U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos. 50-277/94-09, 50-278/94-09

Docket Nos. 50-277, 50-278

License Nos. DPR-44, DPR-56

Licensee: PECO Energy
Nuclear Group Headquarters
Correspondence Control Desk
P. O. Box 195
Wayne, Pennsylvania 19087-0195

Facility Name: Peach Bottom Atomic Power Station (PBAPS)

Inspection Period: May 23-27, 1994

Inspectors: _____ 6/15/94
L. Eckert, Radiation Specialist Date

Approved By: _____ 6/16/94
for R. Bores, Chief Date
Facilities Radiation Protection Section

Areas Inspected

Licensee implementation of the revised 10 CFR Part 20 regulations using NRC Procedure Temporary Instruction 2515/123.

Results

Radiological Controls Program changes made as a result of the revised 10 CFR 20 regulations were conservative and, in general, established with good bases. No safety concerns or violations of NRC regulatory requirements were identified.

DETAILS

1.0 Personnel Contacted

* C. Baker, Manager Radwaste
* D. DiCello, Manager Radiological Engineering
* B. Downey, Health Physics Supervisor
* D. Foss, Regulatory Engineer
* A. Fulvio, Nuclear Quality Assurance (NQA) Manager
* G. Gellrich, Senior Manager Operations
* T. Geyer, Manager, IRM
* D. Iversen, Radiological Engineer
* R. Moore, Manager Radiation Protection
  R. Smith, Regulatory Engineer
* G. Stephenson, Acting Manager Support Health Physics
* T. Wasong, Experience Assessment Manager

Other licensee personnel were contacted during the inspection.

* Denotes attendance at the exit meeting.

2.0 Implementation of the Revised 10 CFR Part 20 Regulations

2.1 High Radiation Areas (HRAs) and Very High Radiation Areas (VHRAs)

2.1.1 Training and Qualifications of Personnel

- The Basic Radiation Worker General Employee Training (GET) Manual was reviewed and determined to provide sufficient detail on worker responsibilities regarding HRAs, locked HRAs (LHRAs) and VHRAs. Interviews with a selected sample of workers and Radiological Controls Technicians (RCTs) were held. These individuals had an acceptable level of knowledge regarding their responsibilities for entry into and while present in HRAs, LHRAs and VHRAs. Most individuals interviewed were familiar with the circumstances surrounding recent failures to meet all HRA entry requirements (see NRC Inspection Report 50-277/93-27 and 50-278/93-27). Most of the individuals interviewed were aware that the transverse incore probe (TIP) rooms and drywells at power were controlled as VHRAs

- Over the past several inspections, the inspector has observed no cases where inadequate instructions had been provided to radiation workers with respect to the hazards associated with working in HRAs and locked HRAs and each worker's responsibility to take precautions as directed by radiological controls personnel.

- Over the past several inspections, the inspector has observed no cases where RCT coverage responsibilities for work in HRAs and LHRAs was not clearly defined and

documented (by procedure, ALARA review, or Radiation Work Permit). The inspector has not had an opportunity to review work conducted in an area controlled as a VHRA.

- As determined from interviews and direct observation of work observed over the past several inspections of this program area, RCTs are familiar with stop-work authority with respect to departures from the radiological conditions and/or intended work scope. NRC Inspection Report 50-277/93-27 and 50-278/93-27 notes a case in which work was held-up for shielding emplacement and also notes a weakness where stop-work authority was not invoked when appropriate (radiological controls response for this matter was otherwise noted as excellent).

- Contractor RCT qualifications and knowledge relating to HRAs/LHRAs/VHRAs will be reviewed in a future inspection close to the upcoming scheduled refueling outage at Unit 2.

- Specific training is now being provided to licensed operators to emphasize the importance of informing radiological controls staff when plant operations may effect radiological conditions within the plant and thereby create HRAs and/or VHRAs. During the week of this inspection, the inspector viewed operator response to a scenario performed on the licensee's plant-specific simulator. This has been an issue in the past which was identified by the licensee as an area where improvements could be made (see NRC Inspection Report 50-277/94-02 and 50-278/94-02 Section 4.0). Some improvement was noted. This will be reviewed further during a subsequent inspection.

2.1.2 Procedures and Work Practices

- Licensee procedures for HRA/LHRA/VHRA characterization, control and access were reviewed. No discrepancies in these procedures with regulations or guidance was noted as a result of this review. No substantive changes to HRA/LHRA access control were made as a result of the revised 10 CFR 20 regulations.

  The licensee has established two levels of keys for LHRAs denoted Level I and Level II. Level II keys control access to areas with greater radiological hazard than Level I keys and all VHRAs are controlled as Level II. Level II keys are issued to ANSI qualified RCTs only with approval needed from a Health Physics Supervisor and Operations Shift Management. Also, all Level I access controls apply to Level II areas. Level I access controls include maintenance of positive access control (defined as keeping the entrance to the LHRA within visual range) and signed acceptance of the responsibilities for the key. A more thorough review of licensee key/lock control will be performed in a future inspection.

- Workers and RCTs interviewed were noted to have acceptable knowledge regarding the establishment and access control requirements for HRAs/LHRAs/VHRAs.

- All RCTs interviewed were cognizant of the fact that the distance criterion for HRAs was changed from 18 inches to 30 cm by the revised 10 CFR 20 regulations. Thirty centimeter rulers are available for RCT use.

- Over the past several inspections, RWPs controlling access to HRAs and LHRAs have been reviewed by the inspector and no discrepancies have been noted.

- Over the past several inspections, postings and access control methods for HRAs and LHRAs have been reviewed by the inspector. No HRA/LHRA/VHRA posting or access control discrepancies have been noted since the problems associated with personnel access controls for the transverse incore probe (TIP) room were addressed by the licensee (see NRC Inspection Report 50-277/93-02 and 50-278/93-02). The TIP rooms are now controlled as VHRAs.

- Licensee access controls regarding the spent fuel pool will be reviewed in a future inspection.

2.1.3 Management and Supervisory Oversight

- Over the past several inspections, the inspector has observed no cases in which inadequate supervisory attention led to discrepancies/events involving HRAs/LHRAs/VHRAs pertaining to training; procedure generation, maintenance and implementation; follow-up and correction of deficiencies (as described in event reports); and RWPs and job packages.

- The licensee has established a supervisory oversight program called Step-up. This program requires that each supervisor spend a minimum of 15 hours touring the plant each month. This program will help station supervision maintain an awareness of HRA and VHRA conditions, access controls, and worker knowledge and compliance.

- NRC Inspection Report 50-277/93-27 and 50-278/93-27 describe events and associated corrective actions involving failure to meet all requirements prior to entry into areas controlled as HRAs. NRC Inspection Report 50-277/93-19 and 50-278/93-19 describe cases where LHRA doors were found in a degraded condition. Licensee corrective actions were previously deemed appropriate by NRC in both cases.

- Licensee management, most notably operations and radiological controls (see Section 2.1.1 above), are taking steps to increase training and the effectiveness of communication between work groups. Also, the licensee has initiated a program where good radiation worker practices job standards will be prepared to provide a more uniform approach in how to complete rote work activities in radiologically

controlled areas. This project will take significant licensee resources to complete as the needs of each station department will necessitate development of standards for each major unique work activity.

2.1.4 HRA/LHRA/VHRA Summary

Proper licensee implementation of HRA and VHRA controls is of concern to NRC and as such it is part of the ongoing radiological controls inspection program. In summary, the inspector concluded that sufficient guidance and procedures have been established for the control of HRAs, LHRAs and VHRAs.

2.2 Declared Pregnant Women (DPW) and Embryo/Fetus Doses

In practice at the time of the inspection, the licensee provided thermoluminescent dosimetry (TLDs) to all red-badged workers which includes all individuals with radiologically controlled area (RCA) access. There are also white badged workers who do not have RCA access. Exposures for both red and white badged workers are considered occupational exposures. The licensee considers the established protected area access boundary as its restricted access boundary. The licensee has established the parking lot as a controlled area.

The inspector reviewed a licensee study "A Prospective Evaluation On The Likelihood Of Exceeding 10% Of The External Dose Limits At Peach Bottom Atomic Power Station." The inspector reviewed the data that the study was based on (quarterly TLD reads for all quarters in 1993 and the first quarter of 1994 (five sets of data)). This data provides reasonable assurance that the licensee would not likely exceed 500 mrem over either a gestation period or in a calendar year. The maximum exposure accumulated in an area outside the RCA and frequented by licensee staff was about 120 mrem in a year. It should be noted that there are accessible areas outside the RCA where exposures are higher, but frequented rarely, such as the fence west of the radwaste building (up to 264 mrem per year) and the north end of the fourth floor of the administration building (up to 193 mrem per year). Also, these values incorporate an occupancy factor of 0.25.

- Licensee Procedure HP-C-106, "Dosimetry Program," implements requirements concerning DPWs.

  The procedure requires that all DPWs likely to receive occupational exposure in excess of 50 mrem deep dose equivalent for the entire gestation period be monitored. The licensee has established a 40 mrem/month administrative limit to help ensure that DPWs do not exceed 500 mrem over the gestation period and to help spread exposure throughout the gestation period. In practice, the licensee plans to issue dosimetry to all DPWs on a voluntary basis.

- There is no difference in the amount of training provided to white and red-badged workers regarding the subject of declared pregnancy and dose to the embryo/fetus. Interviews with a selected sample of workers were held. Sampling was biased toward females who access the RCAs as part of their routine work responsibilities. These individuals had an acceptable level of knowledge regarding declared pregnancy.

  One of the individuals interviewed conveyed that when she was seeking additional information on declaring her pregnancy from her supervisor, it was suggested that she should seek medical verification of a home pregnancy test. The inspector informed the licensee that such practice was potentially discriminatory in nature. This issue is addressed in NUREG/CR-6204, "Questions and Answers Based on Revised 10 CFR Part 20", Q&A #84. The individual did not feel discriminated against and stated that she was satisfied in how she had been treated. Licensee representatives stated that this matter would be pursued. The Vice President, PBAPS immediately communicated the concern to station supervision. Licensee treatment of DPWs will be followed up in future inspections.

  At the time of the inspection, the inspector noted that the licensee no longer provided NRC Regulatory Guides (RGs) 8.13 or 8.29 in GET. While the information provided by the Basic Radiation Worker GET Manual was informative, it did not provide information in the level of detail which the RGs provide. The licensee discussed some potential solutions to this issue with the inspector. Licensee personnel stated that this matter would be evaluated further and actions taken. This matter will be reviewed in a future inspection.

  The inspector also discussed some minor changes to the Basic Radiation Worker GET Manual with the licensee. Licensee personnel stated that they would evaluate this matter and make changes to the manual as appropriate.

- At the time of this inspection, no fetal dose assessments had been performed for any DPW. Fetal dose assessments will be reviewed in future inspections.

In summary, the inspector concluded that sufficient guidance and procedures have been established for the control of DPWs.

2.3 TEDE/ALARA and Respiratory Protection

- There are no indications that there is significant lack of positive acceptance/support regarding reduction of respirator usage. Feedback mechanisms do exist and licensee management is taking action to foster more extensive use of these mechanisms (see NRC Inspection Report 50-277/94-02 and 50-278/94-02).

- Interviews with a selected sample of workers were held. These individuals had an acceptable level of knowledge regarding the concept of maintaining Total Effective Dose Equivalent (TEDE) as low as reasonably achievable (ALARA).

  At the time of the inspection, there had been no cases where respirators were used strictly to meet a worker demand for respiratory protection equipment. Licensee radiological engineering staff have addressed worker concerns regarding work where no respirators had been prescribed and had been used previously. Face to face communication with radiological engineering staff resolved these worker concerns. However, if a worker demands the use of respiratory protection equipment, the licensee intends to provide such equipment as it was the Radiological Engineering Manager's understanding that there was a state regulation pertaining to worker demand for respiratory protection devices. Such practice is acceptable to NRC (see NUREG/CR-6204 Q&A #386).

- There has been work in which the licensee's Radiological Engineering staff has chosen not to prescribe either respiratory protection or local high efficiency particulate air (HEPA) units for work where respirators had been used in the past. Most notable is undervessel work where LPRMs/SRMs/IRMs had been replaced by Instrumentation and Controls (I&C) personnel (these instruments can be quickly disconnected and replaced) and control rod drive shoot-out steel removal by the Nuclear Maintenance Department (NMD). Radiological Engineering staff concluded that HEPA usage was impractical as work is conducted on a rotating platform which would necessitate inordinately frequent attention to HEPA trunk placement. Face shields and head socks were used for this work. There were 6 head/facial personnel contamination reports (PCRs) for this work during 3R09 (the ninth refueling outage at Unit 3). No appreciable uptake of radioactive materials was noted by the licensee and skin doses were less than 10 mrads in each case. The inspector concluded that there were no discernable weaknesses in the choice of not using respirators or HEPA filters. Such choices will be reviewed in future inspections.

- Licensee implementing procedures and TEDE ALARA evaluations were reviewed during the conduct of NRC Inspection 50-277/94-02 and 50-278/94-02. These topics will be the subject of future inspection efforts and are part of the routine NRC health physics inspection program.

- As noted above, there was some increase in facial/head PCRs associated with undervessel work as a result of reduction of respirator protection use. There was little radiological safety consequence from these PCRs. Overall, licensee PCRs (from all causes) have been trending downwards over the past several years.

See NRC Inspection Report 50-277/94-02 and 50-278/94-02 for a more complete analysis of the status of the licensee's ALARA program. This report concluded that the licensee has an effective ALARA program.

2.4 Planned Special Exposures (PSEs)

Licensee Procedure HP-C-108, "Planned Special Exposures," Revision 0, 1/1/94, was reviewed. This procedure provides the following direction.

- The procedure requires that PSEs be used only in exceptional circumstances and provides examples of cases where a PSE might be appropriate.

- The procedure requires approval from the individual's supervisor, the RPM, and the Plant Manager (or Station VP) prior to carrying out PSE work.

- The procedure incorporates the requirements of 10 CFR 20.1206(c) to inform and instruct workers and requires that the worker(s) receiving the PSE shall sign a form (PSE Approval Form) which acknowledges that they have been instructed as the regulations require.

- The procedure requires an ALARA review per licensee Procedure HP-C-324. This procedure requires job-specific review of radiological work conditions. This should help ensure that the requirements of 10 CFR 20.2104(b) and 20.2104(e)(2) are met for individuals who are to be permitted to participate in PSEs. Also, the licensee intends to monitor the appropriateness (for validity and/or need for change) of the gross β/γ and gross α effective derived air concentrations (DACs) by using 10 CFR 61 analyses.

- The procedure makes provisions for ensuring that the PSE limits of 10 CFR 20.1206(e) and 20.1201(b) are met by dictating that:

  All previous exposures in excess of federal limits and all previous PSEs are to be subtracted from the limit for PSE,

  A completed and authenticated exposure history be generated to be eligible for a PSE, and

  The provided annual and lifetime PSE limits not be exceeded.

- The procedure requires generation of a formal report using the Performance Enhancement Program (PEP). The licensee intends to maintain PEP documentation at least until the termination of its license. The procedure also directs that a report be generated and sent to the NRC within thirty days. The licensee is aware of the need to submit two NRC Form 5s for an individual who has received a PSE but has not proceduralized this need as it is felt that the computer software used to generate NRC Form 5s is sufficiently intuitive and provides enough on-line guidance.

- The procedure provides for ensuring that individual(s) are informed of their exposure(s) as a result of a PSE per 10 CFR 20.1206(g) by requiring that the Dosimetry Group send a written report signed by the RPM to the affected individuals within 30 days of the PSE.

The procedure also notes that it is acceptable to seek prior NRC review prior to carrying out a PSE as noted by 10 CFR 20 Question and Answer number 137.

In summary, the inspector concluded that sufficient guidance and procedures have been established for the conduct of PSEs if such need arises.

2.5 Internal Exposure Controls Program

- Licensee Procedure HP-C-628, "Personnel Bioassay Program," Revision 0, 1/1/94 was reviewed. This procedure provides controlling requirements for the licensee's internal exposure controls program. This procedure requires that individuals be whole body counted under the following circumstances.

  suspected intake $\geq$4 derived air concentration (DAC)-hours in seven calendar days

  visitors, minors, and DPW who have a suspected intake $\geq$1 DAC-hour in one day

  individuals with persistent skin contamination after multiple decontamination efforts

  individuals with unexpected/unplanned positive nasal smears >100 cpm above background

  individuals with planned intakes with positive nasal smears >500 cpm above background

  individuals unable to clear a portal monitor and the cause is indeterminate

  incidents involving respirator failure in a airborne radioactivity area

  and at the discretion of the Radiological Controls Department

  This procedure also establishes investigation levels based on a whole body count.

  If the whole body count shows an uptake <0.5% of an annual limit of intake (ALI) when measured within 24 hours post-intake, then no follow-up action is

required but may take place if external contamination was considered to significantly mask the amount of material actually uptaken.

If the whole body count shows an uptake $\geq$0.5% of an ALI measured 24 hours or more post-intake, then follow-up whole body counts will be conducted. Committed dose equivalent (CDE) will be calculated for the critical organ as well as the committed effective dose equivalent using established methodology.

Uptakes $\geq$2.0% of an ALI will be handled in a manner similar to an uptake $\geq$0.5% of an ALI, but in vitro bioassay methods will be initiated based on a review of air sample data, smear surveys, and the presence of alpha or pure beta emitting isotopes.

The inspector discussed with the Radiological Engineering Manager the advantages and limitations of waiting more than 24 hours prior to the initiation of in vitro bioassay. Considering the current radioisotopic mix at the station the inspector currently has no concerns over this practice. Significant changes in the radioisotopic mix (for example, a greater proportion of the total activity from transuranics) might necessitate a change to initiate collection of samples for in vitro bioassay in a more timely manner.

- The licensee has designed its program with three procedural controls designed to maintain and monitor that internal doses be less than 10% of the limit, which includes the ALARA review process, DAC-hour tracking on per task basis, and a 160 DAC-hour administrative limit. The licensee has not made notable changes to its air sampling program. The air sampling program and passive monitoring with PM-7 portal monitors are intended to provide additional ongoing confidence that internal exposures are being maintained at less than 10% of the limit.

- Licensee study, "A Prospective Evaluation On The Likelihood Of Exceeding 10% Of The Internal Dose Limits At Peach Bottom Atomic Power Station," was reviewed. This study concluded that it would be very unlikely that any individual will exceed 10% of the applicable ALIs listed in 10 CFR 20, Appendix B, Table I. The Radiological Controls Department retains discretion of whether to sum internal and external doses under 10% of the limits. The study appeared valid.

Further licensee studies have empirically demonstrated that PM-7 portal monitors are sufficiently sensitive to consistently detect less than one percent (300 nCi) of the Co-60 ALI (other licensee studies have also shown detection ranges of about 1-2% of the Co-60 ALI). Based on past 10 CFR 61 analyses at PBAPS, beta and/or gamma emitters represent at least 99% of the activity in the plant isotopic mix. This leads the licensee to conclude that any intake of regulatory significance could be detected and trigger further investigation.

- One noted change is that the licensee will no longer conduct annual whole body counts. Baseline, termination, routine (random), and investigational whole body counts will continue to be conducted as needed.

- At the time of the inspection, the licensee was using the following DACs for use in their internal exposure control program:

  Gross β/γ DAC: 3N9 μCi/cc
  Gross α DAC: 8N12 μCi/cc

  Additionally, the licensee was using the DAC for Pu-238 as the gross alpha DAC. The inspector and Radiological Engineering Manager reviewed recent 10 CFR 61 analyses taken throughout the station in order to verify the validity of using the Pu-238 DAC as the gross alpha DAC. Preliminary review of this data appears that use of the Pu-238 DAC as the gross alpha DAC appears conservative for most areas in the station. No documentation regarding the basis for the selection of the Pu-238 DAC was found during the inspection (there is no regulatory requirement that the licensee documents procedural bases). Licensee radiological controls staff stated that the basis for the gross alpha DAC would be reevaluated and changed if necessary.

In summary, the inspector concluded that the internal exposure controls program had been conservatively established and, in general, with clear bases.

3.0 Exit Meeting

The inspectors met with licensee representatives at the end of the inspection, on May 27, 1994. The inspectors reviewed the purpose and scope of the inspection and discussed the findings. The licensee acknowledged the findings.