

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

July 18, 1994

MEMORANDUM: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: Ralph Arcaro, Technical Staff

SUBJECT: Savannah River Site Defense Waste Processing Facility Training and Qualification Review, May 24 - 27, 1994.

1. **Purpose:** This memorandum provides comment on a review of training and qualification at the Savannah River Site Defense Waste Processing Facility (DWPF) conducted May 24 - 27, 1994. The DNFSB review team consisted of staff members Ralph Arcaro and Timothy Dwyer, and outside experts John Drain and Richard Thompson. The review consisted of briefings provided by the DOE Savannah River Operations Office (DOE-SK) and by the DWPF Program Manager, Operations Manager and Training Manager, personnel interviews, record review of various training materials, observations of training in progress, and a guided tour of the facility.
2. **Summary:** Since the last DNFSB staff review of training and qualification at DWPF, several improvements have been made in the quality and development of the operations training program. Significant among these improvements is the establishment of a pipeline training program in which future operators are trained full-time in the fundamentals, systems, and operations of the facility. The strengths of the DWPF training program include:
 - A strong course in engineering fundamentals;
 - A rigorous examination process including challenging written exams and plans for oral boards; and
 - Use of a control room simulator.

Potential weaknesses were observed in the following areas:

- The timing of start-up milestones such as finalization of the Safety Analysis Report (SAR) and incorporation of the Late-Wash Facility may not permit sufficient time to incorporate the changes to training requirements these activities may generate; and
- The level of knowledge in fundamentals displayed by incumbent operators was lower than that of the candidates in the new pipeline program. The gaps in level of knowledge will reportedly be made up during On-the-Job Training (OJT). This area will require further review to ensure that incumbent operators provide the same assurance of safety as pipeline-trained operators.

Interviews of operations personnel indicated some knowledge deficiencies that are expected to be corrected by the improved training programs. Future reviews will be necessary to verify the improvements successfully develop qualified operators.

3. **Background:** The DWPF is currently in the pre-operational testing phase. Commencement of radiological operations is scheduled for December 1995. A prior review of training and qualification was conducted by the DNFSB staff in July 1993. Weaknesses were noted during this review in the areas of Facility Representative Training, supervisor training, and the use of the training "fifth" shift.

At the time of the July 1993 DNFSB staff review or shortly thereafter, DWPF assigned a new Operations Manager and Training Manager. The most recent DNFSB Staff review was conducted to follow-up the July review and to determine the effectiveness of improvements instituted by these two new managers.

4. **Discussion:**

- a. **DOE-SR Facility Representatives** - Progress was noted in the qualification of Facility Representatives assigned to DWPF. Of the five Facility Representatives assigned, three are fully qualified and two are provisionally qualified. They provide 24-hour coverage during significant testing operations and routinely conduct performance based reviews of plant activities. The two Facility Representatives encountered during the visit were involved in the plant's activities and were knowledgeable on operational and material issues.

- b. **Operational Overview**

1. **Organization**- All Department Managers (Engineering, Controls Management, Operations, Training, Quality Assurance and Late Wash Process) report directly to the Program Manager. The Program Manager stated, however, that the Operations Manager is the senior report and will probably assume the as yet unfilled Plant Manager position. The improvements in the quality of the training and qualification program, described in more detail below, are recognized as the positive effects of the Operations Manager and Training Manager.
2. **Test Process** - The operating crew is gaining invaluable experience during the plant testing periods. The Operations Manager emphasized that, although there is a Startup Test Engineer and one or more Cognizant Engineers on shift during testing, the operating crew is in charge of all plant testing. When the Startup Engineer makes recommendations to the Shift Manager or the Control Room Supervisor, the manager or supervisor translates that into commands for the various Control Room or Building Operators. The function of the Cognizant Engineer is advisory only.
3. **Schedule Impacts on Training and Qualification** - Several elements of the schedule, as DWPF proceeds toward radiological operations, are of

concern from a training and qualification perspective. Review, revision and approval of the SAR is scheduled for November 1995, and the design, construction and startup of the Late Wash Facility is scheduled for March 1996. Both of these activities can affect the finalization of watchstander requirements, the content of the training program, and the determination of which watchstations will require certification and which will require only qualification. An additional SAR-related item is the completion of the "Assured Confinement Studies," and any plant system changes that might result from these studies. Discussions with managers in Engineering and Training failed to identify the existence of an *integrated* schedule that recognized and accommodated the time required to develop training materials and incorporate training, certification and/or qualification for any new watchstations, and prepare operating procedures, system descriptions, etc., that could result from these engineering changes and reviews.

- c. **Training Programs** - The DWPF Training Manager provided an overview of the operator training program status and course of action being followed based on a programmatic self-assessment made in the Fall of 1993. Among the strengths noted in that internal assessment were the numbers of good people, the use of performance based training methodology, the institution of oral board exams in 1992, an improved Control Room simulator, and the creation of a pipeline training program. Weaknesses identified or confirmed included the lack of training for supervisors, depth of knowledge limited to "facts" rather than understanding, and the virtual nonexistence of meaningful on-shift training. Since then, improvements have been made in the quantity and quality of technical training, integrated systems training has begun, procedural compliance has improved, and the training organization has been strengthened to assure further progress. Two concurrent training programs are now in effect:
 1. **Incumbent Training Program** - The training program for the provisionally qualified assigned shift crew operators is similar to the .fifth shift. training process utilized at K-Reactor. In this process, each shift receives five days of dedicated training out of each five weeks of the rotating shift cycle. To date, the training cycle in fundamentals and Control Room OJT has been completed. Operators are now following the Qualification Standards in preparing for written and oral exams and oral boards. The Incumbent Training Program is not designed to reach as high a level of knowledge of fundamentals or systems as in the pipeline course. In setting the Incumbent Training Program goals, the expectation was that the learning associated with plant operations would compensate for the lower level of formal instruction and testing. It was clear from the interviews conducted during this visit that, at this point, the incumbents have a lower understanding of fundamentals and systems than the pipeline trainees interviewed (both of whom were former incumbents). Whether the expectation for the incumbents will be realized will depend on the

quality of the OJT instruction conducted over the next several months.

2. **Pipeline Training Program** - The pipeline training program was created as a full time classroom program dedicated to systematically training future operators. Of the 72 operators in the program, 52 are slated for DWPF, and the balance for the Tank Farm. About 40% of the candidates for DWPF came from DWPF operating crews, about 40% from K-Reactor, and the rest from sources such as the Reactor Materials Area. The schedule and general topics of study for the pipeline program include:

November '93- May '94	- Fundamentals of math, physics, chemistry, heat transfer, thermodynamics, basic electrical theory, etc.
June '94-August '94	- Applied fundamentals.
August '94- December '94	- Systems training for Building Operators.
August '94- February '95	- Systems training for Control Room Operators.
December '94- Until qualified	- On-the-Job (OJT) for Building Operators.
February '95- Until certified	- OJT for Control Room Operators. (about July '95)

- d. **Pipeline Fundamentals Course** - Discussions with the training staff and interviews of pipeline students, indicated that the fundamentals course is difficult, but manageable. (Excessive course difficulty was a criticism of the DWPF training program voiced by a group of DWPF employees in a letter to the Secretary of Energy.) After reviewing the comprehensive exam to be given in two parts over the following two days, it was concluded that the course content was by far more comprehensive than any of the fundamentals courses reviewed elsewhere in the DOE nuclear weapons complex (excluding that for K-Reactor), and much closer to the expectations articulated by Board members over the last four years. The exam questions were sufficient to evaluate knowledge and understanding of facts and principles, and the ability to apply them. Both of the trainees interviewed (one with three years DWPF experience and one with five years K-Reactor experience) considered the course already to be valuable and "probably" necessary for DWPF or the In-Tank Precipitation (ITP) process.
- e. **Examination Grading** - The DNFSB team reviewed the grading of exams in six training records. The grading of exams was also criticized by the group of DWPF employees in the letter to the Secretary of Energy. The set of records reviewed provided a good sample of the integrity of the grading process; the DNFSB Staff concluded that the training staff has gone to great lengths to assure accurate, fair and equitable grading.

- f. **Interviews of Incumbent Operators/Supervisors**- Nine operators, supervisors, or supporting engineers were interviewed, including a Shift Manager, a Control Room Supervisor, a Vitrification Support Supervisor, two Control Room Operators, a Shift Technical Engineer, a Cognizant Engineer, a Shift Technical Advisor, and a Building Operator. With the exception of the Shift Manager, depth of knowledge was not strong, and among the non-supervisory personnel, the level of knowledge was weaker than expected. Examples of weaknesses noted in one or more of the operators included the SAR, Lockout/Tagout procedures, the Zone One Ventilation system, the steam system, the chilled water system, and valve line-up procedures. None of the incumbent operators or first-line supervisors was able to describe DWPF processes as clearly as the two pipeline trainees interviewed. The DNFSB staff will conduct further reviews of training and qualification in accordance with paragraph 5 of this memorandum to ensure these weak areas are improved as a result of the completed training programs.
 - g. **Control Room Simulator** - When completed, the Control Room simulator will provide a fully interactive replica of the DWPF Control Room. This simulator and its use is one of the most significant improvements in the training program since the July 1993 DNFSB Staff visit. The present training plan allots each operator two weeks of training in normal operations and one week of training in abnormal conditions.
 - h. **Technical Staff Training**- Program development for technical staff training is also under the direction of the DWPF Training Manager. Cognizant Engineers and Shift Technical Engineers are currently in the program. The limiting factor in their progress is the amount of time available for training. The most significant knowledge weakness in this group is overall systems understanding. Some of the engineers are voluntarily attending the training for operators. At the present time, there is no qualification standard or qualification card for the Cognizant Engineer or Shift Technical Engineer positions.
5. **Plans for Future Review :-** The improvements to the training at DWPF have been significant. However, because the improvements have been relatively recent, additional reviews will be necessary to confirm that they have the desired effects. In particular, the DNFSB Staff will conduct follow-up reviews to verify that both incumbent operators and pipeline-trained personnel are sufficiently qualified to provide the necessary measure of safety.