

## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

July 9, 1992

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

**FROM:** Timothy J. Dwyer

**VIA:** Paul F. Gubanc  
Hanford Site Team Leader

**SUBJECT:** Trip Report - Hanford Site Evaporator-242A Review, May 18-21, 1992

### A. INTRODUCTION:

During this trip, four DNFSB staff members and five outside experts (as listed in the Attachment) visited the Hanford Site to conduct a review of the current status and restart preparations for the Evaporator-242A. These reviews involved discussions with personnel from the site M&O contractor, Westinghouse Hanford Company (WHC), the DOE-Richland (DOERL) Field Office, and the DOE-RL Field Office support contractor, Stone & Webster Engineering Corporation (SWEC).

Evaporator-242A became a focus of attention when it was learned that the Grout Facility would not be starting up until successful completion of the Grout Facility Performance Assessment (PA) required by DOE Order 5820.2A, Radioactive Waste Management. (This document essentially failed peer review in December 1991 due to technical unacceptability.) Startup of the Grout Facility, originally scheduled for the end of this fiscal year, has been deferred until mid-to-late FY93. This leaves the Evaporator-242A as the only means of reducing the volume of Hanford site tank waste. Significantly, site waste volume projections developed to date included assumptions that both of these facilities would be available prior to FY93.

### B. SUMMARY:

Evaporator-242A had been scheduled for restart in September 1992. However, the restart effort has been delayed by (1) the measures taken in response to the January 1992 Hanford Tank Farms vapor exposures (as outlined in WHC Occurrence Report RL--WHC-TANKFARM-1992-0011); and (2) the time required to investigate the February 1992 Evaporator-242A Water Hammer Event in the raw water system (as summarized in the investigation report, WHC-SP0-822). As a result of these delays, the Evaporator-242A restart schedule is currently being reevaluated; WHC estimates that restart will occur no earlier than March 1993. However, it was readily apparent during this site visit that restart in September 1992 would have required herculean efforts, based on the observed status of operator training, Operational Readiness Review (ORR) preparations (including DOE Order Compliance Reviews), and procedure development.

The WHC organization controlling Evaporator-242A was observed to be in a state of flux: a major realignment of responsibilities was planned to take effect the week following this site visit. Insufficient information precluded the review team from assessing the adequacy of the proposed organization.

The Evaporator-242A Operator Training and Qualification Programs have been extensively rewritten and formally documented. However, they have not yet been implemented. The delay is tied in with the renegotiation of the Hanford Site operator's Bargaining Unit. Evaporator-242A management is developing an implementation schedule for the programs, taking into account that it may be necessary to proceed with the training prior to obtaining Bargaining Unit agreement.

WHC has begun preparations to perform the Evaporator-242A ORR, with completion expected in December 1992. (The DOE ORR would then presumably occur in the first quarter of calendar 1993, leading to restart by the end of March 1993.) However, the WHC-ORR team has not been directed to validate the installation of facility and procedural upgrades assumed to be complete in Revision 1 to the Evaporator-242A Final Safety Analysis Report (FSAR). These assumptions include both DOE Order Compliance Review corrective actions and physical configuration changes in the facility.

The Evaporator-242A Operating Procedure and Maintenance Procedure development processes are not complete. This is due, in part, to the fact that the FSAR (Rev 1) has not yet been approved by DOE-HQ, although WHC has been authorized by DOE-RL to proceed with procedure development and training, as no further FSAR changes are expected. Discrepancies were noted in the procedure approval chains, as well as the boundary between Maintenance and Operations Procedures. WHC is aware of these discrepancies and is actively working to resolve them.

The review team was informed that the Evaporator-242A FSAR (Rev 1) includes a criticality analysis using the "worst possible tank feed case," with the conclusion that such an event is not credible. In light of the fact that an Unreviewed Safety Question (USQ) involving Tank criticality currently exists, this claim requires further investigation.

It was the conclusion of the review team that, given the pending management reorganization, and review team questions involving criticality and the WHC and DOE-RL ORRs, it will be necessary to revisit this facility at periodic intervals prior to restart in order to monitor program progress.

### C. BACKGROUND

Evaporator-242A was originally placed in operation in 1977, concentrating double shell tank wastes until 1984. At that time, it became evident that processing of liquid waste would be necessary over a period longer than the expected evaporator design lifetime of 10 years. Therefore, a material upgrade program was begun, entailing a capital investment of approximately \$16.5 million. The construction upgrade portion of this program is essentially complete; acceptance testing is in progress. Completion of this upgrade program is expected to allow evaporator operation to continue through the year 2000.

While the evaporator was being upgraded, it was realized that meeting Resource Conservation and Recovery Act (RCRA) regulations would force a change in Evaporator-242A restart planning. Specifically, RCRA requires that the products of processing listed wastes (i.e., listed per 40 CFR 261) must also be treated as listed waste. The process condensate discharged by Evaporator-242A during waste volume reduction operations could therefore no longer be discharged to the ground; it had to be treated as listed waste.

Restarting Evaporator-242A therefore had to wait upon design and construction of a suitable Effluent Treatment Facility (ETF). However, ETF is still in the preliminary design phase, and waste volume projections for the Hanford Site precluded a prolonged wait for evaporator restart. Therefore, an interim plan was conceived: use a Liquid Effluent Retention Facility (LERF) as a temporary holding basin for evaporator process condensate. Evaporator-242A could then be restarted independent of the completion of the ETF, with the listed waste (process condensate) accumulating and being held for treatment after the ETF becomes operational.

LERF consists of three 6.5 million gallon RCRA-qualified basins (including floating covers). Only two of the basins may be used, as the third is required to remain fully available to accept a complete basin transfer should one of the basins in use develop a leak. LERF is also nearing completion of its construction phase. It will then undergo acceptance testing; for ORR purposes, LERF is considered a part of the Evaporator-242A facility. Of note, all of the LERF basins must be removed from the evaporator discharge path and emptied of all process waste by December 1994, per the Tri-Party Agreement (TPA).

#### D. SPECIFIC OBSERVATIONS

##### 1. Evaporator-242A Organization.

WHC personnel at the evaporator are currently undergoing a reorganization, to be effective by May 29, 1992. Information concerning the final organizational configuration was not made available to the review team. It was learned that WHC intends to form an Evaporator Restart Team, to be headed (full time) by Mr. Tom Halverson. However, in the course of three days of briefings, the review team was also informed that Mr. Halverson was: (1) the full time head of the Tank Farm Joint Test Group; (2) expected to run the WHC-ORR Branch that is being formed to improve ORR performance site-wide (including the Plutonium Finishing Plant and U03 Plant ORRs); and (3) still working on various off-site commitments.

A formal, signed Plan of the Day (POD) has been instituted in the last month, including a formal POD preparation meeting attended by the following WHC personnel: Facility Operations Manager, the Facility Maintenance & Production Manager, the Facility Manager, and the Health & Safety Manager.

The Maintenance & Production Manager has instituted a Team Concept among the Crafts (Maintenance Technicians). Mixed groups of each technical skill (e.g., electrician, fitter, welder, etc.) are assigned accountability for specific facilities, promoting "ownership"

attitudes and responsibilities. Initial response has reportedly seen team supervisors requesting more work for their teams, as production outstrips the maintenance work package preparation rate.

Currently, the Facility Manager is responsible for the equipment and is overseeing the upgrade, but does not control the facility operators.

Currently, Shift Managers (reporting to the Facility Operations Manager) review work packages for the following day and decide whether (1) the package is properly planned to meet Operations requirements, and (2) the affected systems can be aligned and tagged out to support the work. Some Shift Managers have rejected as much as 30% of the scheduled packages; Maintenance management views this as "lower level managers not supporting the priorities established by high level Operations management." WHC recognizes this as a problem and is initiating (commencing June 8, 1992) monthly work scheduling meetings, chaired by the Facility Operations Manager, to establish priorities and focus on breaking down barriers to completing maintenance work. These priorities and foci will then be carried forward to the lower level managers via the POD preparation meeting and the POD itself.

Evaporator manning levels for various operations remain to be determined. In particular, Evaporator-242A Operations Management is debating whether it is necessary to assign a dedicated Health Physics Technician (HPT) as part of each shift.

DOE-RL has not assigned an individual Facility Representative (or Site Representative) to the Evaporator-242A, although the facility falls under the purview of a Facility Representative who is also responsible for approximately half of the Tank Farms area. (Specifically, the western half, which includes Evaporator-242A and LERF).

## 2. Operational Readiness Review

DOE-RL has not provided any formal guidance to WHC regarding conduct of the Evaporator-242A ORR. The DOE ORR to be conducted prior to Evaporator-242A restart has been informally planned to include system walk-downs, operator drills, and operator interviews. (This information was obtained through the SWEC personnel representing DOE-RL during the discussion of ORR plans.)

The WHC-ORR is being restructured, based on a self-determination that what had been done previously (for the projected September restart) was inadequate in light of recent ORRs at Savannah River (K-Reactor), Rocky Flats, and WIPP. In particular, WHC determined that Conduct of Operations and DOE Order Compliance would require more emphasis. WHC has established a dedicated organization to perform the ORR, although it was not clear to the review team that a single individual has ultimate responsibility.

The WHC-ORR team is not specifically directed to validate the assumptions made in the development of Revision 1 to the Evaporator-242A FSAR, nor is it presented with

information allowing it to do so. Such assumption include:

- a. Deficiencies reported in the DOE Order Compliance Reviews of Evaporator-242A submitted to DOE-RL by WHC include planned corrective actions. In the Evaporator-242A FSAR (Rev 1), these corrective actions are assumed to have (1) been implemented and (2) been effective. (See Section D Part 4, below).
- b. FSAR (Rev 1) accident analyses include assumptions that all planned physical configuration changes have been completed. The review team found that, in one particular instance, a lateral support bracket assumed to be in place at the upper end of the Evaporator Pot was not in place (as observed during a facility tour), not included in the upgraded facility model in the control room, and not expected to be installed (facility operators stated that the only remaining construction work to be done was post-construction housekeeping).
- c. FSAR (Rev 1) accident analyses include assumptions that all evaporator systems are ready for operation. As indicated in the draft 242A Evaporator Water Hammer Event Investigation, acceptance testing of upgrade component has placed a great emphasis on testing electrical and instrumentation systems, and relatively less emphasis on testing mechanical components. The incident itself is a direct indication that shortfalls exist in the acceptance testing program.

### 3. Safety Analysis Report

The status of revision 1 to the Evaporator-242A FSAR is as follows: (1) all DOE-RL comments have been resolved; (2) one (minor) DOE-HQ comment remains to be resolved. The LERF FSAR has been approved and signed by DOE, but an Engineering Change Notice (ECN) is being processed by WHC to update LERF FSAR source terms based on revised evaporator data.

The Evaporator-242A FSAR (Rev 1) contains the assumption that feed is characterized. However, no mechanism exists to prevent alteration of feed tank constituents (either adding or removing waste) after the characterization samples are drawn, or during an evaporator run. WHC is depending on the Tank Farm transfer procedure review and approval process to prevent such an action.

The review team was informed that the Evaporator-242A FSAR (Rev 1) includes a criticality analysis using the "worst possible tank feed case," with the conclusion that such an event is not credible. In light of the fact that an USQ involving Tank criticality currently exists, this claim requires further investigation.

### 4. DOE Order Compliance

Detailed Order Compliance Assessments with respect to Evaporator-242A have been performed by WHC for 12 DOE Orders, as specified in a letter from DOE-RL. WHC is

awaiting DOE-RL direction to examine compliance to the 26 other orders ("...of the 44 of interest to DNFSB. . . ") which WHC concluded are also applicable to this non-reactor facility.

The 12 assessments completed to date were used as primary input for the Evaporator-242A FSAR (Rev 1). The FSAR implications of performing 26 more assessments have not been considered.

## 5. Evaporator-242A Facility

Turnover of equipment following completion of upgrades is not occurring in an orderly manner. For example, although design, procurement, and construction of system upgrades are the responsibility of Kaiser Engineers Hanford (KEH), acceptance testing has not necessarily been satisfactorily completed by KEH. Several systems have been "taken over" by WHC in order to perform Operational Testing. WHC is also controlling Acceptance Test Procedures (ATPs).

The February 1992 Water-hammer Incident revealed, among other things, that adequate system performance has not been confirmed as a result of acceptance testing. The WaterHammer Incident Report (in draft form at the time of this review) acknowledged that this issue was of general concern.

As of May 14, 1992, there were 56 open work packages for the evaporator: 34 for corrective maintenance, 20 for upgrades, two for KEH.

During a tour of the facility, the review team observed the following:

- a. Most air sampler system valves are unlabeled.
- b. The glass is broken on a pressure gauge near Station No. 1 in the Aqueous MakeUp (AMU) room.
- c. Construction material, trash, and debris were noted on all levels of the Condenser room. This included scaffolds, ladders, planks, tape, hoses, electrical leads, tools, boxes, and test equipment.
- d. Various valves are unlabeled on new systems in the Condenser room, and wall radiation placards are affixed with tape.

## 6. Conduct of Operations

A formal "at the controls" area has been designated for Evaporator-242A operators.

The Facility Maintenance & Production Manager has personally conducted training for all of his Craft Technicians to emphasize:

- a. Facility valves, including instrument root valves, are controlled by the Operators, not Crafts. (Misconceptions concerning this fact were presented by WHC as contributing causes to the February 28, 1992 Water Hammer Incident.)
- b. The Lock and Tag Instruction is inviolate. It is incumbent on the Operators to create a safe envelope for the Crafts to work in; it is incumbent on the Craft Technician to ensure the safe envelope exists, and to remain within it. The last Lock and Tag violator was suspended for three days without pay by the Facility Maintenance & Production Manager.

Discrepancies noted by the review team included:

- a. An HPT was observed frisking books for contamination at a monitoring station in a Radiologically Controlled Area (RCA). To facilitate turning pages, the HPT was licking a finger every few sweeps. Further questioning revealed that the HPT in question was considered one of the senior, most fully qualified HPTs available to the Tank Farms area.
- b. An operator discussing Conduct of Operations with the review team stated that it [formal Conduct of Operations] was nothing new, "...it was the way we always did it, anyway."
- c. Several ventilation duct access panels labeled as controlled areas (surface contamination) were found to be unlatched.
- d. Several operator round sheet entries were found to be made entirely in red ink.
- e. Material System Data Sheets (MSDS) could not be located for several cleaning/solvent agents maintained in the facility per 29 CFR 1910.1200.
- f. No monthly fire extinguisher inspections were performed in the month of April 1992.
- g. No apparent procedure exists to verify that doors/accesses required to be closed/locked during various phases of operation are, or remain, closed/locked.
- h. At least seven instrument transmitters in the Condenser room basement are overdue for calibration.
- i. When exiting the Condenser room (via the air lock), personnel must remove all protective clothing before stepping from the Condenser room to the step-off pad. This results in [unclad] personnel stepping in a potentially contaminated area without protection, and then potentially spreading contamination to the step-off pad.

## 7. Procedures

Plant Operating Procedures are currently being developed for Evaporator-242A. Approximately 23 Operating Procedures require upgrading to support the restart. In addition, 12 procedures contained within Operational Test Work Procedures (or Plans) require rewriting to be issued as Operating Procedures. However, the review and approval system for these procedures did not appear to be formally controlled. For example:

- a. Sample Plant Operating Procedure TFPE-WP-00165 was provided to the review team. It had two pen-and-ink additions to the chain of approval signatures, and the final authorization section was not properly completed by the approval authority. (Approval authority did not indicate, as required, whether all objections to the procedure had been resolved, and, if not, what unresolved issues still exist.)
- b. Plant Operating Procedures will be validated by issuing them as "Work Procedure" versions, which supervisors will be allowed to alter on the spot and Shift Managers will be allowed to approve in the course of operational testing. This places such procedures outside the normal review path, uncontrolled by Engineering Configuration Management. WHC considers these and other shortcuts, specified in WHC-CM-5-5, to be justified due to the fact that lack of information and experience in the upgraded systems requires greater flexibility and ease of making procedural changes.

WHC is developing Plant Operating Procedures based upon the unapproved FSAR (Rev 1), but recognizes that any procedures completed before the FSAR is formally issued will require a complete review upon FSAR (Rev 1) approval by DOE-HQ. The mechanism to verify that this review is performed was not apparent.

As indicated in the draft 242A Evaporator Water Hammer Event Investigation, procedures (in this case, Operational Test Procedures) are being developed based on system design drawings, as opposed to as-built drawings or system walk-down information. At least one incident is directly attributable to this practice.

## 8. Training

The Evaporator-242A Operator Training and Qualification Programs have been extensively rewritten and formally documented. However, they have not yet been implemented. The delay is tied to WHC negotiations with the Oil, Chemical, and Atomic Workers Bargaining Unit. Evaporator-242A management is developing an implementation schedule for the programs, taking into account that it may be necessary to proceed with the training prior to obtaining Bargaining Unit agreement. This would necessitate removing all job-jeopardy considerations.

As presented to the review team, the sequence of planned evaporator training schedules



shutdown on-the-job training (OJT) prior to three-to-four weeks of classroom instruction on evaporator system upgrades. The logic behind this scheduling could not be adequately explained.

A Core Training Program has been initiated on a Tank Farm wide basis, to upgrade overall operator knowledge. The program is conducted at a basic (high school) level but appears to be well-received by both the instructors and the students. Written tests are included in each program module, consisting of multiple choice or true-false questions drawn from an exam bank.

The Evaporator-242A Facility Operations Manager intends to establish a program whereby operators will be able to qualify and become certified to self-frisk. This will allow continued operator access to the facility when the HPT is otherwise occupied.

It is intended that Crafts (Maintenance) personnel be given facility specific training, but the type and means are yet to be determined. Maintenance managers have attended Conduct of Operations training, but Maintenance workers have not. It is intended that Maintenance personnel be given Conduct of Maintenance training, once such a course is developed.

HPTs are not given any facility specific training beyond "Basic Orientation."

9. Permitting and Tri-Party Agreement Considerations

DOE-HQ has orally committed that the original Evaporator-242A Categorical Exclusion (CX) Memo-To-File will be adequate National Environmental Policy Act (NEPA) documentation for restart. A formal letter notifying WHC of this status is currently in the DOE-EM signature chain.

Evaporator-242A and LERF RCRA Part B permit paperwork has been submitted to Washington Department of Ecology (WDOE), although no WDOE action is expected on LERF because of its temporary nature. Restart is not dependent on the Evaporator permit, as the facility is classified as "interim-use."

All Evaporator-242A milestones have been removed from the latest version of the TPA; however, LERF milestones in the TPA include emptying all basins by December 1994, and completion of LERF clean closure by June 1995.

If Evaporator-242A restart is not accomplished by April 1994, the Clean Air Act (CAA) permit under which operation was initially approved will expire.

10. Effects of Restart Delay on Waste Volume Projections

Currently, both proposed evaporator feed tanks 102-AP and 104-AP are relatively empty (less than 7% total volume occupied), and are considered spare Double Shelled Tank (DST) volume. If this spare volume is required for use, the waste to be processed in the

first evaporator run can be preloaded into 102-AP, freeing the tank it currently occupies for tank farm use.

Based on the assumed slip in the Grout Facility and Evaporator-242A schedules, a maximum DST volume projection was calculated, and used to determine a maximum monthly liquid waste allotment for each facility at the Hanford Site over the coming year. Currently, most facilities are well below the allotment each month, although it is not apparent how much of this reduction in liquid waste flow is due to improved efficiency and how much is due to simply holding back some liquid waste in local facility storage.

#### Attachment

DNFSB Staff and Outside Expert Attendees for  
Hanford Site Evaporator-242A Review  
May 18-21, 1992

#### DNFSB Staff:

Dr. Joel Blackman  
Timothy J. Dwyer  
Matthew B. Moury  
James Troan

#### Outside Experts:

David S. Boyd  
Dr. William Hall  
Lawrence Schaeffer  
Dr. John D. Stevenson  
Richard L. Thompson