1992. They illustrate a widespread lack of discipline of operations at the Fernald site. It is my understanding that DOE Fernald Field Office personnel are already aware of some of these observations and that the problems implicit in many of them are being resolved.

If you need further information, please let me know.

Sincerely,

John T. Conway
Chairman

Enclosure:
Fernald Trip Report: March 31 - April 1, 1992

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

June 29, 1992

MEMORANDUM FOR Board Members
G.W. Cunningham, Technical Director

FROM: David Lowe
Ralph Arcaro

SUBJECT: Fernald Trip Report: March 31 - April 1, 1992

1. Introduction - From March 31 to April 1, representatives of the Defense Nuclear Facilities Safety Board (DNFSB) conducted a site visit to the Fernald Environmental Management Project (FEMP) to review preparations for the upcoming uranyl nitrate hexahydrate (UNH) stabilization run. DNFSB Technical Staff included David Lowe (team leader), Ralph Arcaro, and Joseph Sanders and outside experts Keith Magnus and David Boyd.

2. Summary - The general opinion of both the Department of Energy Fernald Field Office (DOE-FN) and Westinghouse Environmental Management Company of Ohio (WEMCO) management is that the WEMCO Operational Readiness Review (ORR) and the DOE-FN Operational Readiness Evaluation (ORE) will find the plant ready to commence operations within a few weeks. The consensus was: "we see no show-stoppers". Despite this contention, it is not apparent to the DNFSB team that WEMCO and DOE-FN are sufficiently ready to commence this operation. However, given the degrading material condition of the plant, the DNFSB team recognizes the need to complete the UNH stabilization run. Our major concerns are:

- Lack of a procedure or set of procedures for the UNH stabilization run.

- Lack of a documented qualification process, including a line management approved list of qualified operators for each task area.

- No plans to conduct a complete walkdown of process system piping to: update the "as-built" one-line drawings to ensure that all valves, pumps, and temperature and pressure indicators are properly identified; verify that all valves are properly numbered and labeled; and verify that all temperature and pressure gauges are calibrated.

- Inadequate plant instrumentation for UNH storage and precipitation tank temperature and level indications.

- Inadequate safety assessment covering the formation and mitigation of NO_x gases in the UNH precipitation process.

Since our visit, we understand that the UNH stabilization run startup date has slipped and that startup is currently scheduled for early July 1992.

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. This material was classified as "material in process". The solution was declared waste in 1991 and several tanks were discovered to be leaking in the summer of 1991. Currently, some tanks still leak and the leakage is collected by buckets and manually returned to the top of the tank and poured into the tank. In September 1991, considering there were nonisolable leaks and additional leaks could be expected, the UNH solution was judged a sufficient threat to public health and the environment that "emergency remedial action" was justified. This declaration allows WEMCO and DOE to proceed with action to neutralize and precipitate the UNH without delaying for intermediate review by the Environmental Protection Agency (EPA).

The major steps of the project include blending the solutions to achieve a nominal concentration of < 100 g U/liter, neutralization and precipitation of magnesium uranate by the addition of magnesium hydroxide and, if required, lime, and filtering the slurry to achieve a wet filter cake. The filter cake will be stored in drums until the dryer is operational and final disposition is determined. The blending, precipitation, and neutralization of the UNH solution will take place in Plant 2/3, and the filtering and drumming will occur in Plant 8.

A WEMCO ORR of the project was convened in July 1991 and a DOE-FN ORE commenced in November 1991 and is ongoing.

4. Discussion - The DNFSB review team concluded that WEMCO and DOE-FN are not yet prepared to conduct this stabilization run in a manner that adequately protects public health and safety. However, the poor material condition of the UNH tanks and supporting systems validate the need to complete this stabilization run as soon as practical. The following sections support this conclusion.

a. DOE Fernald Field Office (DOE-FN) - The Fernald Environmental Management Project (FEMP) was established as a DOE Field Office on February 26, 1992. The office is recruiting to increase staffing to about 200 by the end of fiscal year 1993. A Facility Representative with responsibilities as described in DOE Order 5480.19 has not been assigned for the UNH Project. Insufficient staff was given as the reason. Currently, a DOE-FN employee is assigned as Project Manager for the UNH Project. Although his position was described as "essentially" a Facility Representative, it was clear that he had numerous other responsibilities and could not take an active role in monitoring this operation.

The DOE ORE assessment of the WEMCO ORR is ongoing. Incomplete items include: (1) WEMCO resolution of 13 outstanding ORE observations, (2) final review of the WEMCO ORR, (3) observation of an emergency drill, (4) conduct of operations review, and (5) final walk through.

b. Process System - Although the DNFSB team was assured that the applicable one-line drawings for the UNH stabilization run were "as-built", system walkdowns of a small portion of the process piping revealed that this was not the case. Although it was apparent that an extensive valve labeling program was initiated in anticipation of this run, several deficiencies were identified.

- In several instances, existing valves and connections were not depicted on the drawings and in one case a valve was depicted on the drawing but was not installed in the plant.

- The actual "normal" position of some valves did not agree with the normal position indicated on the drawing.

- Several valve labels were illegible or had fallen off valves because of weather or general wear. In one case, a label that had apparently fallen off its valve was reattached to a different valve.

- "Do Not Operate" (DNO) tags were discovered that were illegible, probably due to age. Some legible DNO tags were dated 1988 and could not be cross-referenced in the lockout/tagout log.

- The lockout/tagout log was located in a radiologically controlled area (RCA) which required protective clothing to access and therefore was not readily accessible to the Shift Supervisor.

c. Operating Procedure - The Plant Test Authorization (PTA) is referred to as the controlling procedure for the UNH stabilization run. However, it is not structured as an operating procedure with clear statements of actions to be performed. When questioned why the PTA was used instead of an operating procedure, WEMCO managers noted the one-time short-duration nature of the project and stated that the PTA provided flexibility in operations and allowed easier revision. The DNFSB team expressed concern that neither of these reasons is adequate when performing an abnormal operation that has the potential to impact public health and safety.

A potential problem associated with the UNH stabilization plan concerns the formation of NO_x gases. NO_x levels of 25 ppm are expected during the steam heating of the UNH solution and during the addition of $Mg(OH)_2$ to the UNH solution. Mitigation of the NO_x formation is accomplished through operator action by shutting the $Mg(OH)_2$ addition valve or the steam supply valve. This is to be performed when the operator notices a temperature increase above 150°F or an increased NO_x concentration. Currently, some tanks have temperature indications, but they are not calibrated. At the precipitation tank, no temperature indication is currently installed, but a single thermocouple is planned for installation; however, no backup indication was considered or is planned for installation. Neither NO_x gas monitoring procedures nor temperature monitoring procedures are clearly stated in the PTA. A safety assessment covers

mitigation of NO_x gases after release, however, there was no assessment to prevent releases.

Specific comments regarding the PTA follow:

- Section 7.0 (Special Precautions) - includes some information, such as blowing down transfer lines with air and walking down lines when pumping operations are initiated, that is not included in the Detailed Test Procedure.

- Section 8.0 (Detailed Test Procedure) - is actually a general procedure to be used for all batches to be processed. Specifics for each batch, such as valve lineups, are provided in attachments. Various operating procedures are referenced in this section. The result is that the operator will have to use both the operating procedure (if there is one) and the PTA to carry out process steps.

- Section 8.3.6 - states that pH indicators will be used to determine the flow rates of $Mg(OH)_2$ in the precipitation step, but it was stated in discussion with WEMCO managers that solution temperature will be the controlling parameter. During an interview with the shift supervisor, he stated that $Mg(OH)_2$ addition will be automatically controlled by a valve based on input from a pH sensor. Further questioning of the Area Supervisor revealed the actual method will evolve during project operation. Additionally, temperature and pH limits are not specified although they are the controlling parameters for process control and prevention of NO_x gas formation.

d. Conduct of Operations - Although training has just commenced in the area of conduct of operations, it is apparent that the safety culture intended by DOE Order 5480.19 has not been embraced by management and operators. Communication between supervisors and operators was informal at all times. Procedural compliance was deficient. Many deficiencies existed in the lockout/tagout process as well as configuration management. When questioned about conduct of operations, management stated that training was being conducted and progress was being made toward implementing the requirements of DOE Order 5480.19. When asked about conduct of operations training, operators stated that they were doing "conduct of operations" all along. There is no evidence to support this claim.

Plant tours and operator interviews indicated that reference to, use of, and confidence in operating procedures are not part of the culture.

- When operators were questioned about operating a system, learning a system, and training another operator on a system, they responded with details, but never mentioned referring to a procedure.

- An experienced operator at the Eimco filter station was asked to identify the filter operating procedure at his station. The operator was unable to locate the procedure until assisted by the Area Supervisor. When a DNFSB team member

showed concern about this, the Area Supervisor stated the operator could not find the procedure because the procedure title was not what the operator had expected it to be. The supervisor showed no concern that the operator was not familiar with the procedure.

- WEMCO managers stated that the use of operating procedures was not required as long as the operator was experienced in the particular task and was familiar with the operating procedure. The only requirement is for the operator to read the operating procedure once each year and when the procedure is changed.

e. Training - Training in preparation for the UNH stabilization run consisted of several sessions of classroom training with written examinations followed by on-the-job training (OJT). Currently all operators have completed the classroom phase. There is no formal qualification card or final line management evaluation of qualification. Selection of operators is based on the Area and Shift Supervisor's knowledge of the skills and competency of individual operators. There are no qualification requirements for the Shift Supervisor and he was selected based on past experience. Specific comments follow:

- A training matrix showing courses completed by project personnel was provided to the DNFSB team. This matrix had not been updated since the System Integrity Test (SIT) and did not list some of the courses included in the training for project personnel. This indicated that the matrix was more of a paperwork requirement than a line management tool in training verification.

- There are no qualification cards or list of qualified operators. To determine if an individual is qualified for an operation, the supervisor must check what training is required for the operation, check the list of completed training, and verify completion of applicable OJT. This results in line management relying on familiarity with operators to determine job assignment.

- Questions about training conducted on the PTA disclosed that personnel that failed the examination were retested using the same examination after additional classroom training.

- When asked to explain the qualification requirements for the Shift Supervisor, the Area Supervisor responded to the effect that there were none because the shift supervisor knew more than anybody else and could not be further trained.

DNFSB review team members interviewed a Plant 2/3 shift supervisor, an experienced Plant 8 operator, an inexperienced Plant 2/3 operator, and an experienced radiological technician. The level of knowledge exhibited was especially deficient in areas of radiological fundamentals and UNH project procedures. Specific comments follow:

- Individuals were generally weak on radiation principles, sources, hazards,

controls, and personal dose received. No operators could explain the requirements associated with different controlled areas.

- The radiological technician provided answers on personal monitoring and a respirator protection factor which did not agree with Radiological Controls Requirements Manual.

- An experienced Shift Supervisor incorrectly described how the addition of $Mg(OH)_2$ will be controlled to precipitate and neutralize the UNH solution.

- Individuals were vague in explaining what the PTA is and how it will be used. When asked about transferring solution between tanks, an experienced operator said that a transfer order form would be used for documentation. This is not covered in the PTA.

f. Radiological Protection - Radiological protection practices were observed during plant tours and discussed with WEMCO managers and technicians. The WEMCO Radiological Control Requirements Manual RM-0009I (RCRM) was reviewed and discussed with WEMCO managers and technicians. Several inconsistencies with these requirements were noted in the areas of posting, protective clothing, and personnel monitoring. Specific comments follow:

- Large areas around tanks and inside plant operating areas are designated Regulated Areas. This type of controlled area is defined in the WEMCO RCRM as an area where surface contamination is present (or likely to be present) in excess of specified surface contamination guide levels, but less than 10 times those levels. It was observed that Regulated Areas were used primarily for convenience to eliminate the need for contamination monitoring (frisking) between known areas of contamination. The result observed was large Regulated Areas where personnel did not actually believe contamination existed.

- RCRM (Section 7.5.1) states the minimum required protective clothing for a regulated area is shoe covers and gloves. RCRM (Section 12.4.2) states that protective clothing requirements shall be determined by Radiological Safety. This lack of consistent direction causes confusion. It was observed that access usually requires shoe covers and gloves, but in at least one case (Plant 8 Eimco filter operator station) no protective clothing was required.

- RCRM (Section 7.9.3) states that exit from a Regulated Area requires a whole body frisk. Personnel observed exiting a Regulated Area performed hand and foot monitoring only.

- At some control points self-monitoring is performed using alpha detectors while at other control points beta-gamma detectors are used. The reason given by WEMCO personnel for use of alpha detectors is the high beta-gamma background

at these locations. This explanation does not address whether alpha monitoring is an effective check based on sources of potential contamination in those areas.

g. Plant Material Condition - The material condition of the plant was observed during a process overview tour conducted by the team and during system walkdowns. Specific comments follow:

- Plant 2/3 has not operated for about three years. Equipment was not maintained until after the UNH Project was initiated September 1991.

- During the system walkdowns, members of the DNFSB team observed some nonisolable UNH leaks. These leaks are collected in buckets and hand carried to the top of the tank where they are dumped into the tank. Operators wear protective clothing to perform this, but carrying highly acidic material in an open bucket over catwalks and around piping provides a high potential for a spill or an accident to occur.

- Tank level instrumentation is inconsistent and sometimes non-existent. When transferring material from one tank to another, an operator is required to convert between inches, feet, and pounds to determine the appropriate amount to transfer. Sometimes the operator must rely on a single level instrument and assume the material is flowing to the correct tank. Frequently tank levels are measured using the "dipstick" method.

- A steam leak was discovered that was not identified in the required maintenance log.