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Licensee: Pennsylvania Power & Light Company
2 North Ninth Street
Allentown, Pennsylvania 18101

Facility Name: Susquehanna Steam Electric Station Units 1 and 2

Inspection At: Berwick, Pennsylvania

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Executive Summary

A special announced training program team inspection was performed at the Susquehanna Steam Electric Station, Units 1 and 2, from August 21 to August 25, 1989 (50-387/89-80 and 50-388/89-80). This in-depth team inspection focused on Susquehanna's training programs and their implementation. The specific training areas inspected were health physics, mechanical maintenance, Instrument and Controls (I&C), and licensed reactor operator and shift supervisor. The inspection included a review of training program procedures, training materials, records, qualification standards, and other applicable documents; observations of classroom training, on-the-job training, simulator training, and on-the-job performances; and interviews with operators, technicians, trainees, instructors, supervisors and managers.

Within the scope of the areas reviewed, the training programs at Susquehanna Units 1 and 2 are well designed, implemented, and strongly supported by both training management and line management including the Senior Vice President Nuclear. Areas of program strengths and specific weaknesses are summarized below:

The team concluded that the training programs satisfied all of the components of a Systems Approach to Training (SAT) based program and the programs are functioning well. The job/task analysis is comprehensive, well defined, and well implemented. The training facility component of the training program which includes the classrooms, laboratories and equipment, and support facilities is an overall strength.

Further, the team concluded that an overall strength of the training program is the comprehensive program evaluation process. This process systematically evaluates the effectiveness of training which resulted in revisions to the training programs.

The technical content of the Units of Instruction (UOIs) are generally good but they are not structured to assure consistent delivery by instructors. The licensee is in the process of improving these UOIs and plans to continue this process.

The Health Physics (HP) training programs were found to be effective and of high quality. Weaknesses were noted with the UOIs and with systems training for HP technicians. The Mechanical Maintenance (MM) training programs were found to be well implemented. Weaknesses were noted regarding incomplete implementation of the applicable examination development policy and the apparent low priority given to MM certification. The Instrument and Controls (I&C) training programs were effectively implemented with weaknesses regarding incomplete implementation of the applicable examination development policy and the frequent use of temporary approvals of UOIs.

The team concluded that the training programs for reactor operators and shift supervisors were performance based and well-implemented. Weaknesses

were observed regarding UOI format, the indication that the licensee has committed to various requirements for program implementation, and as indicated in the following paragraph.

As a result of this inspection, one apparent violation of NRC requirements was identified in that there are inadequate requalification program provisions to provide accelerated training and retesting to licensed operators who have failed a comprehensive written examination or annual operating test prior to their returning to licensed activities. Details are given in Section 6.3 of this report.

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DETAILS

1. Background and Scope of Inspection

The Nuclear Regulatory Commission considers effective training of personnel to be an important part of safe nuclear power plant operations. This inspection was in keeping with NRC policy as stated in, "Commission Policy Statement on Training and Qualifications of Nuclear Plant Personnel," (as published in Federal Register 53 FR 46603), which states that the NRC will expand the method by which is monitors the industry training programs by performing post-accreditation reviews at selected sites.

The inspection was conducted using inspection procedure 41500, Training and Qualification Effectiveness and the guidance of NUREG-1220 "Training Review Criteria and Procedures." NUREG-1220 provides criteria to review what is referred to as performance-based training, or the Systems Approach to Training (SAT). The criteria assess what are considered the five elements of these training programs. The elements are:

1. Systematic analysis of the jobs to be performed,

2. Learning objectives that are derived from the analysis and that describe desired performance after training,

3. Training design and implementation based on the learning objectives,

4. Evaluation of trainee mastery of the objectives during training,

5. Evaluation and revision of training based on the performance of trained personnel in the job setting.

The specific training areas inspected were health physics, mechanical maintenance, Instrument and Controls (I&C), and licensed reactor operator and senior reactor operator.

The inspection included a review of training program procedures, training materials, records, qualification standards, and other applicable documents; observations of classroom training, on-the-job training, and simulator training and on-the-job performance; and interviews with operators, technicians, trainees, instructors, supervisors, and managers.

The inspection was performed by initially obtaining materials from the licensee. The materials provided are given in Attachment 1 of this report. Specific job tasks for the areas reviewed were selected and several training program procedures were reviewed prior to arriving on site. The focus of the inspection was on (1) how the tasks were analyzed; (2) how training objectives were derived from the tasks; (3) how training for the tasks was designed, developed, and implemented; (4) how trainees were observed and evaluated during training to determine their level of

task mastery, and (5) how feedback on training, trainee evaluations, and on-the-job performance indicators are incorporated into revision and evaluation of the training programs.

2. Overall Program Assessment

The team made the following overall assessments of performance of the training programs. Specific findings and conclusions will be described in each training area reviewed.

The team concluded that the training programs satisfied all of the components of a SAT based program and the programs are functioning well. In perspective, the strengths identified in the following paragraphs were prevalent throughout the areas reviewed and the weaknesses and problems observed were related to specific items within the programs.

The following are characterized as program strengths:

Systematic Job/Task Analysis

The team reviewed procedure STCP-QA-112, "Job/Task Analysis Program, Revision 2." This procedure applies to all accredited programs with the exception of the technical staff and managers. The team noted that this procedure incorporates participation of training personnel and the associated work group including job incumbents and determining a systematic approach to developing and selecting tasks. Criteria for initial and continuing training needs are provided. This procedure assures analysis and development of the tasks which support development of learning objectives and while the procedure states the task analyses are historical documents, there are provisions to update the task analysis if the need were to arise. The tasks are placed in Training Cross Reference Matrices after selection for analysis and training. The Matrices reference initial and continuing training criteria, units of instruction and objectives, criteria for deselection, and provide space for comments. They are required to be kept current via pen and ink changes by the responsible training supervisor and periodically revised and approved by appropriate training and line management.

The team verified that the above elements were incorporated into the specific tasks selected from the Training Cross Reference Matrices via interviews and review of the documentation.

The team concluded that the job/task analysis is comprehensive and well defined and that the job/task analysis is well implemented.

Development of Learning Objectives

Based on reviews of the learning objectives for the specific tasks selected, the team determined that learning objectives developed for the tasks are easily tracked from the Training Cross Reference Matrices, they

clearly state expected behavior, they supply the appropriate conditions and standards for performance, and they relate to the specific technical knowledges, skills and abilities required to perform the task. Provisions are also in place to change and update learning objectives.

The team concluded that the learning objectives are specific, well structured, and technically adequate. As an additional improvement, the licensee plans to cluster related learning objectives.

Training Facilities and Equipment

The team concluded via observation that the physical component of the training program which includes the classrooms, laboratories and equipment, and support facilities is an overall strength. Licensee Management has found that the plant specific simulation facility, does not fully support its objectives. Licensee management has therefore determined that the simulation facility will be replaced or upgraded and have addressed this issue with the NRC in a letter to the Regional Administrator dated August 4, 1989.

Management Support

The team found that training management, line management, and senior management strongly supported all training programs. Regarding this strong support, the team noted that training and line managers met regularly to discuss training issues, line managers knew they had primary responsibility for training quality, and the training and line managements fully supported policies to rotate personnel from the plant to training and vice-versa. The team also noted that the Senior Vice President - Nuclear actively supports training by personally teaching a course as well as frequently meeting with management to discuss training issues.

Program Evaluation

The team reviewed procedures that implement the program evaluation of the SAT process. These procedures adequately define methods to systematically evaluate the effectiveness of training programs; to elicit feedback from trainee tests, on-the-job experiences and supervisors; to incorporate instructor and trainee critiques; and to evaluate training instructors. The team reviewed the "Susquehanna Training Center 1988 Training Evaluation Annual Report." The team noted that this report is given wide distribution among plant and corporate management. This report details both overall and specific program performance in preparing the staff to perform their jobs. Senior plant management indicated that evaluation of training effectiveness is expected of plant supervisors and managers.

In addition to the summary report, the team found evidence of consistent and on-going evaluation of training programs. Trainees, supervisors, job incumbents, and instructors indicated that they provide feedback on training program effectiveness. Tracking and trending of these data were

found to provide input that resulted in training program improvements. Also, examination results were used for both near term program adjustments and long term modifications.

Several components of the evaluation of training are noteworthy. These include the analysis of trainee and supervisor comments about training and the prompt feedback given to commentors with regard to the disposition of their comments.

Another feature of program evaluation is the nuclear training group's responsiveness to both internal and external evaluations. An extensive Nuclear Quality Assurance (NQA) audit was conducted in May and June of 1988 to verify the effectiveness of the training, retraining and qualification programs. Areas were identified as needing responses by the nuclear training group and were closed prior to the team's visit. The team also found corrective actions in place to respond to items noted in the INPO accreditation team visit of 1988.

In addition to outside evaluations from corporate quality assurance, INPO, and NRC, the nuclear training group contracts for an assessment from instructional technologists and other training professionals to recommend improvements that might be made to enhance learning.

The team concluded that on overall strength of the training program is the comprehensive program evaluation process. A clear process is in place to systematically evaluate the effectiveness of training programs and to revise the programs as required.

The following is a specific weakness applicable to all programs:

The team noted that the technical content of the Units of Instruction (UOI) (which are utilized by the students as study guides and by the instructors as lesson plans) is generally good. However, they are not structured to assure consistent delivery by the instructors. See Sections 3.2, 4.2, 5.2 and 6.2 for examples of UOI deficiencies. The licensee is aware of this weakness and plans to improve the UOI's as an ongoing project.

3. Health Physics (HP)

The inspectors examined the licensee's health physics technical selection, training, and qualification program and found the overall program to be well-implemented with the necessary program elements in place and functioning to ensure continued performance at the current high level. In addition to using NUREG-1220, "Training Review Criteria and Procedures" as a guide, the program was reviewed and appraised against the following regulations, guides (both NRC and Industry), and good industry practice.

- 10 CFR 19.12, "Instructions to Workers"
- Regulatory Guide 1.8, "Personnel Selection and Training"

- Regulatory Guide 8.27, "Radiation Protection Training at Nuclear Power Plants"
- Regulatory Guide 8.29, "Instruction Concerning Risk From Occupational Radiation Exposure"
- ANSI/ANS-3.1-1978, "Selection and Training of Nuclear Power Plant Personnel"

3.1 Task Selection

The following tasks were selected from this licensee's Health Physics Technician J/TA Training Cross Reference Matrix by the team for evaluation of health physics initial and continuing training:

- Provide close health physics coverage for workers in high dose jobs (for example, control rod drive mechanism replacement).
- Direct the installation and removal of temporary shielding.
- Support the use of air line respirators.
- Respond to a fuel handling accident.
- Assist in developing contractor HP technical training program.

During the 1988 job analysis, the task, "Assist in Developing Contractor HP Technician Training Program," was identified as a management task and is not included in the initial or continuing HP technician training programs.

3.2 Design and Implementation

The team reviewed the UOIs for the four tasks selected for training/retraining. The instructional setting for all tasks was evaluated by the Curriculum Committee during the initial development of the UOIs. As new tasks are selected for training, the Curriculum Committee evaluates the tasks to determine the instructional setting best suited for mastery of the task.

In general, the organization and presentation of initial and continuing training is based upon the relationships among learning objectives and follows a logical sequence.

The team observed the presentation of a scheduled general worker respiratory protection lecture. The lecture was evaluated using the licensee's instructor evaluation form (form STCP-331B) and the guidance of NUREG-1220. The training was conducted in accordance with an approved UOI. The instructor followed the UOI, was poised and professional in his presentation, and maintained class interest. A follow-up interview with the instructor verified the instructor has a complete and thorough knowledge of the subject matter and was confident in his ability to relate the subject matter in an understandable manner. Based on the above and feedback from technicians and HP management, the team determined that the instructors have an excellent rapport with the students. The team concluded that high quality instructors are a program strength.

The team reviewed training records and found they are maintained as a real-time data base for all instructors and trainees. Student data is constantly being input into the data base and is generally current through the previous week's instruction. Class rosters are organized by unit of instruction and converted to microfiche during the calendar year following instruction. The training records examined were generally complete and auditable.

In interviews, HP technicians indicated that feedback and communications between the health physics working group and the training organization were good and had improved over the past two years. The technicians especially liked their ability to improve and select initial and continuing training through the Curriculum Committee. Membership on the health physics committee included Level I technicians, Level II technicians, health physics management, and members of the training organization. This "grass-roots" approach, using a broad spectrum of personnel including qualified technicians as a resource for affecting change to the training program is viewed as a program strength. Based upon feedback given during technician interviews, this practice has a positive impact on worker morale and their strong attitude toward training.

The licensee has a formalized and well-documented on-the-job training (OJT) program for the HP technicians. All HP technicians interviewed agreed that the 10 week OJT training following the initial training more than adequately prepared new technicians for their assigned duties. HP line management fully supports the dedicated 10 week OJT period where the technician's training (guided by an experienced Level II technician) is focused with the technician free to maximize the field learning aspects of qualification. When ready, a technician demonstrates a task and is formally evaluated. This evaluation is documented in the technicians qualification record.

The team concluded that the on-the-job training program following the initial technician classroom phase of instruction is a program strength.

The structured training for professional HP personnel relies on self-improvement methods (e.g., through self-study and reading) following written guidance generally in the form of a subject area checklist. Additionally, plant management provides excellent support for professional development by allowing the professional HPs to attend technical seminars and meetings outside the plant environment. Ensuring that the professional staff maintains contact with fellow industry professionals and routinely attend technical seminars/training is viewed as a program strength.

The HP training facilities in the training center are good. The laboratory equipment properly mimics the plant-side instrumentation,

and of special note is the "spare" Post-Accident Sampling System (PASS). The PASS mock-up is used by both HP/Chemistry technicians and I&C as a training aid. The Control Rod Drive Mechanism (CRDM) removal and rebuild mock-up used by mechanics and HP staff has allowed for excellent, effective ALARA training. The classroom, technical library, laboratories, administrative support services, and the computer-based training laboratory are all good facilities that have been properly designed and effectively utilized. The overall quality of the training facilities is viewed as a program strength.

The current format of the UOIs provide the trainee with an excellent tool for later review of lesson material. However, while the units of instruction contained necessary learning objectives, the team noted that appropriate instructor teaching activities, instructor and trainee references, appropriate evaluation methods/standards, and required materials in their current textual format did not ensure consistency of instructor presentation. Missing from the units of instruction were several of the more important portions of lesson plans designed to ensure consistent delivery such as: 1) embedded instructor references and aids (which indicates when additional information, transparency, or job aid is used to enforce learning), 2) sample exercises (radiation shielding problems, dose rate problems, etc.) as examples for use during lectures, and 3) areas to allow for customization of the lesson plan by the instructor (pertinent, personal anecdotal material). Additionally, while the technical content of the UOIs was good, the team noted that the material for the task, "Respond to fuel handling accident" was inadequate and not up to the facility's high standards. The potential problem with consistency of presentation and the one, substandard unit of instruction (out of four tasks reviewed) are viewed as a program weakness.

The HP technicians receive one-week of plant systems training (Nuclear Plant Operator course), normally during the classroom phase of their qualification process. The team determined this initial orientation training does not stress or focus on the radiological aspects and hazards of the systems. Beginning in 1988, as part of the 80-hour per year continuing training program for qualified technicians and foremen, systems training was initiated on RWCU, offgas, ECCS, RHR, and ventilation/exhaust systems. The RWCU, offgas,and RHR system UOIs were judged by the team as good. The ECCS and ventilation/exhaust UOIs were rated by the team as marginally acceptable as both units of instruction failed to provide the necessary HP focus and thorough coverage of the hazards associated with these systems. Based on interviews with the technicians and a review of the existing systems training material, the team concluded that the HP technician systems training provides inadequate focus on radiological concerns and hazards and fails to uniformly cover all the pertinent systems that can cause significant radiological hazards to the worker. The team's concern is based on technicians providing back shift HP

coverage (without additional supervision). These technicians need adequate systems training to help ensure they take proper precautions and actions during normal, off-normal, and emergency conditions. Licensee management has reviewed the team's concern and in a letter to the NRC, from W. Lowthert, Manager Nuclear Training, dated September 12, 1989, the licensee committed to revise the training program to more effectively train on systems for the next initial training session conducted, and in the 1990 continuing training program.

An interview indicated that the formal evaluator-trainee process for task certification of the respiratory protection speciality may not have been conducted as formally as described in the training procedures in all cases. Team members interviewed a recently qualified technician and an experienced senior technician qualified for this speciality. They were found to be knowledgeable and qualified. Based on verifying the qualifications of the above personnel there is not an immediate safety concern, however, the question of informality in the certification process remains unresolved (387/89-80-01, 388/89-80-01).

Using eleven NRC and INPO generic communications (i.e., Information Notices, Significant Event Reports, etc.) pertinent to the health physics area, the team tried to determine how these particular generic communications impacted the training program. These 11 generic communications were available in the training center technical library. The results of the licensee's search (using an automated tracking system computer print out and class rosters) were made available for review. Based on the review of this information and identified UOIs the team was able to determine that three of the generic communications had been integrated into the formal training program. It appears that the remaining eight generic communications were discussed during the routine weekly HP technician meetings. The team reviewed the attendance rosters for the 1987 and 1989 weekly technician meetings, but the rosters for 1988 were not readily available. Interviews with technicians indicated that all technicians do not regularly attend the weekly technician meetings. Because of insufficient time, the team was unable to perform an in-depth evaluation of the quality of generic communication training provided at the weekly technician meetings, and could not verify technician attendance. Based on this review, the team could not verify that pertinent lessons learned from industry and onsite events covered in the weekly technician meetings are reaching all HP technicians.

The team received feedback from a plant electrical technician (during classroom training observation) who was concerned about HP personnel performing maintenance on HP survey instrumentation. Specifically, the concerned technician believed that the I&C shop should be

performing this maintenance and that HP personnel did not have the necessary experience or training to properly perform maintenance. The team discussed this concern with the Radiological Operations Supervisor (ROS). The ROS was aware of the matter and stated that this concern has been formalized as an official union grievance. The ROS then described the HP department's training and controls to ensure that the scope of maintenance performed by HP was limited to relatively simple tasks and that all equipment was thoroughly checked and calibrated per approved procedures prior to returning it to service. The team independently reviewed the maintenance tasks and associated training. The team concluded that the tasks were relatively simple and that training was adequate for the performance of this work. Based on the limited scope of the work, appropriate licensee management oversight, and adequate training, the team determined this item is not a safety concern.

3.3 Trainee Evaluation

Exemptions from training are based on a combination of performance-based testing and objective evaluation. Typically, exemptions are only granted to former Operations Department for the systems phase of the initial technician training program.

A review of the examination bank revealed that the test items are linked to the lesson objective and job performance requirements. During initial training, trainees are evaluated using daily quizzes, weekly exams, and a comprehensive final exam. Feedback is usually given the day following the exam/quiz. During continuing training, exams/quizzes are given following the lecture.

HP technicians and trainees who perform below standards are provided remediation and retested. As a result of the job placement testing program, health physics trainees have not required removal from the training program. Appropriate precautions are taken to preclude compromise of the exam/quiz contents.

3.4 Summary of HP Training

The findings from the inspection of the HP technician training programs indicate that Susquehanna Steam Electric Station has an effective, high quality performance-based HP technician selection, training, and qualification program. The team found that all elements of the Commission's Policy Statement, with minor exception, have been met and are being effectively implemented. Two weaknesses observed were the need for re-formatting the UOIs to ensure consistent delivery of information and a need to provide job-specific systems training that stresses the radiological hazards associated with certain plant systems.

4. Mechanical Maintenance (MM)

4.1 Task Selection

The following six tasks were selected from the licensee's Mechanical Maintenance J/TA Training Cross Reference Matrix:

- inspect/repair valves
- align pumps
- repair hydraulic control unit
- rebuild control rod drives
- align equipment (belts, couplings, motors, etc.)
- verify equipment blocking

4.2 Design and Implementation

The team found that the Nuclear Technical Training Supervisor is a degreed professional with vocational experience. The supervisor was involved with program development and continues to instruct in order to maintain proficiency and support the high instructional workload. The instructional staff consists of individuals with experience in the maintenance disciplines which they instruct. One of the two mechanical maintenance instructor positions is a rotational assignment, where an assistant foreman is screened and selected for a two year assignment. Instructors indicated during interviews that the instructional workload was high but tolerable.

The team noted that training responsibilities are divided. Formal classroom training is the responsibility of the Training Department, and on-the-job training is the responsibility of the Mechanical Maintenance organization. Training Department and Maintenance managers/supervisors meet quarterly as a curriculum committee to review training and revise it as required. Interviews indicated that managers/supervisors are continually working together on the training program and that there is excellent rapport between the Training Department and the Maintenance organization.

Units of Instruction (UOIs) M001 (valve maintenance), M009 (bearings), AD004 (protective permit and tag), MM015 (lockwiring) and MM014 (rigging) for classroom/laboratory training were reviewed. OJT training guide MM623 (optical alignment) was also reviewed. With one exception, these UOIs provided the information necessary for the instructor to address the stated terminal and enabling objectives. This exception was MM015, where the enabling objective with respect to use of safety equipment was not addressed in the body of the lesson plan, and consequently was not addressed by the instructor when the team observed conduct of this training.

Inspectors observed the conduct of classroon/laboratory training for bearings (M009), rigging (M014), lockwiring (M015) and permit and tagging (AD004). They also observed on-the-job training (OJT) with respect to main steam line plugs (MM087) and optical alignment (MM623). In general, the team concluded that this training was conducted in a professional manner in accordance with the established UOIs/OJT guides. Two exceptions were noted. One is described in the paragraph above regarding the use of safety equipment, and the other was with respect to the optical alignment OJT. While the OJT instructor was very knowledgeable of the subject matter and competently taught those topics he covered in the OJT guide, he did not use the OJT guide in conducting the training, and as result did not address some learning objectives of the guide. He completed the lesson in 2 hours, when the OJT guide indicated that 8 hours was needed. The team noted that the OJT instructor had completed the required instructor training course for OJT and this was the first time that he had provided OJT instruction. He was counseled by cognizant maintenance and training supervisors in the need to address all learning objectives in OJT guides.

In observing the conduct of training, the team noted two instances where training was used to establish plant policy without the associated information also being reflected in related plant procedures. The first was in permit and tagging training (AD004), where page 8 of the UOI indicates "do not use solenoid valves (Target-Rock) since positions cannot be verified." A review of the referenced plant procedure (OI-AD-050) did not provide any prohibitions with respect to the use of solenoid valves for isolation. The other instance was with respect to UOI MM015 (lockwiring), where the practical evaluation requires safety glasses be worn, but the "Precautions" section of procedure MT-GM-016 on lockwiring lists no precautions, and nowhere else in the procedure is the use of safety glasses called out. In both instances the team judged that while it was appropriate for these policy statements to be included in the training sessions, training should not be relied upon as the only mechanism for communicating these policies to plant personnel. Both of these courses have been taught several times and the team noted that these procedure omissions were not identified through feedback from either students or instructors.

During the main steam line plug practical factor training observed, the instructor found discrepancies in the newly developed procedures being used: MT-062-024 (MSL Plug Installation and Removal), MT-062-026 (MSL Plug Preoperational Checks), and MT-062-027 (MSL Plug Operational Checks). The team verified that the instructor prepared the appropriate feedback form (Form MI-AD-02001) for each procedure and submitted them to the responsible engineer.

The team reviewed the training records of job incumbents interviewed as well as the records for the training courses observed. These records were found to be auditable and current.

4.3 Trainee Evaluation

The team found that exemptions from training could be based on prior training or experience and that the determination is objectively based. Provisions are also made for qualification deviation waivers approved by the Senior Vice President - Nuclear in cases where the individual may not fully meet the requirements. Discussions with cognizant personnel indicated that the Senior Vice President had not excused any mechanical maintenance personnel from qualification and training requirements. Some exemptions from the accredited training and qualification program were found in training records. These exemptions were for similar training that had been completed by experienced personnel before the training was subject to accreditation. The team judged these exemptions to be acceptable.

STCP-QA-321, "Administration of Training Course Examinations," Revision 3 and STCP-QA-324, "Technical Exam Bank," Revision 0, deal with the administration of training course examinations, with STCP-QA-324 specifically related to examinations for maintenance, I&C, and health physics personnel. These procedures were revised in December 1988 and January 1989, respectively. The revisions to STCP-QA-324 include provisions for developing a new examination for each exam administration (a minimum of 30% of the exam questions different than the preceding exam). STCP-QA-324 contains a provision for not requiring implementation of this procedure step to develop new examinations if there are existing examinations. Interviews indicated this provision was intended to accommodate a situation where there was not sufficient time available to develop a new examination in accordance with this procedure. Reviews of mechanical maintenance (and I&C) examinations indicated an inconsistent application of STCP-QA-324 in that some recently administered examinations have been developed in accordance with STCP-QA-324, and others have not. The team discussed this matter with licensee management who stated that full implementation was intended. Licensee management in a letter to the NRC from W. Lowthert, Manager Nuclear Training, dated September 12, 1989, committed to fully implement this procedure as of September 12, 1989.

During interviews with the mechanics, they favorably described the Progression Program examinations and indicated that they ensure MM personnel have adequate plant specific skills and knowledge.

A review of the methods used to control examinations indicated that there are effective measures in place to ensure that exams are kept from unauthorized personnel.

The team reviewed the records of four trainees that initially failed end of course examinations. Three individuals repeated the course and passed subsequent exams. One individual was tutored by the instructor and passed a re-examination the next day.

An observation of the team regards the low number (four out of about 55) mechanical maintenance personnel that have completed full certification as compared to other licensee organizations. Licensee management estimates an additional 22 people will certify by the end of 1990. Management also stated that it is intended that all personnel get certified. While noting the above, the team judged the final certification of mechanical maintenance personnel has not been a high management priority. The team ascertained that there were a sufficient number of personnel qualified to perform the needed tasks.

4.4 Summary of Mechanical Maintenance Training

The team concluded that the training materials provide for effective instruction. Excellent working relationships between the Training Department and the Maintenance organization were evidenced through observation of training, interviews with training and plant personnel, and reviews of student evaluations of training. While most training observed was conducted in a professional manner, consistent with established lesson plans/units of instruction, there were two training sessions observed, one in classroom training and one in OJT, where not all learning objectives were addressed. The progression program ensures that mechanical maintenance personnel have plant specific skills and knowledge, and includes comprehensive written and practical evaluations. Inconsistent implementation of the examination development procedure is a concern that the licensee has addressed. The small number of certified mechanical maintenance personnel does not indicate a high management priority toward completion of certification.

The above attributes indicate a strong training program, with both training and plant personnel striving for continued improvement.

5. Instrument and Controls (I&C)

5.1 Task Selection

The following tasks were selected from the licensee's Instrument and Controls J/TA Training Cross Reference Matrix:

- perform response time tests,
- perform feedwater system controller test,
- perform SRM/IRM detector drive test,
- perform PASS alignment test, and
- localize a problem using plant parameters.

5.2 Design and Implementation

The team found that the Nuclear Technical Training Supervisor is a degreed professional with vocational education experience. The supervisor was involved with program development and continues to instruct

in order to maintain proficiency and support the high instructional workload. There is one dedicated I&C instructor in the Training Department. He is responsible for the development and conduct of most I&C technician classroom/laboratory training. He is experienced in the I&C area and is a certified instructor.

Training responsibilities are divided. Formal classroom training is the responsibility of the Training Department, and on-the-job training is the responsibility of the I&C organization. Training Department and I&C managers/supervisors officially meet quarterly as a curriculum committee to review training and revise it as required. Interviews indicated that managers/supervisors are continually working together on the training program and that there is excellent rapport between the Training Department and the I&C organization. Interviews with job incumbents and supervisors indicated that the I&C instructor frequently tours the plant to maintain his familiarity with I&C equipment and training needs.

Units of Instruction (UOIs) for AD004 (protective permit and tag), IC017 (Bailey 7000 instruments), and IC018 (automatic process control) for classroom/laboratory training were reviewed. These UOIs were found to provide the information necessary for the instructor to address the stated terminal and enabling objectives.

The team observed the conduct of classroom/laboratory training for Excore Neutron Flux Monitoring provided by the contractor who installed the equipment, Protective Permit and Tagging, and on-the-job training (OJT) for the reactor manual control system (RMCS). The training was conducted in a professional manner and in accordance with the established UOI's and OJT guides. The instructors were knowledgeable of the subject matter. Regarding the neutron flux monitoring training, the instructor used schematics for the training that were not plant specific. Some of the circuitry included in the schematics and related discussion did not apply to Susquehanna. This was judged by the team to create some unnecessary confusion and complexity in the training.

Interviews of participants in these training sessions indicated that the pace of the instruction was geared to mid-level student ability. Laboratory and simulation equipment provided for training use were determined to be among the strengths of the program, and are indicators of an organization that is striving for continued improvement. The I&C organization has recently developed a reactor manual control system simulator which allows for "hands-on" training on this equipment without jeopardizing the safety or operation of the units. The Training Center also has a well-equipped I&C laboratory with a combination of plant specific equipment and conceptual process control loops. Interviews with I&C technicians indicated that they have confidence in the instructors and that good rapport exists.

The team noted that the I&C training program had a relatively high percentage of UOIs for I&C courses that have been approved for temporary use. Susquehanna procedures allow for the training supervisor to shorten the review process for temporary approvals by eliminating the concurrence of the responsible line department when there is insufficient time to obtain this review before the course is taught. Statistics provided to the team indicated that, overall in the Training Department, about 5% of current UOIs were approved for temporary use. However, for I&C UOIs, about 1/3 were approved for temporary use. Heavy use of temporary approvals for UOIs is considered a weakness.

The team reviewed the training records of job incumbents interviewed as well as the records for the training courses observed. These records were found to be auditable and current.

The team observed actual I&C Technician performance of two surveillance procedures (Monthly Functional Test of Drywell Pressure, S1-283-221 and Weekly Functional Test of Average Power Range Monitor S1-178-209). The technicians observed were knowledgeable. The procedures were conducted professionally and included pretest briefs and proper communications. The team observed one discrepancy where some signoffs for one test were made prior to actual performance of the steps. The team followed up on this issue and verified that the personnel involved would have voided the signoffs if the performance had been incomplete. Futher followup with licensee management found that this was an isolated case and that the personnel involved have been briefed to document procedure steps after actual performance. Based on the above NRC review and licensee followup, no further concern was indentified.

5.3 Trainee Evaluation

The team found rigorous requirements for entry to the I&C program to be a strength. These requirements include an entrance examination and an associate degree in engineering or a related science. Exemptions to training are processed as described in section 4.3 above.

A review of examinations revealed that some examinations were not developed in accordance with STCP-QA-324 . This finding is addressed in section 4.3 of this report.

The certification program for several I&C technicians were reviewed. Certifications were found to be thorough and comprehensive. There are also special equipment certifications for specific equipment such as acoustic monitoring and electro-hydraulic control.

The course completion records for I&C courses conducted during the past two years were reviewed by the team to determine the actions taken for individuals who failed examinations. There were three failures identified during this period. In two cases the individuals

involved were re-enrolled in a subsequent class and passed the next examination. In one case the individual who failed a course in July has yet to be remediated or re-tested.

5.4 Summary of I&C Training

The team found that the training materials generally provide for consistent and effective instruction, although I&C Technician UOIs have a much higher fraction of these UOIs approved for temporary use. This practice does not provide the normal user organization review of the materials. Excellent working relationships between the Training Department and the I&C organization were evidenced through observation of training, interviews with training and plant personnel, and reviews of student evaluations of training. The one Training Department instructor assigned to I&C training is well respected by I&C personnel.

Training observed was conducted in a professional manner, consistent with established units of instruction. Not all examinations are being developed in accordance with a comprehensive examination procedure that was initiated at the beginning of this year. The selection process for I&C technicians includes stringent selection criteria and comprehensive evaluation. All but two of the 47 I&C technicians are certified to work independently, with 35 fully certified. This indicates a high management priority toward completion of certification

The team concluded that the I&C training program is generally well implemented but with some weaknesses.

6. Reactor Operator and Shift Supervisor

6.1 Task Selection

The following tasks were selected from the licensee's Reactor Operator and Shift Supervisor J/TA Training Cross Reference Matrices:

Reactor Operator

- Perform monthly MSIV closure RPS instrumentation (test)
- Start a reactor feed pump
- Respond to a loss of RBCCW
- Operate HPCI for reactor pressure control
- Respond to ATWS

Shift Supervisor

- Approve radioactive waste discharge release permits
- Supervise refueling ops as refueling floor SRO

- Prepare maintenance work requests
- Direct emergency response as site emergency director
- Direct actions to ensure that core cooling and the S/D margin are maintained

6.2 Design and Implementation

In every UOI the team evaluated, a systematic approach to presenting the lesson was undertaken, and the content taught the outlined learning objectives. In addition, the UOIs and Job Analysis provided evidence that the instructional settings (i.e., classroom, simulator, etc.) and materials were evaluated and the appropriate instructional settings identified. These documents also outline the organization and sequencing of initial and continuing training.

The qualification and training requirements for the training staff are addressed in STCP-QA-511,"Formal Instructor Certification," Revision 1, and there is evidence that these requirements are met for the Susquehanna staff. Observations of classroom and simulator instruction indicated that training is being conducted in a superior manner. For example, a lecture on Industry Events was observed by the team. The instructor had good control of the class and always kept to the subject and the lessons to be learned from the event. The method used in presenting material to the class was effective in that it required active participation of the student by interfacing with the industry event via a questionnaire provided by the instructor. Once the students completed the questionnaire, a group discussion on the questionnaire was led by the instructor and plant relevancy was propagated by the instructor.

Overall, the instructors in the classroom were excellent and demonstrated the instructional skills and abilities necessary to ensure optimal learning. Furthermore, the team found that the instructors were knowledgeable of their subject area and could effectively communicate the material to the students. The quality of the classroom instruction and use of visual aids was found to be excellent and considered a program strength.

Operators interviewed indicated that the training department is doing an excellent job and that the dedication of the instructors was considered a program strength. The operators also indicated that their problems and recommendations were being handled as expeditiously as possible.

A review of the qualifications for personnel involved with the training program and selected operators was conducted. The review included the use of a computer tracking system which provided a report titled, "Summary of Personnel Qualifications by Cost Area." These qualifications are consistent with the facility technical specifications.

Through interviews conducted with senior reactor operators, reactor operators, and members of the training department staff, the team determined that initial and requalification training conducted at Susquehanna were both comprehensive and effective. The communications between training and operations is very good as indicated by the excellent working relationship between the two departments. Communications is fostered by an 18 month rotational program for instructors and operators, weekly meetings between operations and training supervision, and the effective use of student critiques. Interviews indicated that the on-going feedback process between management and operations ensures that training remains current and appropriate.

The incorporation of Licensed Event Reports (LERs) into training was also reviewed. Recent Susquehanna Unit 1 and 2 LERs were reviewed to determine if any of these events can be attributed to training. There was no obvious correlation that training or the lack thereof was a casual factor in current LERs.

The Nuclear Training Group was asked to develop a refresher course on electrical print reading as part of the continuing operator requalification training program. This was the result of an event that occurred in March 1989 in which an unplanned ESF actuation was initiated when an improper fuse was removed for protective blocking purposes. As a corrective action the training department did receive a request and the topic will be included on the agenda for the next Requalification Curriculum Committee. The incorporation of LERs into training is judged by the team as a program strength.

The team observed a requalification class that a subject matter expert (SME) (rather than an certified instructor) taught on core reload. The students seemed to drive the instructor's presentation rather than the instructor following a prescribed formatted presentation. Queuing from the assigned requal instructor assured continuity of material being presented. Learning objectives were provided to the student in the handout but the SME did not cover the objectives in class. This may have left the student unaware of what was expected and could lead to inconsistency in the instructors presentation. Overall, however, the class was well received by the students and any disruptions were caused by over zealous students rather than inattentive ones.

A concern was noted in regard to the Units of Instruction. The majority of the training staff and operators alike indicated that UOIs should be rewritten and reformatted to ensure the consistent delivery of information. This project is already under consideration by the licensee.

A similar problem exists in the instruction of Administrative Procedures. Although the instructor has developed exercises that require the student to research the procedures giving him a hands-on familiarity that could not be accomplished in a stand-up lecture presentation, this method is not used by all instructors. When the Training Manager was asked when standardization would occur, his reply suggested that this was a low priority and no firm date had been set.

The team reviewed the licensee's program for controlling active and inactive licenses. The licensee tracks active licenses via the station shift schedule. Inactive licenses are upgraded to active status per "Return To On-Shift Duty" procedure, OI-AD-044. This procedure establishes requirements for returning operators to on shift duty following an absence. These requirements include a review of administrative procedures, plant modifications, and the current operations agenda. This is followed up by an oral examination administered by the Supervisor of Operations. This procedure was revised to include license upgrade from inactive to active status in response to an LER dated December 23, 1987, in which an individual possessing an inactive license was assigned Refuel Floor SRO duties. OI-AD-044 exceeds the requirements of 10 CFR 55.53(f) which delineates what is required of an operator before resumption of licensed duties. One problem in the documentation of this procedure was the inability to determine the exact time and date the required activation watches were completed. This problem was brought to the attention of the licensee and would be taken under consideration by the operations staff.

6.3 Trainee Evaluation

The inspectors reviewed two tasks that required training and their associated learning objectives, and checked these tasks against the exam bank. A sampling of the objectives were evaluated in the form of test questions. Test items for the tasks were consistent with the objective. Furthermore, requalification exams are evaluated the next working day and the students performance is available on request. Trainees who perform below minimal standards are provided an opportunity to retake an exam after they have performed a self study exercise. STCP-QA-321 ensures that exams are used only once which precludes the compromise of test content.

The team reviewed NTP-QA-31.2, "Licensed Operator Requalification Program Implementation," Revision 2 to determine the licensee's disposition of individuals who fail the annual requalification examination which consists of an operating test and a comprehensive written examination. Procedure step 6.10.3 states that failure does not require removal of the individual from licensed duties, failure requires an evaluation of the individual's qualifications by the Superintendent of Plant and the Manager-Nuclear Training, and retraining and re-examination of the individual in the categories that were failed as soon as practical.

Further review of the licensee's application of this procedural requirement found that at least one licensed senior reactor performed licensed duties for 14 shifts in January and February 1989 after failing an annual operating examination prior to retraining and re-examination in February 1989.

The team judged that the provision that permitted personnel who had not demonstrated or maintained a satisfactory level of proficiency to continue to perform or return to licensed duties after evaluation by management and prior to retraining and reexamination is an apparent violation in that a licensed senior reactor operator who had not satisfied the conditions of his license pursuant to 10 CFR 55.53 (h) was designated by the licensee to perform licensed activities in accordance with 10 CFR 50.54 (l) and the requalification program required by 10 CFR 50.54 (i-1) as described in 10 CFR 55.59 did not provide adequate measures to ensure qualified personnel perform licensed activities (387/89-80-02, 388/89-80-02).

The NRC's concern in this matter was that license's procedure allowed personnel who had not demonstrated or maintained a satisfactory level of proficiency to perform licensed activities.

This concern was brought to the attention of senior licensee management. The licensee immediately verified that no one, who has failed annual requalification examination, was currently performing licensed duties. Prior to the exit meeting, the licensee committed to ensure that no one who had failed an annual requalification examination will perform licensed duties prior to retraining and re-examination.

After the exit meeting, the team conducted a review at the NRC Region I office to determine the consistency of licensee training and qualifications commitments. The team noted conflicting statements existed depending on which revision of the ANSI/ANS Standards for the "Selection, Qualification and Training of Personnel for Nuclear Power Plants" (ANSI/ANS-3.1, ANSI N18.1) was referenced. The following were noted relative to licensee committments to this standard:

a. The Operational Quality Assurance Manual, Policy Statement OPS-6 "Qualification, Training, and Certification of Personnel," Revision 2 references ANSI/ANS-3.1-1978 and step 5.2.2 of the procedure which requires that NRC licensed personnel be qualified, trained, and certified in accordance with the requirements of 10 CFR 55, ANSI/ANS 3.1-1978, and Regulatory Guide 1.8 - Revision 1, 1975. ANSI/ANS3.1-1978 paragraph 5.5.1.3.1 contains a provision that personnel shall not perform licensed duties until successful completion of mandatory accelerated training after an examination failure.

b. Unit 1 Technical Specifications section 6.4, Amendment No. 47 states that a retraining and replacement training program for the

unit staff shall meet or exceed the requirements and recommendations of section 5.5 of ANSI N18.1-1971 and Appendix "A" of 10 CFR part 55... The Unit 2 Technical Specifications are similar. Appendix "A" of 10 CFR Part 55 was deleted and incorporated into the revision of the 10 CFR Part 55 rule implemented May 26, 1987. ANSI N18.1-1971 does not address disposition of requalification examination failures.

c. FSAR Chapter 17, "Quality Assurance," Revision 35, Table 17.2-1, references ANSI/ANS 3.1-1978 with clarifications and exceptions in FSAR Chapter 13. FSAR Chapter 13, step 13.2.2.1.4, Accelerated Retraining, Revision 35, dated July 1984, states that failure of the annual requalification examination does not require removal from licensed duties.

The lack of consistency in the above requirements is unresolved pending further licensee action and NRC review. (387/89-80-03, 388/89-80-03).

6.4 Summary of Reactor Operator and Shift Supervisor Training

The team concluded that the training programs for reactor operators and shift supervisors were performance based and well implemented. Notwithstanding the concerns raised regarding the disposition of licensed operators who failed annual requalification examination, the findings indicate that the training program contains all of the elements that characterize effective training.

7. Exit Meeting Summary

At the exit meeting held on August 25, 1989, the inspection methods were described. Major strengths and weaknesses were discussed. The apparent violation of NRC requirements was discussed; the licensee was thanked for its cooperation during the inspection.

The licensee stated that they thought this was an in-depth inspection and that the team conducted the inspection in a professional manner. They also stated that it was their intent to continue to improve training.

Appendix 1

Pre-Inspection Requested Information

The following is a list of information provided by the licensee to enable the team to conduct the inspection:

- Task lists for the positions being reviewed.

- Instructions/procedures related to:

  - Systematic methods used to analyze jobs,
  - Training organization goals, objectives, and plans,
  - Responsibilities/authority of training organization personnel,
  - Methods for evaluating/selecting instructional materials, methods, and media,
  - Methods for organizing/sequencing of training,
  - Methods for keeping training programs current,
  - Maintenance of training records,
  - Selection of candidates for training and the granting of waivers/exemptions from training,
  - Evaluation of training programs, and
  - Training, qualification, and evaluation of instructors
  - Interface between the training department and plant organization

- Roster/organization chart for the training organization and the training organization relative to the plant organizations.

- Training schedule for the past six months and the next six months for the positions being reviewed.

- Qualification and experience standards for Radiation Protection and Chemistry technicians, supervisors, and managers

- Qualification and experience standards of instructors for the positions being reviewed.

Appendix 2

Persons Contacted

Pennsylvania Power and Light (PP&L)

ab J. Alwood, Research and Evaluation Supervisor
ab J. Blakeslee, Assistant Superintendent of Plant
ab W. Bogle, Construction Supervisor
ab R. Byram, Superintendent of Plant
b M. Deckman, Nuclear Technical Training Supervisor
a S. Denson, Outage Supervisor
ab W. DiDomenico, Simulator Instructor
ab J. Edwards, Personnel and Administrative Supervisor
a G. Fetterman, Administrative Supervisor
ab H. Fetterman, Instructor
ab E. Figard, Supervisor of Maintenance
ab A. Fitch, Operations Training Supervisor
ab J. Fritzen, Radiological Operations Supervisor
ab G. Glaser, I&C
a M. Haring, Mechanical Maintenance Instructor
ab A. Iorfida, I&C Supervisor
c H. Keiser, Senior Vice President-Nuclear
ab J. Lex, Nuclear General Training Supervisor
ab W. Lowthert, Manager Nuclear Training
a T. Marlowski, Dayshift Supervisor
ab J. McClintock, Training Document Control Specialist
ab M. McGann, Technical Information Services Supervisor
a J. Minneman, Supervisor-Nuclear Emergency Planning
a L. Oberiender, Stenographer
ab J. O'Sullivan, Installation Engineering Supervisor
ab H. Palmer, Jr., Supervisor of Operations
ab R. Peal, Operations Training Supervisor
ab R. Prego, QA Supervisor - Operations
ab H. Riley, HP/Chemistry Supervisor
a B. Rizzo, Instructor - SSES/CBT
a D. Roth, Senior Compliance Engineer
ab K. Roush, Supervisor Nuclear Instruction
a R. Schwarz, NPE Resident - Senior Project Engineer
ab J. Snarponis, Curriculum Development Supervisor
b G. Stanley, Assistant Superintendent Outages
a R. Stotler, Supervisor of Security
b K. Tutorow, Foreman Mechanical Repairs
ab J. White, Supervisor Training Support

Institute of Nuclear Power Operations (INPO)

b R. Burris, Program Manager

United States Nuclear Regulatory Commission (USNRC)

ab S. Barber, Senior Resident Inspector
ab T. Bettendorf, PNL
b M. Claussen, Technical Assistant, NRR
ab T. Easlick, Operations Engineer, Region I
ab A. Howe, Team Leader, Region I
ab T. Mazour, Consultant, NRC
ab M. McCoy, Human Factors Analyst, NRR
ab W. Oliveira, Reactor Engineer, Region I
ab R. Pelton, Training and Assessment Specialist, NRR
ab T. Rebelowski, Senior Reactor Engineer, Region I
ab S. Shankman, Chief, Training and Procedures Section, NRR
a J. Stair, Resident Inspector
ab J. Wigginton, Chief, Facilities Radiation Protection Section NRR

a Denotes attendance at the entrance meeting on August 21, 1989
b Denotes attendance at the exit meeting on August 25, 1989
c Denotes interviewed by the team but did not attend entrance or exit meetings

The inspectors also contacted other administrative, technical operational, and training personnel during the inspection.