U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos. 50-334/89-21
50-412/89-20

Docket Nos. 50-334
50-412

License Nos. DPR-66
NPF-73

Priority - -

Category C

Licensee: Duquesne Light Company
One Oxford Center
301 Grant Street
Pittsburgh, Pennsylvania 15279

Facility Name: Beaver Valley Power Station, Unit 1 and 2

Inspection At: Shippingport, Pennsylvania

Inspection Conducted: September 25 - October 10, 1989

Inspector: P. O'Connell, Radiation Specialist — 10-13-89 date

Approved by: W. Pasciak, Chief, Facilities Radiation Protection Section — 10-13-89 date

Inspection Summary: Inspection conducted on September 25 - October 10, 1989 (Combined Inspection Report No. 50-334/89-21; 50-412/89-20)

Areas Inspected: Routine, unannounced inspection of the implementation of the licensee's Radiological Protection Program during the current outage. Areas reviewed include Organization and Management, Audits and Appraisals, External Exposure Control, and Internal Exposure Control.

Results: Within the scope of this review two apparent violations and one unresolved item were identified. The apparent violations involved multiple examples of personnel failing to follow radiation protection procedures and a failure to perform an adequate survey. These two apparent violations resulted in a substantial potential for an exposure in excess of 10 CFR Part 20 limits. One item remains unresolved pending licensee final dose evaluation.

DETAILS

1.0 Licensee Personnel Contacted

D. Hunkele, Director, QA Operations
*D. Girdwood, Director, Radiological Operations, Unit 1
*J. Kosmal, Manager, Radiological Controls
*W. Lacey, General Manager, Nuclear Operations Services
*F. Lipchick, Senior Licensing Engineer
*T. Noonan, General Manager, Nuclear Operations
*B. Sepelak, Licensing Engineer
S. Vassello, Director, Licensing
*W. Wirth, Industrial Safety

* Denotes those individuals who attended the exit meeting on September 29, 1989.

The inspector also contacted other licensee personnel during the course of this inspection.

2.0 Purpose and Scope of Inspection

This inspection was a routine, unannounced inspection of the licensee's implementation of their Radiological Controls Program during the current Unit I refueling outage. The following areas were reviewed:

Management and Organization,
Audits and Appraisals,
External Exposure Control,
Internal Exposure Control.

3.0 Management and Organization

The inspector reviewed the organization chart for the Radiological Control Department. All professional level positions indicated on the organization chart were staffed. The inspector noted that currently the licensee has 19 vacancies for Radiological Control Technicians (RCTs). The Radiological Control Department is authorized to have 56 RCTs and currently the licensee has 37 qualified RCTs. The licensee stated that the number of vacancies is partially due to the licensee's overtime pay policy for different departments. The licensee also stated that, typically, unexperienced individuals are hired to fill RCT positions and it takes three years for these individuals to become fully qualified. Currently the licensee is employing 13 contractors, on a long term basis, to compensate for the deficit in the number of licensee RCTs.

The inspector reviewed the licensee's staffing levels of contractor RCTs and Radiological Control Foremen (RCF) for the Unit I refueling outage. At the time of the inspection the licensee had 111 Senior RCTs on-site, which was 12 short of the licensee's outage goal, 18 RCF, and 28 Junior RCTs.

During inspector observation of various work activities in Unit I it appeared that the staffing levels of contractor RCTs were adequate to provide job coverage for outage work activities.

During tours inside containment and observation of work activities inside containment the inspector noted that the majority of the work inside containment was conducted under the supervision of contractor RCF. The inspector reviewed the licensee's outage staffing organization and noted that contractor RCF were directly responsible for in-field radiological control of all steam generator work, nightshift refueling activities, ISI work, work in the PAB and Auxiliary buildings, and balance of containment work. If a contractor RCF had a problem or a question, licensee Radiological Control Supervision was available as Daily, Afternoon, and Nightshift Coordinators, however these coordinators did not routinely provide in-field management oversight of work activities. Based on inspector observation of work activities and problems noted (See Section 6.0), it appeared that management oversight of work activities is an area which needs improvement.

4.0 Audits and Appraisals

The licensee's Quality Assurance Unit conducts three QA audits of the Radiological Control Program each year. The audits are in the areas of calibration and documentation, radwaste handling and transportation, and monitoring and control.

A previous NRC inspection identified a weakness in these audits in that the audits were not being performed by individuals with a background in radiological control principles and practices. In response to this concern, the licensee is planning on having a health physics contractor company conduct the calibration and documentation audit which is scheduled for November 1989. This audit will include topics such as posting of controlled areas, calibration of survey instrumentation, control of radioactive sources, respiratory protection, and performance and documentation of radiological surveys.

During the inspection the monitoring and control portion of the QA audit was being conducted. The inspector noted that a licensee Senior Health Physics Specialist from the Radiological Engineering Department was part of the audit team. These audits will be reviewed during a future inspection.

The inspector reviewed several Radiological Control Supervision Surveillance Reports. These surveillance reports are internal audits of the Radiological Control and Safety Programs. The surveillance reports consisted of observations of on-going work activities in the controlled areas of the plant and overall plant conditions. The majority of surveillance reports reviewed were completed by the Director of Radiological Operations after he conducted routine tours of the plant. Corrective actions appeared to be appropriate for the surveillance report findings.

The inspector noted the following weaknesses in the licensee's audit program. Audits were not performed of contractor firms to ensure (1) the accuracy of NRC Form 4's, and (2) appropriate medical evaluations for respirator qualification.

These weaknesses are discussed in Sections 5.0 and 6.0 of this report.

5.0 Internal Exposure Control

The inspector reviewed the licensee's program for controlling personnel internal exposures relative to criteria contained in 10 CFR Part 20, Standards for Protection Against Radiation, and applicable licensee procedures.

The following strengths in the licensee's program were noted.

The inspector reviewed the licensee's Whole Body Counting Data Positive Results Log and noted that the number of individuals with positive whole body counts was very low. The inspector also noted that no individual had significant intakes of radioactive material.

The inspector reviewed the licensee's Maximum Permissible Concentration (MPC) Hour Assessments for calendar years 1987 through 1989. The licensee records and tracks exposures based on air sample results which indicate airborne radioactivity concentrations greater than 25 percent of MPC. There were no instances of individuals exceeding regulatory limits (520 MPC-hours/quarter) or control limits (40 MPC-hours/7 consecutive days). The inspector noted that the MPC-hour exposures assigned to individuals were low and these results were consistent with the whole body count results.

The inspector toured the whole body counting facility and reviewed the quality control charts for the whole body counter in use. Quality control checks are performed every four hours while the counter is in operation and supervision is notified if a quality control value falls outside the licensee's control parameters. The control charts were frequently reviewed by supervision.

The inspector reviewed respirator issue logs and determined that the licensee's control of the issuance of respirators was adequate. The individual issuing respirators uses a list of respirator qualified personnel to determine whether or not to issue a respirator to an individual. The inspector verified that only qualified individuals were issued respirators.

The inspector noted the following areas for improvement.

The inspector reviewed the licensee's Respirator Fit Test Log and Respirator Issue Log to determine if individuals had the required training and evaluation by a physician prior to wearing a respirator. The licensee's Medical Services Section sends a list of personnel who are medically restricted from wearing respirators to the Radiological Health Services Department. The inspector compared this list with the Respirator Fit Test Log and noted that an individual had been fit-tested for three types of respirators approximately three months after a physician placed him on the medical restricted list. The licensee reviewed this finding and determined that this occurred when a contractor, using a new type of fit-testing equipment, fit-tested licensee personnel. The contractor's fit-testing procedure had been approved for use by the Onsite Safety Committee (OSC). The contractor's procedure was inadequate in that it did not require the contractor to verify that an individual was not on the medical restricted list prior to fit-testing the individual. Subsequently, the licensee purchased new fit-testing equipment and implemented their own fit-testing procedures which require verification of no medical restrictions prior to fit-testing. The inspector verified that the individual had not been issued a respirator after being placed on the medical restricted list and that this was an isolated occurrence. This is an example where additional licensee attention needs to be placed on review of contractor activities and procedures.

The inspector reviewed the manner in which the licensee ensures that contractor personnel using respirators have had an annual medical evaluation. The licensee requires contractors to submit a statement certifying that the contractor's employees have current physicals and are medically fit to wear respirators. The licensee does not require this certification to be completed by a licensed physician. Licensee management oversight of this area was considered poor in that the licensee has never audited contractors to ensure that appropriate medical evaluations are being completed. The licensee stated that they would review this matter.

The inspector examined several HEPA units which were being used to minimize airborne radioactivity concentrations inside containment. The inspector noted that the magnahelix gauge on one unit did not appear to be functioning properly (i.e. less than zero inches of water). On a different HEPA unit the magnahelix gauge was reading greater than 3/4 of the scale. The RCT and RCF providing job coverage for these areas inside containment stated that the magnahelix gauges are not checked when a performance check of the HEPA unit is performed. The RCF stated that the HEPA unit performance check consisted of a dose rate verification, however the RCF had been given no guidance as to what dose rates on the HEPA would require action by the RCF. Further training and guidance needs to be given the RCFs and RCTs regarding the verification of the operability of HEPA units.

6.0 External Exposure Control

The inspector reviewed the licensee's program for controlling personnel external exposures relative to criteria contained in 10 CFR Part 20, Standards for Protection Against Radiation, and applicable licensee procedures.

The licensee provided the inspector with a copy of their National Voluntary Laboratory Accreditation Program (NVLAP) accreditation renewal, which is effective until October 1, 1990. The licensee's dosimetry processing is accredited for ANSI-N13.11 categories I through VII, inclusive. The inspector noted that the licensee was assigning whole body doses based on the dose delivered to the lenses of the eyes through a tissue equivalent absorber having a density of 300 mg/cm^2.

The inspector reviewed the licensee's exposure records for individuals working on the steam generators in order to evaluate if the licensee had determined the individuals' accumulated occupational whole body doses prior to permitting the individuals to receive occupational whole body doses greater than 1.25 rems/quarter. The inspector noted that the licensee did not have the actual records of contractor employees' occupational exposures. Contractor companies provide the licensee with a completed list (containing the same information as Form NRC-4) of their employees' occupational doses, but do not provide the licensee with the actual records. The licensee stated that they do not audit contractors to ensure that the licensee is given accurate information. The inspector stated that this is another example of the licensee's lack of oversight of contractor activities.

While reviewing several Unit I outage work activities inside containment, the inspector identified several examples where individuals were not adhering to the licensee's Radcon Procedure 8.1 "Radiological Work Permit" (RWP). Examples include:

A. Procedure 8.1 requires, in part, in Section 3.3.2.14, that a Preliminary ALARA Review (RCM Form 8.1 Section 16) shall be initiated and completed by the work party supervisor when the ALARA initiation values exceed 200 mrem per worker or 1000 person-mrem for the work party. The inspector identified several RWP work packages, including RWP 16266 "RTD Modification", dated 9-5-89 and RWP 16272 "Chemical Decon of A, B, C, Steam Generators", dated 9-6-89, where the ALARA initiation values were exceeded and the Preliminary ALARA Reviews were not conducted as required.

B. Procedure 8.1 requires, in part, in Section 2.6, that all RWPs shall be updated to reflect changes or requirements. The inspector identified several RWP work packages where changes were made but the RWPs were not updated as required. For example, RWP 16266 "RTD Modification", dated 9-5-89 was not updated to reflect that workers were no longer wearing arm and hand monitors. RWP 16272 "Chemical Decontamination of A, B, C, Steam Generators", dated 9-6-89, was not updated to reflect that workers were no longer wearing full face particulate respirators.

C. Procedure 8.1 requires, in part, in Section 3.3.2.11, that Special Whole-Body/Extremity Monitoring Data (RCM Form 8.1, Section 13) shall be initiated and completed as required to provide documentation of non-routine wearing of whole-body exposure monitoring devices. The inspector identified that on 9-28-89, under RWP 16297 "FOSAR", whole-body exposure monitoring devices were repositioned from the chest area to the arms of workers without RCM Form 8.1, Section 13 being completed as required.

These examples are an apparent violation of Technical Specification 6.11 which requires, in part, that procedures for personnel radiation protection shall be adhered to for all operations involving personnel radiation exposure (50-334/89-21-01).

In many instances, based on discussions with several RCTs and RCF, it appeared that the RCTs and RCF providing job coverage of work activities inside containment were not aware of the requirements of the controlling RWP.

The inspector noted two other examples indicating that management oversight of contractors needs improvement.

(1) Most of the licensee's RWPs contain a provision stating "The cognizant RCF will implement additional radiological controls based on RCM Form 8.1 Section 12, work steps, prework survey and job support surveys". The inspector discussed the meaning of this statement with several individuals. Licensee supervision interpreted this statement to mean that the cognizant RCF may add radiological controls to a work activity but not downgrade the controls. Many contractor RCF stated that they interpreted this statement to mean that they had the authority to downgrade radiological controls and that they had done so in the past.

(2) The inspector questioned a discrepancy between posted frisking instructions for personnel coming out of containment. Two signs were posted, one stated that a whole body frisk was required for all personnel and the other sign stated that a whole body frisk was required only for personnel exiting a "Zone C" area. The RCT in the area and a licensee supervisor were of different opinions as to which sign was correct.

6.1 FOSAR Incident

The inspector reviewed the circumstances regarding an apparent administrative overexposure to a contractor working in the Unit I B-2 steam generator handhole. At approximately 12:30 p.m. on September 28, 1989 an RCT provided job coverage for five individuals performing Foreign Object Search and Retrieval (FOSAR) on the B steam generator. Three of these individuals alternately reached into the steam generator to manipulate equipment. The licensee had set an administrative extremity dose limit of 4.0 rem for each of the individuals. The RCT calculated stay times, which is the amount of time an individual could have his arm in the handhole without exceeding the authorized dose, based on a September 13, 1989 survey.

That survey indicated the following exposure rates in the B-2 handhole:

1200 mR/hr at the entrance to the handhole
3000 mR/hr at a position 2 inches inside the handhole
12000 mR/hr at a position 6 inches inside the handhole
20000 mR/hr at a position 20 inches inside the handhole

The RCT evaluated a stay time of 22 minutes based on an average exposure rate of 10000 mR/hr inside the handhole. The RCT stood at a distance and timed individual entries. For approximately 1.5 hours the workers alternately reached into the handhole area without checking or having the RCT periodically check the readings on the workers' self reading pocket dosimeters which were located on the workers' hands and upper arms. At approximately 2:00 p.m., based only on a stay time calculation, the RCT estimated that two of the individuals were close to reaching their administrative dose limit. The RCT instructed the workers to stop work and read their pocket dosimeters. The workers stated that the job was close to being completed and that it would only take an additional 1 to 2 minutes to finish. The RCT allowed the work to continue without reading the workers' pocket dosimeters.

The licensee's Radcon Procedure 4.5 "Pocket Dosimeters-Controlling" requires, in part, in Section 3.3.1, that "dosimeters are to be read frequently when working in radiation areas". This is another example of an apparent violation of Technical Specification 6.11 which requires, in part, that procedures for personnel radiation protection shall be adhered to for all operations involving personnel radiation exposure (50-334/89-21-01).

Approximately 20 minutes after the RCT initially told the workers to stop work and check their pocket dosimeters the work was completed. At that time the RCT read the workers' pocket dosimeters and noted that one individual's extremity pocket dosimeter was off-scale (over 5000 mR). The licensee subsequently processed this individual's thermoluminescent dosimeter (TLD) and determined that this individual received an extremity dose of 10.5 rem.

The licensee's immediate corrective actions included terminating all FOSAR work, resurveying the area involved, holding a critique regarding this issue, and issuing a memo to RCF emphasizing the RCT's stop work authority.

The FOSAR work was conducted under the control of RWP 16297 "FOSAR" which required continuous radiological monitoring. The licensee's Radcon Procedure 8.1, "Radiological Work Permit", defines continuous monitoring, in Table 3.8.1.1, to mean that "continuous surveillance and awareness of the radiological conditions of the area and the exposure status of the work crew is required".

The RCT providing continuous radiological monitoring for the FOSAR work on September 28, 1989, did not adequately monitor the exposure status of the work crew. This resulted in a worker receiving an extremity exposure of greater than twice the administrative dose limit. This is another example of an apparent violation of Technical Specification 6.11 which requires, in part, that procedures for personnel radiation protection shall be adhered to for all operations involving personnel radiation exposure (50-334/89-21-01).

On September 29, 1989 the licensee surveyed the handhole and determined that the exposure rate at the entrance to the handhole was 2000 mR/hr and 6000 mR/hr two inches inside the handhole. These exposure rates are approximately twice those indicated on the September 13, 1989 survey. The exposure rates six inches and twenty inches inside the handhole were the same as indicated on the September 13, 1989 survey.

On September 29, 1989 the licensee also constructed a mock-up arm extremity to evaluate the radiation fields inside the handhole and what gradients of exposure would exist for a fully inserted arm. The results of this survey showed that, with an individual's arm fully inserted, an individual's hand (where the extremity dosimetry is worn), would be in a radiation field of approximately 6600 mR/hr. The individual's arm, above the elbow, at the same time would be in a radiation field of approximately 5650 mR/hr. It did not appear that the licensee was adequately controlling personnel exposure for this activity based on an administrative limit of 4 rem to the extremity because an individual could receive an occupational whole body dose in excess of regulatory limits (3 rem/calendar quarter) without exceeding the licensee's administrative control limit.

The inspector stated that it appeared that the licensee did not perform an adequate evaluation of the radiation hazards prior to initiating the FOSAR work on September 28, 1989. The licensee's evaluation was inadequate in the following areas:

> The licensee based stay time calculations on a survey which did not accurately reflect the radiation levels in the work area. A subsequent survey showed exposure rates in some areas approximately twice those indicated on the survey.
>
> The licensee established personnel exposure controls based on an administrative dose limit of 4.0 rem to the extremities. The licensee did not establish personnel exposure based on a whole body dose to a worker fully inserting his arm into the handhole.

This is an apparent violation of 10 CFR 20.201(b) which requires that "each licensee shall make or cause to be made such surveys as (1) may be necessary for the licensee to comply with the regulations in this part, and (2) are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present" (50-334/89-21-02).

The RCT stated that, based on his timing of the workers, the individual whose pocket dosimeter was off scale had his arm inside the handhole for 26 minutes. Discussions with the workers and the RCT indicated that the RCT may have incorrectly identified the workers and assigned incorrect stay times for the workers who had their arm inside the handhole. The three workers were dressed in full sets of protective clothing and had their backs to the RCT throughout the job evolution and the RCT would have had difficulty distinguishing between the workers.

The RCT stated that, by his calculation, the three workers had their arms inside the handhole for 26, 21, and 18 minutes respectively. However, one of the workers, the foreman, stated that he only reached inside the handhole for a total time of approximately 7 to 8 minutes.

Subsequently, the licensee reconstructed the work activities and estimated that the worker whose dosimetry was off scale had his arm inside the handhole for approximately 46 minutes.

The RCT stated that he repositioned the workers' whole body TLDs to their upper arms prior to starting the job. However, the dosimetry was not positioned to record the highest dose to the whole body, i.e. it was positioned above the elbow and may have moved further up the worker's arm. The licensee is evaluating the individual's whole body occupational dose to determine if the regulatory limit of 3 rems/calendar quarter was exceeded. This matter is unresolved pending licensee evaluation (50-334/89-21-03).

The failure of the licensee to conduct an adequate evaluation of the radiation hazards combined with allowing the workers to exceed calculated stay times without evaluating their accumulated exposures by reading their pocket dosimeters, and incorrectly evaluating the period of time each individual was exposed, resulted in a substantial potential for an exposure in excess of 10 CFR 20 limits.

NRC Inspection Report 50-334/88-03 identified a similar lack of control during significant radiological operations which resulted in an administrative overexposure. That inspection noted that a RCF allowed a worker to re-enter a steam generator with accumulated dose close to the administrative limit. The worker subsequently exceeded his administrative dose limit. The licensee revised their procedures for radiological control of primary side steam generator work but did not incorporate those controls for the secondary side steam generator work.

7.0 Exit Meeting

The inspector met with licensee representatives denoted in Section 1 of this report on September 29, 1989. The inspector summarized the purpose, scope and findings of the inspection.