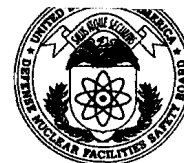


John T. Conway, Chairman
A.J. Eggenberger, Vice Chairman
Edson G. Case
John W. Crawford, Jr.
Herbert John Cecil Kouts

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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May 19, 1992

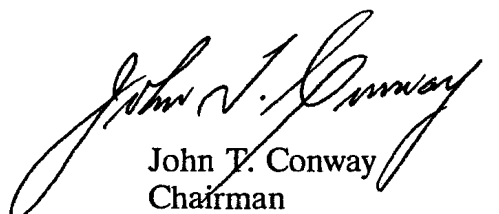
Honorable Richard A. Claytor
Assistant Secretary
for Defense Programs
U.S. Department of Energy
Washington, D.C. 20585

Dear Mr. Claytor:

Enclosed for your consideration and action, where appropriate, are a number of observations concerning the operations, training, and qualification of UO₃ Plant personnel at Hanford Site. These observations were developed by Jay A. DeLoach and Ralph Arcaro of the Defense Nuclear Facilities Safety Board (DNFSB) staff, and our outside experts, David S. Boyd, Edward O. Dietrich, and Richard L. Thompson. These observations are based on a review of available documents, and discussions and interviews with Department of Energy (DOE) staff and contractor personnel at Hanford Site from March 16-18, 1992.

If you need further information, please let me know.

Sincerely,



John T. Conway
Chairman

Enclosure:

Trip Report - Hanford Site UO₃ Plant, Operations and Training Review, March 16-18, 1992

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

May 17, 1992

MEMORANDUM FOR: Board Members
G.W. Cunningham

FROM: Jay A. DeLoach

SUBJECT: Trip Report - Hanford Site UO₃ Plant, Operations and Training Review, March 16-18, 1992

- A. **SUMMARY:** During this trip, five Board representatives, comprised of two Board technical staff members, Messrs. Jay A. DeLoach and Ralph Arcaro, and three outside experts, Messrs. David S. Boyd, Edward O. Dietrich, and Richard L. Thompson, visited the Hanford Site in Richland, WA, specifically the UO₃ Plant. The purpose of the visit was to observe the conduct of operations, material condition, and status of the training and qualification preparations for restart of the facility to conduct a stabilization campaign. The UO₃ Plant is operated by the Westinghouse Hanford Company (WHC) for the DOE Richland (DOE-RL) Field Office.

Planning and preparations are ongoing to restart the facility to conduct a stabilization campaign in 1992. The purposes of the upcoming campaign are to (1) process approximately 260,000 gallons of stored waste water, (2) convert approximately 240,000 gallons of uranyl nitrate hexahydrate liquid (UNH) to uranium oxide powder (UO₃) for long-term storage, and (3) clean out residual material in the plant to support transition to standby status. The plant was constructed in 1944 and used intermittently as required to support the DOE special nuclear material cycle. The last campaign at the UO₃ Plant was completed in May 1989.

The Board's representatives received briefings from the DOE-RL and WHC on restart activities, reviewed training and qualification records of plant personnel, interviewed plant personnel and support personnel, and toured the plant. As noted by DOE-RL and WHC during the visit, restart plans and preparations have not been completed and several issues remain to be resolved. The schedule provided to the Board representatives shows the campaign taking place during four weeks in July and August 1992. Prior to start up, DOE must get permission from the State of Washington to release 260,000 gallons of rainwater to cribs in order to provide a storage tank for receipt of the UNH solution from PUREX. Once permission is gained from the State, it will take about 10-12 weeks to disburse the rain water. It appears that the time required to obtain the state's permission will cause a delay in plant start up.

Observations of the Board representatives indicated that some conduct of operations attributes such as logkeeping, lock-out/tag out, housekeeping, training, and material condition are at an early stage in the cultural change process. During a tour of the plant, it was observed that housekeeping is not up to the standards appropriate for an operating low hazard plant. Radiological housekeeping is in need of prompt attention and upgrade. Most significantly, the knowledge level in fundamentals, safety limits, and radiological protection displayed by the WHC operators and health physics technicians (HPT) is significantly below that necessary for safe operations.

In committing resources to plan and prepare for the forthcoming campaign, it is necessary to meet high standards for public and worker health and safety, keeping in mind that the plant operations are categorized as low hazard and will be of short duration. There is always a possibility that the low radiological and toxicological hazard classification and the completion of past campaigns over a long time period can lead to an attitude that hazards are minimal. Based on the observations noted in this report, the Board representatives are concerned that such an attitude with regard to radiological hazards exists among the personnel associated with the UO₃ Plant. We strongly feel that the UO₃ Plant with its "low hazard" classification does not translate to a "no hazard" facility.

B. SPECIFIC OBSERVATIONS:

1. **Organizational Relationships:** Some functions that support UO₃ plant operations such as Health Physics technicians (HPT), Power Operations, and the Analytical Laboratory are not part of the UO₃ Plant line organization. This arrangement can adversely affect responsiveness to operational requirements.
 - a. The UO₃ Plant Manager has dedicated HPTs matrixed to the facility. The HPT supervisor at the UO₃ Plant reports to the PUREX HPT manager and supports UO₃ Plant operations. The HPT manager for PUREX reports to a manager in the WHC Occupational Safety & Health (OS&H) organization and is also matrixed to the PUREX Plant manager. This loose matrix relationship between the UO₃ Plant Manager and the supporting HPT organization has had adverse effects. There is little coordination between the site wide HPT organization and the UO₃ Plant to ensure the HP needs of the plant are realized. Specific comments follow:
 - 1) HPTs interviewed demonstrated a very weak knowledge level of the plant's radiological environment. The Plant Manager's only available recourse is to request upgraded training from the Site OS&H director responsible for HPT training.

- 2) WHC instructors for HPT training have not been in the field or facilities such as UO₃ Plant in the last 10 years. They are out of touch with the needs of the facilities and the feedback they get is largely from their students at the end of training.
 - 3) Although required to provide feedback for training, HPT at UO₃ Plant had not provided any input to initial training. The HPT supervisor recognized the very deficient radiological environment (training and practices) at the UO₃ Plant and was reported to be in the early stages of corrective action.
- b. The Power Operations organization supports the UO₃ Plant operations, but does not report directly to the UO₃ Plant manager. As a result of this organization, plant equipment under the responsibility of power operators is not effectively monitored by operations personnel. As an example, the UO₃ Plant air compressors in Bldg. 224-U which supply service, instrument, and control air for various equipment and systems are operated by a power operator assigned to the PUREX Plant several miles away. During the plant tour, Board representatives noted that an air compressor data sheet filled in by the power operator had several readings out of specification and incorrectly recorded. The UO₃ Plant shift supervisor was unaware of this situation.
 - c. The Analytical Laboratory (located at PUREX), which conducts chemical and radiochemical analyses of UO₃ Plant samples, is not located at the plant and is in a functionally different organization. It was reported that the support provided to the UO₃ Plant is defined in a letter of understanding agreed to by both parties. (For additional comments on the Analytical Laboratory see Lessons Learned in Section 5.d. and 5.e. below)
2. Operations - Plant Operations are based on recent Conduct of Operations training but are not mature. An initial class for all UO₃ Plant personnel in Conduct of Operations was personally taught by the PUREX Plant Manager who is responsible for both PUREX and the UO₃ Plant. The training was three days in duration and demonstrated the commitment to conduct of operations by the top level manager. Interviews of UO₃ Plant personnel showed an awareness of the importance of professionalism, formality of operations and teamwork among various work groups to support UO₃ Plant operations. During plant tours, the Board representatives observed several problems in implementing the principles of a conduct of operations program. Examples included:
 - a. Alarm status tracking sheets for several control room alarms were

incorrectly filled out and filed. The tracking sheets did not accurately report actual alarms.

- b. Radiation survey maps are not posted at the entrance of the Radiological Control Area.
 - c. Numerous "Caution-Do Not Operate" tags repeat information normally contained in operating procedures or refer to operating procedures or direct that authorization be obtained prior to operation of equipment. This use of caution tags indicates that procedural compliance and obtaining authorization to operate equipment may not be the normal way of doing business in the plant.
 - d. A number of informal stickers, tags, and operator aids were posted on equipment and control panels.
3. Training and Qualification - UO₃ Plant operator training programs that have been developed cover process fundamentals, conduct of operations, nuclear process operator supervisory topics, and UO₃ Plant specifics. Six operators, two operations supervisors, two process engineers, and two HPTs were interviewed by the Board representatives to discern their level of knowledge on safety related aspects of their jobs. A WHC and a DOE representative were present at each of the interviews.
- a. Interviews revealed that supervisory personnel were knowledgeable but most of the operators interviewed were weak in plant processes. Radiological fundamentals knowledge was exceptionally weak. Most operators interviewed could not state the whole body exposure limit or remember their annual exposure received in 1991. Most operators interviewed could not state the primary ionizing radiation associated with UO₃. In light of the amount of loose UO₃ powder observed during the plant tour, the Board representatives are particularly concerned about this lack of basic knowledge in radiation fundamentals.
 - b. Training in fundamentals and subjects with site-wide applicability is provided by a centralized technical training organization. Board representatives noted in discussions with WHC managers of technical training that instructors are not required to routinely visit facilities in the field to maintain current knowledge of how trainees will apply the knowledge and skills gained in courses taught by the instructors.
 - c. The UO₃ Plant specific operator training includes lectures on systems, equipment and processes; walkdowns of the plant on lecture subjects;

and in-plant on-the-job training and evaluation (OJT and OJE). Instructors are designated to be evaluators for OJT. Some parts of the OJT and OJE phases and the process to qualify operators are still being developed. Oral examinations, as we know them, are not currently required for final qualification of operators. It was reported that completion of operator "certification" is planned by the end of April 1992. It was also reported that about half of the operators were recently assigned to the UO₃ Plant since the plant last operated in May 1989.

- d. The Power Operation personnel interviewed had not received any training in plant specifics. This was confirmed in an interview of an experienced Power Operation operator who was responsible for operating air compressors in the plant that are important to UO₃ Plant operations.
 - e. Courses completed by personnel were recorded in individual training records but exam scores in individual courses were not recorded.
 - f. Training course exams given by the site were of relatively short duration (10-15 minutes) and had multiple choice questions that were not considered challenging. Answers to these questions could be easily determined by simple elimination. These exams did not include fill-in-the-blank or essay style questions. The UO₃ Plant specific operator training exams are of longer duration (approximately 30-45 minutes) and contained multiple choice questions as well as a few fill-in-the-blanks type questions.
4. Housekeeping and Material Condition - A Board representative toured the UO₃ Plant outside the radiation zone during the evening shift on March 17, 1992, and all the Board representatives toured the plant inside and outside the radiation zone during the day shift on March 18, 1992. WHC managers assigned to the UO₃ Plant led the tours and recorded the conditions observed by the Board representatives. Discussions with managers and observations in the plant indicated that a structured housekeeping program is not in place. Maintenance work is ongoing under work package control but management needs to demonstrate a higher standard for material condition and cleanliness. Management also needs to upgrade the radiological attitude in the plant from that of a NO HAZARD attitude to that of a LOW HAZARD radiological environment. The Board representatives were concerned by the present state of housekeeping and material condition of the plant as noted during the tours:
- a. UO₃ powder was noted in many places on external equipment surfaces, pipes, and floors in Bldg. 224-UA. UO₃ material was encrusted on

pipng at several valve manifold stations (Hot boxes).

- b. Excess material and debris were noted in the phosphoric acid storage room.
- c. Excess dirt and grease were noted in C Cell, and trash and excess material were observed in D Cell.
- d. Paint discoloration indicated the presence of a long standing and continuing steam leak from valve DOV-JA-1-2 which has dripped condensate on electrical equipment.
- e. On the third floor of Bldg. 224-U various materials such as tools, plastic pipe, and cleaning gear were not put away after use.
- f. Two drums stored at the north end of Bldg. 224-U second floor are not planned to be used in the plant and have labels describing health hazards from exposure to contents, but the drums are not marked with NFPA placards.
- g. A covered vat outside the east side of Bldg. 224-U contained valves and other components in a muck of cleaning compound.

5. Lessons Learned - WHC did not recognize the similarities between the tritium release to the environment at the Savannah River Site (SRS) K-Reactor and the potential for exceeding limits in gaseous discharges to the environment at the UO₃ Plant. It is not apparent the lessons learned from the recent heat exchanger leak at the SRS have been disseminated at the UO₃ Plant. Some precursor conditions for an inadvertent release of radionuclides from exhaust stacks of the UO₃ Plant are identical to that of the K Reactor heat exchanger release. The similarities include:

- a. There is only a single method of airborne radioactive release detection.
 - Neither the U-2 nor the U-4 stack on the UO₃ Plant have continuous monitoring for radioactive release. The release potential is deemed low enough to require only sampling every 12 hours. This is accomplished by a time proportional air sample that is filtered through a record sampler. The record sampler filter paper is counted every 12 hours.
- b. The sample analysis results are not reported in units that are readily converted to the units used in environmental discharge permits.
 - The sample results are recorded in disintegrations per minute (dpm) while the limit is in Curies released over time or dose to

the public. As shown at SRS, this ambiguity results in a lessened sensitivity to the actual impact of an environmental release of radioactivity.

- c. The exhaust activity sample is taken by an organization separate from the operations department.
 - The sample is taken by the Health Physics Technician (HPT) who is matrixed to the UO₃ Plant manager but does not report directly to him.
- d. The sample is counted and analyzed by an organization physically separate from the operations department.
 - After a gross count is performed by the HPT, the sample is transported to the analytical laboratory over five miles away where it is counted by Laboratory personnel at PUREX. While the same transportation controls encountered at SRS are not required, this situation could lead to unanticipated delays.
- e. Procedurally, there is no requirement to report the completion and results of in-spec samples to the shift manager.
 - Like SRS, the absence of a reported sample results indicates a satisfactory sample. Like SRS, this could result in missed samples going undetected for an undetermined period of time.

The above similarities set the stage for a radioactive environmental release which may not be quickly recognized and corrected. While an assessment to determine the risk of such an event may show an exhaust release event to be incredible, the similarities above warrant review. Some of these similarities may also exist in liquid discharges to the environment at the UO₃ Plant.

6. DOE-RL UO₃ Plant Site Representative - The DOE-RL site representative program is immature with no qualification package or definite schedule that includes the UO₃ Plant site representative. The formerly assigned UO₃ Plant site representative was interviewed and his knowledge level was minimal. Other than stop work authority by an informal oral policy, his role was not defined. A new site representative to the UO₃ Plant has been assigned. Although DOE-RL stated it has this program as a high priority, there is still no real program in place after several months of initial effort. This was also identified by the DNFSB staff as a problem area in September 1991 - over 6 months ago.
 - a. The present DOE-RL organization concerning the UO₃ Plant has an Operations Division with a Facilities Surveillance Branch and an Operations Programs Branch. The UO₃ Plant site representative

(similar to facility representative) is assigned to the Facilities Surveillance Branch while the UO₃ Plant program monitor (who is also responsible for the UO₃ Plant site representative) is assigned to the Operations Programs Branch. It was reported that there is a plan to reorganize the Operations Division in the near future to combine the site representative and program monitor functions.

- b. The new UO₃ Plant RL site representative arrived at the site in October 1991 and has completed various generic technical training and auditor courses but no UO₃ Plant specific courses. A proposed Site Representative program document has been drafted but not implemented. The present impact and role of the site representative were not clearly established from discussions with various DOE-RL managers.

7. Order Compliance - A DOE order compliance self-assessment pilot program is in progress to support the Plutonium Refinishing Plant restart with a target date for completion in June 1992, before making an effort to assess other facilities in priority. The pilot effort is reported to be slipping and will complete the earliest in August 1992. No action has been taken to determine the status of order compliance at the UO₃ Plant. It is recognized by DOE-RL that they may need to start some order compliance work on other facilities before completing the pilot effort, but, according to DOE managers, none are currently ongoing. DOE-RL has just recently brought onboard a person with appropriate experience to lead the order compliance work. It should be noted that the pilot effort is programmatic only and no review of compliance with codes and standards is planned unless they happen to be within the 44 (43 + DOE Order 5480.21) Level 1 safety related DOE Orders. It appears that DOE-RL does not give order compliance high priority in view of the progressive shutdown/long term shutdown trend over the entire site.