U.S. NUCLEAR REGULATORY COMMISSION
Region I

Report No. 50-278/81-28

Docket No. 50-278

License No. DPR-56 Priority -- Category C

Licensee: Philadelphia Electric Company

2301 Market Street

Philadelphia, Pennsylvania 19101

Facility Name: Peach Bottom Atomic Power Station, Unit 3

Inspection At: Delta, Pennsylvania

Inspection Conducted: October 13-15, 1981

Inspector: R. L. Nimitz 7/26/82
R. L. Nimitz, Radiation Specialist date signed

date signed

Approved By: Edward A. Greenman 7/26/82
E. G. Greenman, Chief, Facilities Radiation Protection Section date signed

Inspection Summary:
Inspection on October 13-15, 1981 (Inspection Report 50-278/81-28)
Areas Inspected: Special, announced inspection of the circumstances and licensee actions taken following a reported 14.1 rem exposure to a TLD assigned to a licensee employee for August 1981. Areas inspected included: event description and reconstruction, exposure records, work review and dosimetry irregularities, notification requirements, procedure adherence and adequacy, qualifications, and corrective actions. The inspection involved 20 inspector hours onsite by one region based inspector.

Results: Of the seven areas inspected, no violations were identified in 5 areas, 2 violations were identified in 2 areas (Failure to promptly notify the NRC in accordance with 10 CFR 50.72, Paragraph 6; Failure to follow radiation protection procedures as required by Technical Specification 6.11, Paragraph 7.a and 7.b).

DETAILS

1. Persons Contacted

Philadelphia Electric Company

D. Barron, Technical Assistant, Dosimetry
J. Dawson, Instrumentation and Control Engineer
*N. Gazda, Health Physics Engineer
F. Pulaski, Reactor Engineer
*W. T. Ullrich, Station Superintendent
J. Valinski, Health Physicist
J. Whisted, Assistant Foreman, Electrical Maintenance

USNRC Resident Office

*C. J. Cowgill, Senior Resident Inspector
*A. R. Blough, Resident Inspector

*denotes those persons present at the exit interview on October 15, 1981.

The inspector also interviewed several other licensee employees including members of the Health Physics staff and maintenance personnel.

2. Purpose of Inspection

The purpose of this special inspection was to review the circumstances, licensee evaluations and follow-up actions relating to a reported 14.1 rem exposure of a thermoluminescent dosimeter (TLD) worn by a member of the licensee's electrical maintenance group during August 1981.

3. Event Description

a. General

The licensee uses several methods of monitoring personnel radiation exposure at the Peach Bottom Atomic Power Station. A vendor supplied (Eberline) thermoluminescent dosimeter (TLD) is used as the "official"* personnel monitoring device, while a licensee supplied (Harshaw) TLD is used to augment the vendor TLD's. The vendor TLD badges are worn by individuals for an entire month and subsequently sent off-site for processing. The licensee supplied TLD badges are worn in conjunction with the vendor TLD badge, but are turned in and processed after each day's use.

*Official results, as used here, means results which have been determined through evaluation of a dosimetry system, the use of whose components are controlled and whose operation is subject to quality assurance. Unofficial results are obtained from programs which do not have all of these necessary controls applied. For example, a record based on pocket dosimeters read by the individual himself is "unofficial."

The licensee also provides direct reading pocket dosimeters. These provide gamma radiation exposure information for each entry where personnel monitoring is required. The individual's pocket dosimeter readings are entered on Radiation Work Permits (RWP) as exposure received on a particular job.

b. Description

On September 9, 1981, the licensee's Technical Assistant (TA)-Dosimetry, received a telephone call from the TLD vendor. The vendor indicated that a monthly TLD badge, assigned to a licensee employee for August, 1981, received an exposure of 12.5 rem (gamma radiation). Applying a previously determined correction factor to the reported exposure, the indicated exposure was 14.1 rem.

When notified of the exposure, the licensee's TA-Dosimetry, believing the high exposure to have been received by a lost and then later found badge assigned to the employee, requested a technician to check the employee's file to determine if a "Lost Badge Report" was present for the employee. This check indicated a report had been completed and no other action was taken at that time by the TA-Dosimetry.

On September 24, 1981, the TA-Dosimetry began to receive the vendor supplied TLD badge process data. At that time (approximately early afternoon) the TA-Dosimetry determined, through review of lost badge reports, that the vendor badge, which indicated 14.1 rem, had not been lost and subsequently found. The lost badge report which was on file for this individual, was a report for a licensee supplied TLD badge which had been assigned to the employee.

During the afternoon of that day, the TA-Dosimetry reviewed lost badge reports to attempt to relate the high reading to a lost badge. He was unable to determine the cause by the end of his normal day and left the site. That evening, the TA-Dosimetry contacted the Engineer-Health Physics to notify him of the high reading TLD and to ask for instructions.

The Engineer-Health Physics directed the TA-Dosimetry to notify the onsite Health Physicist so he could bring it to the attention of appropriate station management. Due to an apparent misunderstanding, station management was not notified of the high reading TLD on the following day (Friday, September 25, 1981).

The Engineer-Health Physics, when he returned to the station on Monday, September 28, 1981, notified the Station Superintendent of the situation. Based on information provided to the Engineer-Health Physics on that morning, (no dose-extensions were in effect for the worker, and no apparent high radiation areas existed which could cause such a dose) and, considering the worker's tasks, the Engineer-Health Physics concluded that the worker did not receive the exposure as indicated by the badge, and reported this to station management.

The worker was later interviewed on September 29, 1981 by Health Physics personnel. The NRC (Resident Inspector) was not notified of the problem until October 5, 1981.

c. Licensee Investigations

Between September 24, 1981 and October 5, 1981 an investigation of the high reading was conducted by onsite licensee radiation protection personnel. Between October 13, 1981 and October 27, 1981 an onsite investigation of the high reading was also conducted by a licensee corporate staff engineer. The latter investigation was reopened on November 9, 1981 when additional information was obtained which indicated the employee had lost his badge during August.

The results of the licensee investigations were furnished to NRC Region I in a report dated November 13, 1981.

The licensee evaluation of the employee's potential to receive a 14.1 rem dose (based on a review of the employee's work during the month) was described in the report. The licensee concluded that the employee did not work for sufficient time in radiation fields of a magnitude which would allow the accumulation of this dose. Based on the licensee's investigation findings, an exposure of 640 millirem was assigned to the employee.

An investigation of the licensee's TLD vendor facilities was also conducted by a dosimetry consultant and the licensee's Superintendent-Quality Assurance Division. This investigation was conducted to provide a basis for judging the validity of the high exposure reading of the badge.

Regarding the apparent 14.1 rem exposure of the badge, the licensee's evaluation of the processing capability and quality assurance system of the TLD vendor program did not identify any credible source of error. The licensee concluded that, based on the investigation findings, the reported reading was correct.

The licensee investigations did not determine how the employee's badge could have received the high dose, but, based on the investigations, concluded that the employee did not actually receive the 14.1 rem exposure.

4. Exposure Records Review

The inspector reviewed all available dose information for the employee for the month of August, 1981. Licensee supplied TLD data was available for the period August 1-12, 1981 and the period August 17, 1981 (starting at 5:00 p.m.) through August 31, 1981. Because the employee had not placed his licensee supplied TLD in a special deposit box, referred to as a work function box, for processing at the end of his shift for the period August 13-16, 1981, no licensee supplied TLD data is available for that time period.

Table 1 below is a listing of available data:

Table 1

Date	Licensee Supplied TLD Data (millirem)	Dosimeter Reading From All Radiation Work Permits (millirem)
7/27/81 thru 8/12/81	180	--
8/13/81	Not Read[2]	No RWP Work
8/14/81	Not Read	50
8/15/81	Not Read	75
8/16/81	Not Read	No RWP Work
8/17/81	Not Read	185
8/18/81	Not Onsite	No RWP Work
8/19/81	20[1]	No RWP Work
8/20/81	Not Read	90
8/21/81	75	110
8/22/81 thru 8/31/81	63	--

[1] This reading is for exposure received during the period August 17, 1981 @ 5:00 p.m. thru August 19, 1981 inclusive. (New badge issued August 17, 1981)

[2] Indicates badge not turned in for reading.

Table 1 shows that during the period from 7/27 - 8/31, 1981 excluding the 5 day period 8/13-17/81 during which the licensee supplied badge was not read, a total of 338 millirem was recorded on the licensee supplied TLD badge reported worn by the employee. The summation of dosimeter readings on RWP's during the period 8/13-17/81 indicated an additional 310 millirem was received. The sum of these values indicates that the individual received approximately 648 millirem during the August 1981 period which the "official" vendor supplied TLD with the 14 rem exposure was assigned to the worker.

5. Work Review, Dosimetry Use and Dosimetry Irregularities

On October 13 and 14, 1981, the inspector interviewed the employee who had worn the high reading thermoluminescent dosimeter. The inspector discussed the work locations of the employee during August, 1981, his use of personnel dosimetry devices, the number of badges lost during August 1981 and any dosimetry irregularities e.g., offscale dosimeters etc., which the employee might have identified during the exposure period in question.

a. Work Review

The inspector's discussions with the employee indicated he had worked throughout Units 2 and 3 (including the drywells), during August 1981. The employee said he had not entered any unusually high radiation areas, during that period. He also said that high radiation area producing "hot spots" in the drywells, were usually marked by flashing red lights and that he did not work in close proximity to these. The employee further said that he did not go into any area without signing in on a Radiation Work Permit (RWP) and that, other than the reactor drywells, only general areas were entered.

The inspector determined based on available TLD dose information, (licensee supplied TLD data) for the period prior to and including August 12, 1981 and subsequent to and including August 17, 1981, the employee did not receive a 14.1 rem exposure during those periods.

The inspector then focused on review of the employee's work locations during the 5 day period for which licensee supplied TLD data is not available (August 13-17, 1981).

In order to determine and review the employee's work locations during this 5 day period, the inspector used a listing of the employee's key card (i.e. access card) punch in and out times and constructed a day/time/general location matrix, to track the employee during the period in question, where data was missing. Table 2 provides the information obtained using the access card and available Radiation Work Permit sign-in data.

Interviews with the employee, review of the licensee's evaluation, and a review of the employee's RWP sign-in data and key card data (see Table 2) showed that the individual worked approximately: 90 minutes on the Unit 2 Refueling floor on the morning of August 13, 1981; about 30 minutes in the U-3 Reactor Building (outside the drywell) on the afternoon of August 13, 1981; 90 minutes in the Unit 3 Drywell ('B' Recirculation Pump area) on the afternoon of August 14, 1981; 60 minutes in the morning and again in the afternoon in the Unit 3 Drywell ('B' Recirculation Pump area) on August 15, 1981; 30 minutes in the area of the Core Spray pumps on the afternoon of August 16, 1981; and 2 hours during entries in the morning, early

afternoon, and late afternoon to the Unit 3 Drywell ('B' Recirculation Pump area) on August 17, 1981.

The inspector's review of radiation work permit sign-in data found the individual had been signed-in with co-workers during the work periods on the afternoon of August 14, the morning of August 15, and during the morning and early afternoon entries on August 17, 1981. He received low exposures during these entries (maximum dose received was 65 millirem during the early afternoon entry on August 17, 1981).

The review of the entries made on the afternoon of August 15 and late afternoon of August 17, 1981, indicated a maximum of 80 millirem was received. No co-worker data is available for these time periods, which could have been used for the purposes of comparison.

Regarding the entry onto the Refueling Floor on the morning of August 13, the entry into the U-3 Reactor Building that afternoon, and the work in the area of the Core Spray Pump Rooms on the afternoon of August 16, 1981, no RWP exposure information (sign in data) is available, since these areas do not require an RWP. Radiation survey data showed that general area radiation dose rates, of about 2-4 millirem/hr on the Refueling Floor and 2-10 millirem/hr in the Core Spray Pump Room existed in these areas. The dose rates in the Unit 3 Reactor Building did not require use of an RWP.

During the Unit 3 Drywell entries made on the afternoon of August 15 and also the late afternoon of August 17, 1981, no co-worker sign-in data is available to substantiate the doses received by the employee during those entries (15 and 80 millirem respectively). Although radiation survey data was available showed general area radiation dose rates of from 10-400 millirem/hr and about 200 millirem/hr on contact with the 'B' Recirculation Pump, the inspector could not determine whether the employee had entered any other areas where dose rates may have been significantly higher (i.e. some other location in the drywell).

On October 15, 1981, the inspector made independent radiation surveys of this individual's work locations in the Unit 3 Reactor drywell (as described during the interview of the employee). The inspector found no dose rates inconsistent with the licensee's surveys.

In a letter to NRC Region I dated March 26, 1982, the licensee provided estimates of the maximum exposure the individual could have received. This letter indicated the individual could have received a maximum exposure of 68 millirem on August 15 and 112 millirem on August 17, 1981.

Licensee representatives also advised the inspector no radiography, fuel movement, or incore detector movement had occurred during the period in question (August 12-17, 1981).

The inspector's review of facility records and interviews of licensee representatives and the employee involved, did not indicate that additional and unidentified radiation exposure to the employee occurred during the period in question. Based on this review, the licensee's assigned dose of 640 millirem to the employee, is therefore considered reasonable.

b. Dosimetry Use

The employee told the inspector he always wore his dosimetry (in a small plastic bag) on his upper left shirt pocket, and that he had his dosimetry with him at all times during August, 1981. The employee also said he did not drop his dosimetry during August, 1981 and that, although he did not routinely look at his badges, he believed he always had his own.

Since the vendor and licensee supplied badges are worn together, the inspector questioned licensee dosimetry personnel to determine if any personnel at the station had a high reading on a licensee supplied badge, comparable to the reading on the employee's vendor supplied badge. This was done to eliminate the possibility that some other individual might have worn the vendor supplied TLD and received the reported exposure. Based on discussions with licensee dosimetry personnel, and a review of August, 1981 licensee supplied badge readout data, no individual received an exposure to a licensee supplied TLD badge comparable to that on the employee's vendor supplied badge.

c. Dosimetry Irregularities

The inspector's discussions with the employee indicated that after completing work on the 'B' Recirculation Pump on the 135' elevation in the Unit 3 Drywell on the morning of August 17, 1981, the employee exited the Drywell and asked a helper to read his dosimetry. The helper told him that his dosimeter (500 millirem pocket dosimeter) was offscale. Believing the dosimeter to be malfunctioning, he asked the helper to log the same dose that his co-workers had received (≅ 40 millirem). Licensee Health Physics personnel were not notified of this off-scale dosimeter.

The afternoon of that same day (August 17, 1981), the employee said he again worked in the area of the 'B' Recirculation Pump. After leaving the station (about 3:30 p.m.), the employee said he turned his dosimetry (both vendor supplied and licensee supplied) in to the guard. When the employee returned that evening, he said that his licensee supplied badge was missing. At that time (approximately

4:30 p.m.) he was issued a temporary, licensee supplied badge, which he used in conjunction with his vendor supplied badge until August 19, 1981. At the end of work that evening, he turned his badges (vendor supplied and temporary licensee supplied) in when he left the site. When he returned the following day (August 20, 1981), the employee determined that the temporary badge had been sent for reading and he was requested to report to the Dosimetry office. Dosimetry personnel then filled out a lost badge report for the licensee supplied badge lost August 17, 1981, and, based on the worker's statement that he had received 200 millirem that day, he was issued a second permanent licensee badge, which he used for the remainder of the month.

The employee also said that his 500 millirem dosimeter had gone "slightly" off scale, i.e. not completely off scale, on a second occasion (August 21, 1981) when he was working in the area of the 'B' Recirculation Pump (135' el. Unit 3 Drywell). At that time, a helper again read the dosimeter and logged a dose for him comparable to that received by his co-workers (approximately 100 millirem). Again, licensee Health Physics personnel were not notified of this off-scale dosimeter (See paragraph 8).

6. Notifications

The inspector reviewed this event with respect to the notification requirements of 10 CFR 50.72, "Notification of significant events," and 10 CFR 20.403, "Notification of incidents."

10 CFR 50.72, "Notification of significant events," requires each licensee of a nuclear power reactor to notify the NRC Operations Center as soon as possible, and in all cases within one hour, by telephone of the occurrence of, among other events, any event meeting the criteria of 10 CFR 20.403 for notification.

10 CFR 20.403, "Notifications of incidents," requires in paragraph (d) that the incidents included in 10 CFR 20.403 (a) and (b) shall, in addition, be reported pursuant to 10 CFR 50.72. Paragraph (b) of 10 CFR 20.403 requires the licensee to notify the NRC of any incident involving licensed material possessed by him and which may have caused or threatens to cause exposure of the whole body of any individual to 5 rems or more of radiation.

The inspector's review indicated the licensee received essentially immediate telephone notification on September 9, 1981, from the licensee's vendor of the potential exposure of an employee to 12 rems of whole body radiation. Applying appropriate correction factors, the apparent exposure to the badge was increased to 14.1 rem.

Discussions with the individual supervising the dosimetry program, the licensee's Technical Assistant(TA)-Dosimetry, indicated that he had received the call from the vendor but believed the exposure to have been received by a lost and subsequently found vendor supplied badge which had

been sent to the vendor for processing. He believed that the dose to the badge did not represent an actual exposure to an individual. To confirm this belief, the TA-Dosimetry requested a technician to check the individual file for a lost badge report. No distinction was made as to whether the file should contain a lost vendor supplied or lost licensee supplied badge report. The technician's check of the file showed a report was on file. After verifying that a lost badge report was on file at that time (September 9, 1981), no other action was taken.

The inspector discussions with the TA-Dosimetry regarding his belief that the exposure was due to a lost and subsequently found badge indicated that at that time, total monthly exposure, based on licensee supplied TLD readout data, was available which indicated that the employee had low exposure for August 1981. This exposure did not reflect exposure received during the days the employee had not turned in his licensee supplied (Harshaw) TLD badge for readout (see Section 4 of this report). Table 1 of Section 4 indicates that back-up readout data does not exist for at least 5 days in August 1981. Dose estimates were obtained for these 5 days, by collecting and reviewing area radiation surveys and radiation work permit sign-in data. During the 5 days for which licensee back-up TLD data was not available, the worker had been working in the Unit 3 Reactor drywell, which is a High Radiation Area. As discussed in Section 5.c, the licensee did have verbal indication from the worker that he received about 200 millirem on August 17, 1981.

At the time the licensee received initial notification of the exposure TA-Dosimetry did not review radiation survey and radiation work permit data. He initiated a review of lost badge reports after receipt of a written vendor report (September 24, 1981) and made the determination that the lost badge report on file was a report for a lost licensee supplied badge, not a lost vendor supplied badge. Based on the above there was not sufficient information to eliminate the possibility of an exposure to this employee, and this required NRC notification.

As discussed in Section 3.b of this report, when the TA-Dosimetry realized that the exposure didn't occur when the badge was lost, the TA-Dosimetry contacted the Engineer-Health Physics at home, who directed that station management be made aware of the high reading badge. Due to an apparent misunderstanding of information transmitted, station management was not made aware of the high reading until the Engineer-Health Physics returned on September 28, 1981.

The inspector noted that at that time, the Engineer-Health Physics informed the Station Superintendent that, due to his general perception that no radiation fields of sufficient magnitude existed in the plant which could cause such an exposure, he believed the worker did not receive the exposure indicated by the badge. This was also based on information provided to the Engineer-Health Physics that no dose extensions were in effect for the worker and the consideration of this worker's responsibilities during that time. The Engineer-Health Physics' belief was based on a general knowledge of the radiation fields throughout the plant and was not based

on a complete investigation of the exposure including, but not limited to an interview with the worker and a determination that the high reading could not have resulted from a special activity, e.g., radiography.

Based on the above, the inspector concluded that although the licensee had the general perception that the indicated badge exposure had not been received by the worker, the licensee could not completely eliminate the possibility of an incident involving radiation which may have caused the exposure to the badge and possibly to the worker and was therefore required to report the event in accordance wth 10 CFR 50.72. The inspector noted that at the time of notification of the Station Superintendent (September 28, 1982), the licensee was unaware that the worker had lost the vendor supplied badge for a portion of August, 1981.

The failure to report a 14.1 rem exposure to the badge, which may have been due to an incident involving licensed material possessed by the licensee, and which may have been indicative of an exposure to the worker, constitutes a violation of 10 CFR 50.72 and 10 CFR 20.403 (50-278/81-28-01).

Procedure A-31, Revision 6, Procedure for Prompt Notification of NRC, dated April, 1981, was established by the licensee to provide guidance for notification in accordance with 10 CFR 50.72. No radiation protection procedure existed to provide guidance to the licensee's onsite health physics staff to ensure appropriate personnel exposure events are brought to the attention of plant management. This procedural requirement if incorporated, would allow management to implement procedure A-31. This is further discussed in section 8 of this report.

7. Procedure Adherence

The inspector reviewed the event with respect to the requirements of Technical Specification 6.11, "Radiation Protection Program."

Technical Specification 6.11 requires that procedures for personnel radiation protection be prepared consistent with the requirements of 10 CFR Part 20 and be adhered to for all operations involving personnel radiation exposure.

a. Dosimetry Use Procedure Adherence

The licensee's radiation protection procedure HPO/CO-13a, Revision 7, "Control of Personnel Dosimeter Badges," requires in Section B.4 that upon leaving the plant for the day, persons with other than green Harshaw badges are to place their Harshaw badge in a work function box best describing the area in which they worked that day. In addition, Procedure HPO/CO-15, Revision 3, "Departure from Contaminated Areas and from the Facility," requires in Section 1.c that personnel place all Harshaw badges, except green Harshaw badges, in a work function box upon leaving the plant. These badges are then removed from the box by dosimetry personnel and processed that evening. Since radiation work permit sign in data is not totaled at

the end of each day, readout of the licensee supplied badges provide information for total exposure received that particular day.

The inspector's review of the event showed that the licensee employee who wore the TLD with the reported high reading during August 1981, had worked at the plant on August 13, 14, 15, 16, and 17, 1981. When he left the plant at the end of those work days, the employee did not drop his non-green (black) Harshaw badge into a work function box, rather the employee attached it to his security badge, along with his vendor supply badge and turned these into the guard.

The inspector discussions with the employee regarding the above indicated he did not drop his badge into a work function box because he did not know if he would be called back in to work overtime. Once called back in, the employee would need to report to the site dosimetry office for re-issue of his Harshaw badge.

This failure to follow radiation protection procedures for dosimetry handling constitutes an example of a violation of Technical Specification 6.11 (50-278/81-28-02).

b. Dose Evaluation Procedure Adherence

Procedure HPO/CO-13 b, Revision 4, "Management of Lost or Found Personnel Dosimetry Badges," requires in Section A that a Lost Badge Report be filled out and an evaluation be performed to determine the estimated exposure to the badge.

The inspector review of the event with respect to the above requirements showed that the licensee employee who wore the TLD badge with the reported high reading during August, 1981, was apparently not provided his licensee supplied badge by the security guards upon his entry into the plant on the afternoon of August 17, 1981. The vendor supplied badge, normally worn in conjunction with the licensee supplied badge, was provided.

As a result, the employee reported to the Dosimetry office and was given a temporary licensee supplied badge. No evaluation was performed at the time of this temporary badge issue to determine the dose to the lost badge.

The lost licensee badge had been last processed by the licensee on August 12, 1981, and dose information was available for work periods prior to August 12, 1981. The badge had not been processed between August 13-17, 1981 due to the employee's failure to turn the badge in for daily processing. As a result, no licensee supplied badge readout data was available to provide dose information for this period. The temporary badge was issued without the completion of a dose evaluation of the badge and without information regarding the exposure the worker received during the 5-day period proceeding the loss of the badge. During this time period, the employee had worked in high radiation areas, i.e. Unit 3 Reactor Drywell.

The failure to follow radiation protection procedures for lost dosimetry, constitutes an example of a violation of Technical Specification 6.11 (50-278/81-28-02).

Inspector discussions with licensee dosimetry personnel indicated that the employee used the temporary badge through August 19, 1981. At that time, he dropped the badge in a work function box for processing. The employee returned to work on August 20, 1981, when a second licensee supplied badge was issued to the employee after the performance of a dose evaluation in accordance with the licensee procedure. This evaluation consisted of a verbal request from the employee for his estimated exposure (see Section 8).

8. Dosimetry Procedure Adequacy

Technical Specification 6.8 requires that written procedures and administrative policies be established, implemented and maintained that meet the requirements of Section 5.1 and 5.3 of ANSI-N18.7, 1972 and Appendix "A" of USAEC Regulatory Guide 1.33 (November 1972).

Regulatory Guide 1.33 (November 1972) lists in Section G5, Personnel Monitoring and Special Work Permit, procedures for restrictions and activities in Radiation and High Radiation Areas (Section G.5.a) and procedures for surveys and monitoring (Section G.5c) as procedures to be prepared to limit personnel exposure.

10 CFR 20.201(a) defines a survey as an evaluation of the radiation hazards incident to among other items, the production, use or presence of radioactive materials or other sources of radiation under a specific set of conditions. When appropriate, 10 CFR 20.201(a) requires that the evaluation include a physical survey of the location of materials and equipment and measurement of levels of radiation present. 10 CFR 20.201(b) requires each licensee to make or cause to be made such surveys as may be necessary to comply with the regulations in this part and are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present. One such regulation, 20.101, requires that no licensee possess, use or transfer licensed material in such a manner to permit any individual to receive in any period of one calendar quarter a total whole body radiation dose in excess of 1.25 rems.

ANSI-N18.7, 1972 requires in Section 5.3, "Operating and Maintenance Procedures," that nuclear power plants be operated in accordance with written procedures to provide an approved preplanned method of conducting operations to minimize reliance on memory. Section 5.3.1 of this same standard requires that each procedure be sufficiently detailed for a qualified individual to perform the required function without direct supervision.

The inspector reviewed the licensee's approved dosimetry procedure, which provides guidance for estimating personnel dose when a lost or recovered badge may have erroneous personnel exposure. In addition, the licensee's

dosimetry procedures were reviewed to determine the guidance provided for review of the circumstances and follow-up for off-scale dosimetry and notifications of appropriate individuals in the event of unusual exposures.

Procedure HPO/CO-13 b, Revision 4, "Management of Lost or Found Personnel Dosimetry Badges," indicated that the procedure requires that when a badge is lost, the person to whom the badge was issued is not to continue to work until they have gone to the Dosimetry office and filled out a Lost Badge Report. Dosimetry personnel are to analyze the loss to determine the estimated exposure to the badge from radiation work permits (RWP's), area surveys, dosimeter readings, and exposure received by fellow workers in the same areas, determine the quarterly balance and issue the person a second badge prior to his re-entering the plant.

Further review of procedure HPO/CO-13 b indicated that the procedure provided general guidance for the analysis of a badge loss to determine personnel exposure. The procedure did not provide guidance relative to the preferred means of dose determination, e.g. means independent of the worker such as surveys, data review, and comparative analysis. No evaluation was performed for the badge loss by the employee on August 17, 1981, and only a verbal determination was made for the badge loss on August 19, 1981, i.e. the worker was asked to estimate his dose. This estimated dose was used as his exposure received (See paragraph 7.b regarding dose determination).

Additionally no guidance was contained in the procedures regarding actions to be taken relative to unusual exposures or off-scale dosimeters. These actions would include such matters as notification of appropriate management, evaluation of the exposure circumstances, and prohibition of further exposure to the individual pending resolution of the dose (particularly if the dose was in excess of specified limits).

The inspector determined that upon notification of the licensee by the dosimetry vendor on September 9, 1981, that a badge assigned to an employee of the licensee received a significant exposure, the individual receiving the call did not notify appropriate management, did not evaluate the circumstances of the high exposure, and did not take action to prohibit further exposure of the employee assigned the high reading TLD badge. The estimated exposure received by the badge was noted to be in excess of 4 times the allowable quarterly exposure of an individual. The employee was permitted to receive additional exposure that quarter. No action was taken to determine if a radiation source existed which could possibly result in a similiar exposure to other workers.

Regarding off-scale dosimeters, the inspectors review showed that on at least 2 occasions during August 1981 (see paragraph 5.c) the individuals dosimeter indicated an abnormal exposure (off-scale and high). The individual estimated his dose based on other workers pocket dosimeter readings and continued to receive further exposure. No procedure was in place which provided guidance to the worker or licensee dosimetry personnel for off scale dosimetry. As a result, no evaluation was performed for

these 2 instances to determine if the dosimetry irregularities were due to unusual or unexpected radiological conditions.

The inspector discussed the above with licensee representatives and indicated that the licensee's dosimetry procedures were not sufficiently detailed (as required by ANSI-N18.7-1972 Section 5.3.1) to permit a qualified individual to perform the required function, in that 1) the dosimetry procedures did not provide guidance relative to the preferred means of personnel dose determination in the event of a lost badge, 2) the dosimetry procedures provided no guidance relative to offscale dosimetry, and 3) the dosimetry procedures provided no guidance relative to what actions are to be taken for unusual exposure, e.g. notification of appropriate management, evaluation of the circumstances, and prohibition of further exposure pending resolution.

The inspector's review indicated that: 1) the employee was provided 2 additional licensee supplied badges without a complete dose evaluation being performed; 2) the employee's August, 1981, vendor supplied badge indicated 14.1 rem upon processing and no evaluation of the exposure was performed for a period of approximately 20 days; 3) although NRC notification is required within 1 hour of identification of an exposure in excess of 5 rem, the NRC was not notified until approximately 11 days after the licensee became aware of the exposure; and 4) although the employee's badge had an exposure in excess of 4 times the allowable quarterly limit, the employee was not prohibited from receiving additional exposure that quarter.

The licensee's corrective actions for the above are presented in Section 10 of this report.

9. Qualifications

The inspector reviewed the qualifications of the licensee's Technical Assistant (TA)-Dosimetry, who was responsible for the Dosimetry Program, to determine if the individual had the background and experience to permit him to distinguish between a potential overexposure and a high reading on a lost and subsequently found badge.

Technical Specifications Section 6.3 requires that each member of the facility staff meet or exceed the minimum qualification of ANSI-N18.1-1971 except for the Engineer-Health Physics who must meet the qualification specified therein. Section 4.3.2 of this standard requires that supervisors have a high school diploma or equivalent and a minimum of four years experience in the craft or discipline supervised. As indicated in Technical Specification 6.2.2 (Figure 6.2-2), Engineers and Technicians are members of the Facility Staff.

The inspector determined through discussions with the TA-Dosimetry that this individual had worked approximately 1 year as a Junior Health Physics Technician and 3 years as a Senior Health Physics Technician. During this time the individual's duties were limited to sample counting, and

did not include in-plant Health Physics work. The TA-Dosimetry, indicated he has been in his current position since January 1980 (i.e. 1 3/4 years at the time of the event.)

The inspector discussion with the TA-Dosimetry indicated he had encountered 6 or 7 high reading badges (maximum of 5 rem) since he had been in his current position. These high reading badges were indicated as being easily resolvable in that they were lost and found badges sent for processing. The TA-Dosimetry indicated he had not encountered a high reading badge, such as the 14.1 rem exposure, which was not easily resolvable.

As discussed in paragraph 3.b of this report, the licensee's dosimetry supervisor (TA-Dosimetry) became aware of the high reading TLD on September 9, 1981. However, at that time, this individual dismissed the high exposure as an exposure received by a lost and subsequently found badge, which had been sent to the vendor for processing. At no time between September 9 through September 24 (when the vendor TLD readout data began arriving) was any subsequent review or evaluation of the exposure performed.

The TA-Dosimetry performed a limited review of the exposure (i.e. review of lost badge reports) when the exposure was determined not to have been received by a lost and subsequently found badge. However, due to lack of specific procedure guidance relative to high reading TLD's, the TA-Dosimetry contacted the Engineer-Health Physics from his home on the evening of September 24, 1981 to obtain instruction and guidance.

Based on the above findings, the inspector determined that notwithstanding the lack of of procedural guidance, the TA-Dosimetry's limited experience in evaluating high reading contributed to the delay in initiating prompt review of the circumstances, notification of appropriate management, and prohibition of further exposure of the individual pending completion of the evaluation.

The licensee committed to establish appropriate procedural guidance (see paragraph 10 of this report) and indicated that a Health Physics professional level training program was to be established (licensee representatives response to Health Physics Appraisal, Combined Inspection Report No. 50-277/80-18 and 50-278/80-10).

10. Corrective Actions

During a telephone conversation on October 22, 1981, between Mr. J. Cooney, Nuclear Superintendent, Generation Division and Mr. J. M. Allan, Deputy Regional Administrator, Region I, the licensee indicated the following additional actions would be taken:

- A report of the result of the investigation of the exposure to the TLD badge, the dosimetry evaluation and dose assignment to the employee would be submitted to the then Director, NRC Region I, by November 13, 1981.

- Station approved procedures for required actions on off-scale dosimetry or notification of unusual exposures will be established and implemented by November 30, 1981. The procedures will require notification of appropriate management, evaluation of the circumstances, determination of exposure received, prohibition of further exposure to the involved individual(s) pending resolution, and appropriate corrective actions.

- The procedure for lost dosimetry will be revised by November 30, 1981, to specify the technique for dose assignment based both on worker reporting and independent means of dose determination. Procedures will also require formal monitoring of TLD badge loss rate and establish an appropriate threshold beyond which corrective action is required by November 30, 1981.

In addition, based on discussions at the exit interview, licensee representatives indicated a Directive will be issued to the Dosimetry Group as to what action to take following the report of off-scale dosimetry. Verbal instruction regarding off-scale dosimetry is to be given to the Dosimetry Group by October 15, 1981.

These corrective actions will be reviewed during a subsequent inspection (50-278/81-28-03).

11. Exit Interview

The inspector met with licensee representatives (denoted in paragraph 1) at the conclusion of the inspection on October 15, 1981. The inspector summarized the purpose, scope and findings of the inspection.

TABLE 2
TIME MOTION STUDY

TABLE 2 TIME/MOTION STUDY

DAY	7am	8am	9am	10am	11am	12noon	1pm	2pm	3pm	4pm	5pm	6pm	7pm	8pm	9pm	10pm
Thursday 8/13	A Time Onsite Unknown	Not in Reactor Building	U-2 Re-Fuel Floor (no RWP Work)	Not in Reactor Buildings	Offsite Time onsite unknown		Control Room	Onsite Not in Reactor Bldg	Offsite		2 "U-3 135' el. 1 No RWP work	1*	2 Offsite			
Friday 8/14	Offsite						Time on Site Unknown	Not in Reactor Buildings			RWP # 3-02-0378 Drywell	1 RWP No. 3-G2-0378 Drywell	1 2	Offsite		
Saturday 8/15	Offsite enters site	2 U-3 135 ft.	1, RWP No. 3-07-0390 Drywell	1 2	Offsite		2 Control Room/Cable Spread Room,	U-3 135 ft.el	RWP No 3-02-0378 Drywell	U-3 10ff 135 ft. 11Site el.	Offsite		To/from U-3 135 ft el No RWP Work	Core Spray Pump Rm U-3	U-3 135	Offsite
Sunday 8/16	Offsite		OnSite Not in Reactor Buildings			Offsite				D	RWP No. 3-02-	J-3 OnSite 135 Not in ft Reactor Buildings				
Monday 8/17	Offsite	U-3 135 ft.	RWP No. 3-02-0378 Drywell	B 1	Offsite		U-3 135 ft.	RWP No. 3-02-0378 Drywell	1 Onsite Not in Reactor Building	Offsite	U-3 135 ft	0378 Drywell		Offsite		
Tuesday 8/18						Offsite										
Wednesday 8/19			Offsite								OnSite Not in Reactor Buildings		Offsite	2 U-3 Rx-135	RWP No. 3-03-0359 Control Room	F Offsite

1 In Change Area
2 In Transit

A Last Reading of Harshaw (Licensee Badge)
B Dosimeter found off-scale
C Harshaw (Licensee badge) lost
D Temporary Harshaw badge issued

F Turned in Temporary Harshaw
Dose accumulated from
D → F is 22 millirem.

NOTE: During the time period 5:30pm to about 6pm on 8/13/81, the employee may have worked under RWP. No. 3-07-0390. However, no RWP sign-in and out data is available for this period. Assuming the employee worked on the task covered by this RWP, the exposure received would be similiar to that received during other work under this RWP.