

U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Report No. 50-05/82-01

Docket No. 50-05

License No. R-2 Priority - Category F

Licensee: The Pennsylvania State University

University Park, Pennsylvania 16802

Facility Name: Breazeale Nuclear Reactor

Inspection At: University Park, Pennsylvania

Inspection Conducted: December 7-9, 1982

Inspectors: *W. W. Kinney*
W. W. Kinney, Project Inspector

1/6/83
date

Approved by: *R. R. Keimig*
R. R. Keimig, Chief, Reactor Projects
Branch No. 2

1-6-83
date

Inspection Summary: Inspection on December 7-9, 1982 (Report No. 50-05/82-01)

Areas Inspected: Routine, unannounced inspection by a region-based inspector (20 hrs.) of: reactor operations; organization; logs and records; radioactive gaseous and liquid effluents; procedures; experiments; instructions to individuals; surveillance activities; reviews and audits; and requalification training of reactor operators.

Results: No violations were identified.

DETAILS

1. Persons Contacted

*Dr. W. F. Witz' - Head, Nuclear Engineering Department
*Dr. S. H. Levine - Director, Breazeale Nuclear Reactor
*Mr. I. B. McMaster - Deputy Director, Breazeale Nuclear Reactor
*Mr. R. W. Granlund - Health Physicist
Mr. R. E. Totenbier - Operations Supervisor

The inspector also interviewed reactor operators during the inspection.

*denotes those present at the exit interview.

2. Reactor Operations

The inspector toured the entire facility with the licensee. The house-keeping was acceptable; however, access to an eyewash and safety shower station in the water treatment room was blocked. The licensee indicated that these safety devices were needed only during ion exchange media regeneration, and the devices would have been checked as being available and operable before the regeneration was performed. The licensee stated they would unblock the access to the safety devices now.

The inspector noted that a tag on the hood for the pneumatic rabbit terminus in room 2 stated that the air velocity into the hood was checked on December 14, 1979, and was due to be checked again on December 14, 1980. The licensee indicated that they do not have a set schedule for checking the air velocities into hoods, and this tag was inappropriate. The licensee indicated they would take appropriate action on checking the air velocity into the hood and tagging the hood properly.

No violations were identified.

3. Organization

The organization operating the Pennsylvania State University Breazeale Nuclear Reactor is as follows:

Director - S. H. Levine (Senior Reactor Operator)
Deputy Director - I. B. McMaster (Senior Reactor Operator)
Operations Supervisor - R. E. Totenbier (Senior Reactor Operator)
Reactor Supervisors - D. C. Raupach (Senior Reactor Operator)
 J. J. Bonner (Reactor Operator)
 H. R. Carusone (Reactor Operator)
Reactor Supervisors & Training - J. L. Penkala (Senior Reactor Operator)
 T. L. Flinchbaugh (Senior Reactor Operator)
Electronics Designer - D. S. Vonada (Reactor Operator)

Service Engineering Aide/
Mechanical Services - K. E. Rudy (Reactor Operator)

No violations were identified.

4. Logs and Records

The inspector examined the following logs and records:

- Penn State Breazeale Reactor (PSBR) Log No. 32 - October 28, 1981 - May 6, 1982
- PSBR Log No. 33 - May 7, 1982 - November 12, 1982
- Daily Checkout Lists - 1982
- PSBR Burn-up Log - 1982
- Monthly and Quarterly Operating Statistics - 1982
- PSBR Maintenance Schedule - 1981 and 1982
- Extra Maintenance Duties Log - 1981 and 1982
- Reactor Detectors Log - 1981 and 1982
- Electronic Maintenance Log - 1981 and 1982
- Radioactive Waste Treatment Work Report of Operation - 1980 - 1982
- PSBR Ar-41 Releases - 1971 - 1982

The Penn State Breazeale Reactor Logs are used to provide the primary record of operation. It contains records of reactor personnel on duty, performance of daily checkouts, reactor startup and shutdown, power levels, control rod positions, pulse operation data, experiment data, performance of surveillance checks, maintenance information, and reactor scrams. This log is used as the source for reports of operating statistics. It was noted that the scrams were not consistently marked with an asterisk to make them easier to find. One scram, which happened on May 17, 1982, was not marked and was not included in the report of operating statistics. The inspector suggested that all scram entries in the log be marked for ease in finding them.

No violations were identified.

5. Radioactive Gaseous and Liquid Effluents

During the inspection of records, the inspector asked to see the records showing radioactivity discharge into the air beyond the effective control of the Pennsylvania State University as measured at or prior to the point of such release or discharge as required by condition C.(2) of License No. R-2. The licensee indicated that the only radionuclide being discharged in the air from the reactor is argon-41. They do not routinely measure and record the concentration of argon-41 in the air exhausted from the reactor bay. However, the licensee does routinely measure the radiation in the reactor bay and in the outside environment using thermoluminescent dosimeters (TLD's). Any significant change in argon-41 concentration in the air in the reactor bay and in the outside environment would be reflected by the amount of radiation measured by the TLD's.

The licensee did measure the amount of argon-41 released as a result of reactor operation during the period of July 1973 through February 1974. The licensee determined from these measurements that 1.37 millicuries of argon-41 was generated per megawatt-hour of reactor operation. Using this rate of argon-41 generation, the megawatt-hours of reactor operation, and the volume of air discharged from the reactor bay for each year from 1971 through 1981, the licensee calculated the yearly average fraction of the Maximum Permissible Concentration (MPC) of argon-41 in the discharged air. These calculations showed the average argon-41 concentration was from 0.37 to 1.6 percent of the MPC for unrestricted areas.

During August 1979, the licensee measured the argon-41 released from the reactor using a sampler which compressed the air so that the argon-41 concentration could be measured. The argon-41 concentrations in the air in the reactor bay during reactor operations were well within the MPC limits both while the air was in the reactor bay (a restricted area) and after the air was discharged to the outside environment (the unrestricted area).

The licensee recently installed a different pump in the reactor diffuser. Even though the purpose of the diffuser is to minimize the amount of nitrogen-16 in the water at the surface of the pool, the inspector suggested that the licensee remeasure the concentration of argon-41 in the reactor bay and verify that the argon-41 concentrations in the air had not changed significantly. The licensee indicated they would perform these measurements.

The licensee does not discharge any radioactivity in liquid effluents. The licensee uses ion exchange beds to purify their reactor pool water. When the licensee regenerates the ion exchangers, the waste water containing the radionuclides is distilled. The distilled water is stored and used as pool makeup water. The sludge from the still, which contains the radionuclides, is solidified and sent to a low-level waste burial ground.

6. Procedures

The licensee has 7 emergency procedures, 9 standard operating procedures, 5 special procedures, and 7 administrative policies. The master copy of these procedures is maintained in the reactor control room. Each senior reactor operator and reactor operator has a personal copy of the procedures.

The procedures are reviewed and revised as needed at least annually. Each page of each procedure has the signature of the person last revising the page, the signature of the approving official, and the date of revision. Each procedure has a table of page revision dates to help personnel assure that procedures are maintained current. The revision date of each procedure is within the last three years, demonstrating that the licensee is maintaining current procedures.

The inspector reviewed SOP-2, Daily Checkout Procedure; SOP-5, Experiment Evaluation and Authorization; and AP-6, Penn State Reactor Safeguards Committee Operating Procedure. These procedures were technically adequate and met the Technical Specification requirements.

No violations were identified.

7. Experiments

The licensee has the following procedures addressing the performance of experiments involving the reactor:

- AP-6, Penn State Reactor Safeguards Committee Operating Procedure
- SOP-5, Experimental Evaluation and Authorization
- SOP-6, Sample Encapsulation
- SOP-7, Sample Irradiation
- SOP-8, Release of Irradiated Samples
- SOP-9, Pneumatic Transfer System Operation

Persons appointed by the Director evaluate proposed experiments in terms of possible effects on personnel safety and reactor operation. In certain instances, experiments are referred to the Reactor Safeguards Committee for its review and approval. Prior to the performance of the experiment, an irradiation authorization form providing the basis for the favorable evaluation must be completed and signed by the appointed person.

The irradiation authorization form is given on the outside of a brown envelope. All pertinent procedures, information, and data concerning the experiment are kept in the envelope, which is maintained on file.

Involvement of the Reactor Safeguards Committee in safety reviews of experiments was demonstrated by their review and questioning of an experiment involving a liquid level gauge apparatus during March 1982. In this instance, the experiment was reviewed by the reactor staff and approved by the Reactor Director and the Reactor Safeguards Committee Chairman.

No violations were identified.

8. Instructions to Individuals

During the inspection, two individuals from a national laboratory performed an experiment using the beam port.

The inspector inquired as to the instructions given to these individuals as required by 10 CFR Part 19.12, "Instructions to Workers". The licensee indicated that they had ascertained during conversations with these individuals that they were familiar in working with and measuring radiation. The licensee also indicated that well qualified individuals constantly escort and/or work with the individuals while they are in restricted areas of the facility to assure the safety of the individuals. However, the licensee had not given these individuals instructions in site-specific information such as emergency alarms and evacuation procedures. No poor radiation protection practices were noted by the inspector.

Ensuing discussions with the licensee during the inspection and by telephone on December 13, 1982, resulted in the following understandings.

- The Reactor Staff formally will determine the radiation protection qualifications of personnel prior to their performing experiments or other work in the facility and will instruct the personnel in radiation protection matters to an extent commensurate with potential radiation problems and the qualifications of the personnel.
- The Reactor Staff will provide site-specific instructions on emergency actions for fire and personnel evacuation to personnel prior to their performance of experiments or other work in the facility.
- When escorts are used to assure the safety of personnel, the escorts will be qualified in the radiation protection aspects of the activities being performed.

This action will be verified during a future inspection. (50-05/82-01-01)

No violations were identified.

9. Surveillance

The following surveillance requirements were reviewed.

<u>Tech Spec</u>	<u>Description</u>	<u>Frequency</u>	<u>Time Period</u>
E.5	Pulse reactor with insertion of reactivity of $\leq 1.5\% \Delta k/k$ and compare fuel temperature and peak power levels with previous pulses of the same reactivity insertion.	semi-annual	11/30/79-6/21/82
E.6	Check each fuel element for transverse bend and longitudinal elongation	annual	6/79-5/82
F.2	Visually inspect control rods for distortion or deterioration.	biennial	6/78-5/82
F.9	Check reactor instrument channels and safety circuits for operability	each day of operation	1/4/82-12/8/82
F.11.a.	Functionally check all interlocks	semi-annual	8/16/79-6/23/82
F.11.b.	Verify th. all control rod drop times are less than one second	semi-annual	1/10/79-5/26/82

No violations were identified.

10. Review and Audits

The inspector reviewed the minutes of the Reactor Safeguards Committee meetings for 1981 and 1982. The committee met at least quarterly and a quorum was present at each meeting. According to these minutes, the committee performed safety reviews of certain experiments, considered recommendations resulting from annual audits, and reviewed reactor operations with the reactor staff.

The annual audits, which are required by Administrative Policy AP-6, Penn State Reactor Safeguards Committee Operating Procedure, were performed during 1981 and 1982. Each audit report gave favorable findings; however, each auditor provided recommendations and comments for potential improvements. The reactor staff and Reactor Safeguards Committee addressed each item and either took or is taking appropriate action.

No violations were identified.

11. Requalification Training of Reactor Operators

The inspector examined the records of operator requalification training and test results for 1981 and 1982. Administrative Policy-3(AP-3), Operator and Senior Operator Requalification Program, defines the program.

The biennial written examination was last given in November 1981. The written examination covered the following subjects:

- Principles of Reactor Operation;
- Features of Facility Design;
- General Operating Characteristics;
- Instrumentation and Control;
- Safety and Emergency Systems;
- Procedures, Technical Specifications, and Government Regulations; and
- Radiation Control and Safety.

The questions on the subjects were sufficiently comprehensive to provide an adequate examination. The licensee graded the answers to each subject separately and computed an overall grade for the examination. If an operator did not score at least 70 percent on a subject, the operator was given additional training and was subsequently retested. All the operators who needed additional training on a subject passed the next examination.

The "walk-through" examination was last given in October 1981. The examination had 25 questions which were sufficiently comprehensive to provide an adequate examination. All examinees passed these examinations.

The oral examinations on abnormal, emergency, and standard operating were given in October 1981 and November 1982. The examinations had, respectively, 32 and 35 pertinent and meaningful questions. All examinees passed these examinations.

No violations were identified.

12. Exit Interview

The inspector met with the licensee representatives (denoted in paragraph 1) at the conclusion of the inspection on December 9, 1982. The inspector presented the scope and findings of the inspection, including:

- the requirements of 10 CFR Part 19.12, "Instructions to Workers" (paragraph 8);
- corrective action concerning a blocked eyewash and safety shower station in the water treatment room (paragraph 2);
- checking and posting of air velocities into the hoods for the pneumatic tube termini (paragraph 2); and
- remeasurement of the argon-41 concentration in the reactor bay air with the reactor operating (paragraph 5).