U.S. NUCLEAR REGULATORY COMMISSIO
REGION I

THREE MILE ISLAND NUCLEAR STATION
TRAINING PROGRAM INSPECTION

REPORT NO. 92-81

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LICENSEE: GPU Nuclear Corporation
Three Mile Island Nuclear Station
P.O. Box 480
Middletown, Pennsylvania 17057-0191

FACILITY NAME: Three Mile Island Nuclear Station

INSPECTION AT: Middletown, Pennsylvania

INSPECTION DATES: July 20 - 24, 1992

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EXECUTIVE SUMMARY

In Section 306 of the Nuclear Waste Policy Act of 1982, the NRC was directed to promulgate regulations, or other guidance for training and qualifications of civilian nuclear power plant operators, supervisors, technicians and other operating personnel. The Commission policy statement issued in March 1985 and amended in November 1988 states that the NRC will conduct inspections as deemed necessary and take appropriate enforcement action when regulatory requirements are not met. The Nuclear Regulatory Commission considers effective training of nuclear power plant personnel to be an important part of safe plant operations.

This announced training program inspection was performed at the Three Mile Island (TMI) Nuclear Station in Middletown, Pennsylvania, from July 20 through July 24, 1992, in accordance with the policy statement. The inspection focused on the use of the Systems Approach to Training (SAT) methodology in TMI's various training programs. The specific training programs inspected were those for: licensed operators; nonlicensed operators; radiation control technicians; and chemistry technicians. The team's emphasis was to observe classroom and simulator training, and interview operators, technicians, instructors, supervisors and managers to determine the effectiveness of the licensee's SAT-based training programs. The inspection team reviewed the training programs' procedures, training materials, training records, qualification standards and other applicable documents only as necessary

The team assessed the training programs to be well developed and effectively implemented. These effective training programs contribute to the defense-in-depth approach to safe operations. Several program strengths were noted, including a staff of highly experienced and qualified instructors and well developed SAT programs. The support training group effectively incorporates plant changes into training. Good working relationships were found to exist between the training department and the user groups. A few minor weaknesses or discrepancies were found. Several training programs have experienced a reduction in their training weeks by one day. Trainee feedback solicitation and resolution was informally conducted for operator training. Also, some differences among the various training groups were observed. For example, instructors in one group spent more time in the plant on the job than other instructors. Training content varied among programs in the amount of detail provided to the trainees, such as in the area of technical specifications and system interactions. Even though the training programs as a whole were assessed to be effective and technically strong, minor weaknesses were found to exist.

DETAILS

1.0 INTRODUCTION

The inspection was conducted using guidance from NRC Inspection Manual Procedure 41500, "Training and Qualification Effectiveness" and NUREG-1220, "Training Review Criteria and Procedures." To assess the effectiveness of the INPO accredited SAT-based programs a performance-based inspection approach was used emphasizing observation of training and interviews with training department and user group personnel. Training records and documentation were reviewed where observations and interviews indicated a potential performance issue. The team evaluated the implementation of the five elements that comprise an SAT-based program by sampling several components of each element. Listed below are the five elements and their components that comprise an SAT-based program, as outlined in NUREG-1220.

1. Systematic Analysis of Jobs

   A systematic method is used for identifying and selecting tasks for training to prepare individuals to do their job.

   Tasks for continuing and initial training are differentiated.

   The analysis is adequate for development of learning objectives.

   The analysis is kept current as job performance requirements change.

2. Learning Objectives Derived from Analysis Which Describe Desired Performance

   There are learning objectives related to knowledge, skills, and abilities.

   Learning objectives contain actions, conditions, and standards needed for job performance.

   There are procedures to modify learning objectives as job performance requirements change.

3. Training Design and Implementation Based on the Learning Objectives

   The goals, objectives, responsibilities, and authority of training organization and staff are clearly stated.

   Qualifications and training requirements for the training staff address both appropriate subject matter and instructional skills.

   Training is appropriately organized, sequenced, and the instructional settings are appropriate to the tasks.

Lesson plans provide for consistent training delivery.

Existing instructional materials have been evaluated based on training needs.

Training is conducted in an adequate manner and records are maintained.

4. Evaluation of Trainee Mastery of Objectives During Training

Exemptions from training are objectively determined.

Trainee performance is regularly evaluated using job performance measures and objectives.

Trainees who perform below minimum standards during initial and requalification training receive remedial training, are retested, and are removed from training or job duties if performance is not acceptable.

Precautions are in place to prevent test compromise.

5. Program Evaluation and Revision Based on Performance in Job Setting

Methods are in place to systematically evaluate the effectiveness of training programs and revise training programs as appropriate.

Feedback from trainee tests, on-the-job experiences, and supervisors is used in program evaluations.

Instructor and trainee critiques are used in program evaluation.

Both internal and external program audits are used for program evaluation.

Training staff is routinely and objectively evaluated.

The specific training groups inspected were licensed operator (Senior Reactor Operators and Reactor Operators (SRO and RO)), nonlicensed operator (Auxiliary Operators (AO)), Radiation Control Field Office technicians (RCFO) and chemistry technicians. The inspection began in the Regional Office during the week of July 13, 1992, with a review of job tasks for each training program. Training program procedures were reviewed and schedules were reviewed to assist in planning the team's activities for the week of July 20, 1992. While on site, classroom, laboratory, and simulator training was observed. Interviews were conducted with operators, radiation control technicians, chemistry technicians, instructors, supervisors and managers. The inspection included a review of various training program procedures, training materials, records, qualification standards and other applicable documents to follow up potential weaknesses. The Support Training

program was also reviewed as it pertained to the specific programs. During this inspection, twelve classroom, one training laboratory, two simulator, two OJT and two OJT evaluation sessions were observed. From the various groups, thirteen job incumbents, six plant supervisors or managers, and twelve training personnel were interviewed.

2.0 SUMMARY OF FINDINGS

- Job incumbents stated that training quality was generally good but expressed concern that the time available for job-related training was decreasing. Time available for job-related training has decreased primarily because of increasing use of the requalification training week for other training and information programs. In the case of nonlicensed operators, the requalification training week has been reduced from five days to four days. For RCFO and chemistry staff, the requalification training week has been reduced from four days to three days.

- Operators indicated that no consistent method is used to solicit feedback regarding training. Training feedback forms are not routinely distributed and are not available in the classroom. For RCFO and chemistry staff, training feedback was consistently solicited and promptly addressed.

- The Equipment Change Modification Program (ECMP) was used to ensure plant equipment or procedure changes were addressed in the applicable training sessions. This was implemented by the Support Training group and was found to be a well-run program that ensured the programs were accurate and complete.

- The instructors demonstrated good technical knowledge and instructional skills. Instructors are well qualified both in the plant and as instructors and have high credibility with both students and plant management/supervision.

- Instructors generally rely upon initial training materials for requalification training. These materials tend to focus on the functions and design characteristics of systems and equipment rather than being more operationally oriented.

- The use of guest instructors provided a positive contribution to the credibility and technical quality of this training.

- Good working relationships exist between training and plant organizations. Plant operations managers are actively involved in operator training, including observation and evaluation of simulator and classroom training.

- The effectiveness of self-study sessions during requalification training for licensed operators were dependent upon the guidance provided by the shift supervisor.

- RCFO and chemistry technicians stated that evaluations of the training was conducted weekly both in writing and through interface meetings with the lead instructor. Comments made by the technicians were resolved in a timely manner.

- RCFO instructors maintained their qualifications as Group Radiological Controls Supervisors (GRCS) and provided manpower assistance to the RCFO as necessary. Chemistry instructors fulfilled their minimum in-plant time and maintained chemistry technician qualifications.

3.0 FINDINGS

3.1 Licensed and Nonlicensed Operator Training Programs

3.1.1 Training Observations

Operator and Shift Technical Advisor training classroom activities were observed. Topics addressed included reactor theory, plant systems, maintenance skills and knowledge, and normal and emergency operating procedures. Two system training classes were observed that adequately addressed the selected learning objectives for those classes. However, the use of training materials from the initial operator training program resulted in rudimentary coverage (such as location of plant equipment) which did not benefit experienced operators.

A class in performing heat balance calculations was presented by the plant manager responsible for performing heat balances. This individual provided a comprehensive presentation that included additional material not addressed by the approved learning objectives but, in so doing, caused the class to exceed its scheduled time by about 50%. The Plant Training Department reviewed and approved the learning objectives for this class. Even though the training was beneficial, the training department did not review the instructor's materials. While this guest instructor was provided support by the Plant Training Department, this support is not mandated by policies or procedures. The inspectors found that use of guest instructors provided a positive contribution to the credibility and technical quality of this training.

An operator class/lab session on motor operated valves (MOVs) was conducted in the maintenance training facility by Support Training instructors. The MOV training was found by the inspectors to be effective because it addressed skills and knowledge that went beyond those the operators had developed during initial training and because of the visual aids provided to illustrate details about the operation and maintenance of these valves. A licensed operator requalification class which discussed Technical Specification (TS) use and interpretation was also observed. The instructor presented several examples of possible plant conditions. The class was then to use the TS to identify the correct Limiting Condition for Operation (LCO) and the TS required action for the listed plant condition. The instructor directed the SROs to allow the ROs to respond first. This training was intended to upgrade the ROs' ability to use and interpret the TS since this area had previously been taught

primarily to the SRO licensed personnel. This training department action was a positive step to correct a previously observed deficiency in RO knowledge and use of the TS.

In all classes, the instructors demonstrated good technical knowledge and instructional skills. Students were attentive and demonstrated a knowledge of the material being presented. Instructors spent considerable time at the beginning of each lesson on learning objectives by having the students read the objectives and then reading the objectives to the students. In contrast, the review at the end of the lesson did not generally include questioning of students to determine if the objectives have been mastered but, rather, was an announcement that each objective had been addressed followed by a query of the students if they had any questions.

Other training-related activities observed by the inspectors included On-The-Job (OJT) training, simulator training, and plant surveillance observation. Good coordination was observed between classroom training and OJT for the AOs. In-plant OJT focused on reinforcing systems training presented during the week. In-plant task training, using JPMs or plant procedures, involved walk-through of tasks discussed during classroom systems training. An OJT evaluation session was staged for the inspectors using qualified nonlicensed operators, as there were no such evaluations scheduled during the inspection. The "trainee" demonstrated adequate performance of the selected tasks, and the "instructor" used appropriate evaluation techniques. The inspectors observed licensed operators performing requalification training drills on the plant simulator. The drills involved plant transients, which required the use of abnormal and emergency procedures. A critique of the drill was held immediately after it was completed. The critique was conducted by the operators with comments and direction by the simulator instructor. The critique was quite candid and addressed problems experienced during the simulator drill and questions raised by either the operators or the instructor.

The performance of control rod movement surveillance (procedure 1303-3.1) was observed by the inspector. The shift supervisor had the feedwater control placed in manual to prevent any plant power oscillations due to coolant temperature changes resulting during control rod movement. The inspector noted that placing the feedwater controls in manual was not a note or a required step in the procedure; however, through discussions with licensed operators, the inspector learned that it was almost always placed in manual for this surveillance procedure. The inspector judged that this absence of procedural guidance could challenge operator ability and memory. When questioned by the inspector regarding this issue, the plant operations manager stated that placing the feedwater controls in manual was not stated in the procedure to allow the foreman or shift supervisor to decide whether to place the system in manual or leave it in automatic. Throughout the surveillance, the operators demonstrated good systems interface knowledge by remembering to place the feedwater controls in manual and appeared knowledgeable of the rod drive control system.

The licensed operator requalification program attendance records for the 92-1, 92-2, and 92-3 cycles were reviewed. Several personnel had missed some of the classroom training. When questioned, the Manager, Operations Training, stated that their approved program allows up

to 20 hours of classroom training to be missed in a one year period and individuals that miss training must still pass the test given at the end of the training cycle. The training staff also keeps track of the classes and number of instruction hours missed to ensure that none of the operators exceed the 20 hours. The inspector considered these practices to be acceptable.

Two industry events were randomly selected, and the Manager, Operations Training was asked to identify where they appeared on the training schedule. The schedule contained one of the events with the second event planned for a later training cycle that did not have a schedule prepared yet. The inspector reviewed the record of topics covered for the 9R Outage. The inspector also asked how selection of plant modifications was conducted. The Manager, Operations Training, stated that the Operations Department management selected the plant modifications requiring formal training. The Operations Department issues a outage book which lists all plant modifications conducted during the outage and a description of its function. The Training Department develops lesson plans and learning objectives and conducts the training during the Outage Training Cycle. The inspector concluded that industry events were being adequately incorporated into training.

3.1.2 **Interviews**

Interviews were conducted with four licensed operators, four nonlicensed operators, a Shift Supervisor, the Plant Operations Manager, two licensed operator instructors, two nonlicensed operator instructors, two lead instructors, the Operations Training Manager, and the Plant Training Department Manager.

The operators interviewed were an experienced group with the least experienced operator having been qualified at TMI for more than six years; thus, the focus of discussions was on requalification training rather than initial training. Operators stated that requalification training was generally good but expressed concern that the time available for job-related training was decreasing. Licensed operators were particularly concerned about maintaining the time available for simulator training. Nonlicensed operator requalification training weeks had been reduced from five days to four days. Also, nonlicensed operators were not provided as much training time during outages as were licensed operators. Some licensed operators indicated that self-study sessions during requalification week were not effective because they were unstructured. Other operators indicated that their self-study sessions were structured. Subsequent discussions with instructors and supervisors indicated that these sessions were the responsibility of shift supervisors to lead and that some shift supervisors were better than others at conducting such sessions. Operators indicated general satisfaction with the quality of instruction provided them, but indicated that no consistent method was used to solicit feedback regarding training they received. Operators indicated that instructors had credibility and were genuinely interested in their students' progress.

Licensed operators indicated that having the same simulator instructor assigned to their shift for all requalification cycles resulted in better coordination and continuity between training and operations. The Plant Operations Manager has instituted some new methods for

providing feedback to each shift on their performance during simulator training. One method is to videotape the simulator drill and the evaluation session during the first day of the requalification cycle. The Plant Operations Manager (POM) reviews the tape and provides written comments. It is intended that the comments be provided to the shift before Friday afternoon of that week when the POM is in the simulator for another evaluation session. However, operators indicated that the evaluation comments from the video tape review are not always provided to them, or were sometimes provided during subsequent requalification cycles.

Even though the operations training staff has decreased from 20 to 15, the instructors interviewed indicated that they are generally provided adequate time to prepare for the training for which they are responsible. Occasionally, overtime work was needed to prepare upcoming training assignments. However two areas that were identified as being negatively impacted were in-plant time and time to develop more operationally oriented requalification training materials. As a result, the instructors rely upon initial training materials which have already been presented several times to most operators. These materials focus on the functions and design characteristics of systems and equipment rather than being more operationally oriented.

3.1.3 Summary

Operator training was determined to be a well-developed, performance-based program that has the user group support. While the operations training staff has decreased, no indications were found that this reduction had adverse impact on training. On occasion, training instructors need to work overtime to prepare for upcoming training assignments. Even though training was satisfactory, areas of improvements have been identified by the licensee to maintain and improve the quality of these programs. Implementation of these improvements is resource limited. Based on interviews and observation, inspectors identified the following strengths of these training programs. Instructors are well qualified for their assignments and have credibility with both students and plant management/supervision. Good working relationships exist between training and plant organizations. Plant operations managers are actively involved in operator training, including observation/evaluation of simulator and classroom training.

Based on interviews and observations, inspectors identified the following weaknesses of these training programs. The training evaluation feedback system for both licensed and non-licensed operator training programs did not ensure follow through. Both ROs and AOs interviewed did not perceive that there was an interest by the Plant Training Department in their comments regarding the training they received. In contrast, plant operations managers and supervisors stated that there was a mechanism for providing feedback on training and that they were provided a response to their feedback, although the feedback was generally not documented. Training feedback forms are not routinely distributed and are not available in the classroom. Time available for job-related training has decreased, primarily because of

increasing use of the requalification training week for other training and information programs and, in the case of nonlicensed operators, because of a reduction in requalification training from five days to four days per cycle.

3.2 Chemistry and Radiological Control Technician Training Programs

3.2.1 Training Observations

Light chemistry and RCFO classroom presentations were observed and found to be job oriented. The technicians who attended these sessions were attentive. They participated in the sessions by questioning the instructors for clarification or additional information and answered questions posed by the instructors. The chemistry and RCFO instructors were evaluated by the inspectors to be credible as technical instructors and knowledgeable in the specific job performance requirements of the technicians. The instructors were professional in demeanor and maintained the control of the class, especially during periods of discussion among the technicians. The instructors maintained their qualifications as technicians/foremen and demonstrated good instructional abilities.

Classroom materials were good. Trainees were provided with quality handouts that were relevant to the observed sessions and well formatted for trainee use. Lesson plans, with the exception of the Equivalence of Mass and Energy lesson plan, were complete and usable by any qualified instructor. The Equivalence of Mass and Energy lesson plan was to be used with a videotape that was not utilized. In spite of the inadequacy of the lesson plan, the instructor ensured an adequate transfer of information and coverage of learning objectives. The visual aids used during the presentations were generally satisfactory. The system on-line drawings were adequate but were difficult to interpret when displayed. The newer visuals produced in-house by the instructional staff were clear and well formatted. Overall, classroom materials were determined to be good.

3.2.2 Interviews

All technicians commented that the continuing training quality was generally good, however, the time devoted to technical training was less than it was five years ago. The technicians interviewed were experienced individuals with the least experienced technician having been at TMI for more than seven years. Continuing training was becoming more based in the actual aspects of the job but many of the presentations were repetitive. The same topics were being presented but changes were being made to help the technicians retain more of the information. Even though several of the technicians questioned the purpose of some of the training and had suggestions for additional training, the technicians were, overall, satisfied with their training.

The technicians supported the current system of trainee and program evaluation and believed it to be effective. All technicians commented that the processes were fair and ensured competency of the technicians. Technicians stated that there was good rapport with the

training organization and that communications between the technicians and training were effective. Technicians stated that the semi-annual polls conducted by training made the technicians feel that the training program was their program. Technicians stated that evaluations of the training was conducted weekly both in writing and through interface meetings with the lead instructor. Any comments made by the technicians were resolved in a timely manner.

The instructors interviewed were very experienced both as instructors and as technicians. RCFO instructors maintain their qualifications as Group Radiological Controls Supervisors (GRCS) and provide manpower assistance to the RCFO as necessary. Chemistry instructors were qualified as chemistry foremen, fulfilled their minimum in-plant time, and maintained chemistry technician qualifications. The instructors expressed the view that maintaining user group qualifications ensured good rapport with the user groups and increased the credibility of the training organization. The technicians viewed the instructors as a program strength.

Training and plant supervisors considered the training program to be effective. Training supervisors attributed the program strength to instructional staff, communications with the user groups, commitment to training by the plant and senior management, and equipment available to develop training. They viewed cross-training of instructors, use of vendors to provide specific equipment training, and use of creative training methods as areas for program improvement. Plant supervisor interviews revealed a commitment to training and an involvement in the training material development and program improvement process. The supervisors expressed that communications with the training organization were very good. Plant supervisors felt that the effectiveness of the programs was good but improvements could be made in increased plant time for initial programs and developing a qualification card specifically for requalification of the technicians rather than using the initial technician qualification cards.

Discussions with the Support Training supervisors indicated their involvement with all aspects of the chemistry and radiation controls training groups. The supervisors strived to ensure good communications were maintained with the user groups. The Equipment Change Modification Program (ECMP), as implemented by the Support Training group, was found to be a well-run program that ensured the programs were accurate and complete. Station procedure changes and incoming industry notices were screened for training program applicability and the ECMP provided a decision tree checklist for disposition of the changes into the appropriate training program elements.

3.2.3 Summary

Both of these training groups are satisfactory in their current state. The training programs, as implemented, are well-developed and well-managed programs. Training department personnel are qualified and capable technicians and/or supervisors. Instructors have credibility, maintain contact with the user group, and have good instructional skills. The training staffs and user groups strive to ensure that both programs are accurate, plant-specific,

and job relevant. The strengths of the programs identified by the inspectors were the instructional staff, the commitment to relevancy and accuracy of training by both the training departments and the user groups, the strong training feedback system, and the Support Training staff that ensures procedure changes, equipment modification and industry experience are incorporated into the training programs. Though not identified as an area of concern, the inspectors noted the reduction in training time for these programs from four days to three days per training week. Overall, the inspectors concluded that these programs were strong.

4.0 CONCLUSIONS

By sampling various components of an SAT-based program, the team determined that the training department has satisfactorily implemented the elements that comprise an SAT-based program. The task lists were reviewed and found to be adequate with differentiation made between initial and continuing training. Learning objectives were based on those tasks related to knowledge, skills and abilities for job performance and did contain proper standards. The training program was determined to be well organized, sequenced and designed within the appropriate settings to incorporate the tasks and learning objectives. The training department and plant staff understood their respective responsibilities regarding training and interfaced as necessary to coordinate and plan training. Training staff qualifications and abilities were strong. Lesson plans prepared by the staff were satisfactory to ensure consistent delivery by instructors. The trainee evaluation process was good. OJT evaluations were observed to be sufficient to measure trainee mastery of in-plant duties. Also, these programs have bi-annual requalification examination requirements that not only measure trainee knowledge but provide incentive for attentiveness and participation in the training process. Finally, program evaluation and revision are generally strong. Industry peer evaluation efforts, annual quality assurance audits, and plant and training interface meetings are used to evaluate training effectiveness. Moreover, the feedback system within these departments enables the exchange of ideas and constructive criticism, thus, providing constant input regarding the programs.

Attachment: Persons Contacted

ATTACHMENT 1

PERSONS CONTACTED

Three Mile Island Personnel

T. Broughton, Director, TMI Unit 1
*# H. Crawford, Plant Analysis Manager
* L. Florey, Supervisor, Training Administration Support
# E. Gliot, Chemistry Instructor
# A. Graybill, Chemistry Instructor
* D. Hassler, Licensing Engineer
* R. Hess, Lead Instructor Operator Training
* W. Heysek, Licensing Engineer
*# E. Houser, Lead Instructor RCC
*# F. Kacinko, Technical Program Specialist
*# D. Laudermilch, Maintenance Training Manager
*# S. Mervine, Support Training Manager
* R. Parnell, Lead Instructor, Simulator Training
* F. Perry, ESP Training Coordinator
* M. Ross, Director Operations and Maintenance
*# O. Shalikashvili, Manager, Plant Training
*# H. Shipman, Plant Operations Director
*# M. Trump, Operator Training
*# D. Tuttle, Manager, Special Programs, Radiation Controls
* R. Zechman, Training Development Coordinator
# D. Zeiter, Radiation Controls Instructor

NRC Personnel

L. Bettenhausen, Chief, Operations Branch
*# L. Briggs, Sr. Operations Engineer
*# T. Mazour, Training Specialist, SAIC
*# J. Noggle, Radiation Specialist
*# R. Pelton, Training Specialist, NRR
*# D. Silk, Sr. Operations Engineer
* F. Young, Sr. Resident Inspector

*Denotes those in attendance at Entrance Meeting on July 21, 1992.

#Denotes those in attendance at Exit Meeting on July 24, 1992.