U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos. 50-334/92-03; 50-412/92-02

Docket Nos. 50-334; 50-412

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

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

Inspection At: Shippingport, Pennsylvania

Inspection Conducted: January 6 - 10, 1992

Inspector: J. Noggle, Radiation Specialist — date: 1/27/92

Accompanied by A. Massey, NRR

Approved by: W. Pasciak, Chief, Facilities
Radiation Protection Section, DRSS — date: 1-27-92

Areas Inspected: An unannounced safety inspection of the Beaver Valley Power Station radiological controls program was conducted. Areas reviewed included: staffing and organization changes, audits, outage preparations, ALARA, dosimetry program implementation, and source term reduction program review.

Results: The inspector found a high level of outage readiness with respect to the HP department. The dosimetry program was generally strong with a minor weakness relating to dose reports noted. Although source term reduction projects have been undertaken by the licensee in the past, minimal station activity in this area has apparently occurred during this SALP cycle. Within the scope of this inspection no violations were identified.

DETAILS

1.0 Personnel Contacted

1.1 Licensee Personnel

M. Banko, Radiation Control Supervisor, Dosimetry
J. Belfiore, Nuclear Quality Assurance Auditor
D. Blair, Director, Radiological Health Services
*E. Cohen, Director, Unit 2 Radiological Operations
R. Drew, Training Specialist
(R.) J. Freund, Radiation Control Supervisor, Instrumentation
*D. Girdwood, Director, Unit 1 Radiological Operations
B. Halpin, Radiation Control Supervisor, Operations
R. Haney, Senior Training Specialist
D. Hardaway, Radiation Control Technician, Dosimetry
*M. Helms, Senior ALARA Health Physics Specialist
G. Kammerdeiner, Director, Materials and Standards Engineering
*J. Kosmal, Manager of Health Physics
J. Lebda, Training Instructor
A. Lombardi, Radiation Control Technician, Dosimetry
*T. Noonan, General Manager, Nuclear Operations
R. Pucci, ALARA Health Physics Specialist
*B. Sepelak, Licensing Engineer
*D. Spoerry, General Manager, Nuclear Operation Services
*G. Thomas, General Manager, Corporate Nuclear Services
*R. Vento, Director, Radiological Engineering
M. Vienelli, Supervisor, Bartlett Nuclear, Inc.

1.2 NRC Personnel

* J. Beall, Senior Resident Inspector
* P. Wilson, Resident Inspector

* Denotes attendance at the exit meeting on January 10, 1992.

2.0 Purpose

The inspection was an unannounced safety inspection of the Beaver Valley Power Station radiological controls program. Areas reviewed included: staffing and organization changes, audits, outage preparations, ALARA, dosimetry program implementation, and source term reduction program review.

3.0 Previously Identified Items

In a previous inspection[1] the inspector questioned the station procedural guidance which equated the direct contamination survey limit with the smearable contamination survey limit (i. e. 100 net counts per minute as measured by a HP-210 probe). The licensee has reviewed this issue and produced test results which demonstrated Minimum Detectable Activity (MDA) of approximately 2000 dpm/100 cm^2 for the direct frisk survey method and approximately 400 dpm/100 cm^2 for the indirect smearable survey method using the same HP-210 probe. The licensee has determined that changes to the radiological controls program were warranted and a compromise of selective procedure applications has been adopted. Requisite procedure revisions are expected to be completed by April 1992. The licensee has decided to require an indirect smear survey and a direct frisk of material leaving known contamination areas, however, only a direct frisk (or use of an automated tool frisker) is required upon exit of the Radiological Controlled Area. This would allow the use of automated survey equipment and result in more efficient processing with increased throughput of materials and equipment from the controlled area. Current station practices have demonstrated excellent contamination area controls within the controlled area. Personnel egress and contamination control practices will be observed under the dynamics of outage work during future inspections. This issue is considered closed.

4.0 Staffing and Organization

A new position, Director of Environmental Services, has been added to the Health Physics Department reporting to the Manager of Health Physics. This position is currently filled. No other staff changes have been made since the last report period. Current plans call for the gradual phasing out of contractor health physics technicians (HPT) by the summer of 1992.

5.0 Audits

The latest Health Physics audit was conducted from October 17 - December 20, 1991. Audit No. BV-C-91-18 was reviewed in draft form. The areas covered included: radiation and contamination surveys, radiation worker practices, posting and control of radiation and contamination areas, ALARA program, radiation measuring instruments and equipment, dosimetry and exposure monitoring, bioassay program, exposure control and authorization, radiation exposure records, respiratory protection program, radioactive source control, radiation barriers and key control, and corrective actions from prior HP audits.

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[1] Inspection No. 50-334/91-20; 50-412/91-18, Section 4.0

There were two observations or findings resulted from this audit. The first observation has two parts, both related to high radiation key control. There were two radiation barrier containment (RBC) keys which were removed from the locked storage cabinet without being appropriately logged out but were controlled by HP personnel. Also, the Unit 2 control room key accountability log had not specified individual key numbers. The second observation involved questioning the validity of previous instrument readings that were made using a survey instrument that was found out of calibration. There were also five recommendations given to add quality to the department. The inspector reviewed the makeup of the audit team; three certified auditors and two technical specialists all of which were Duquesne Light Company employees. The licensee has plans for outside company consultants for the next HP audit. The inspector was satisfied that a good audit was conducted with sufficient depth and representation of team members and no significant safety related items were found.

6.0 Outage Preparations

The inspector attended a regularly scheduled Radiological Control Department Outage Task Force Meeting on January 9, 1992. The purpose of the meetings was to address departmental action items in a timely fashion. Normally, meetings are scheduled once a month. As a scheduled outage approaches the meetings are held more frequently. At the time of this inspection, the licensee was approximately two months away from the next refueling and maintenance outage. The following items were discussed:

- Revise the steam generator controls/procedures and incorporate suggestions from previous outage experience.

- Outage staffing and work hours had been formalized; HP staff scheduling was well underway, shift work hours had yet to be finalized.

- Two courses had been completed: a formal four week HP technician training program for contractors and a four hour ALARA training program for supervisors - both to be initially used for the next outage.

- Working on a contract to lease 12 closed circuit television (CCTV) camera systems for a pilot program this outage. Permanent CCTV equipment will be obtained after the need is established.

- Various HP support trailers were in the process of being ordered.

- The Duquesne Light Company HP staff will be complemented with the following additional HP vendor personnel for the outage: 23 supervisors, 149 senior HP technicians, 44 junior HP technicians, and 23 dosimetry technicians.

There appeared to be a high level of outage preparation underway with sufficient instrumentation, equipment, supplies, HP staffing levels, training, and ALARA preparations for adequately supporting the Unit 2 third refueling outage.

7.0 ALARA Status

At the time of this inspection, the licensee provided the following annual station collective personnel exposures for 1991: 483 person-rem for Unit 1 and 13 person-rem attributed to Unit 2, for a total station annual collective personnel exposure of 496 person-rem. Final TLD results for the fourth quarter were expected to increase these totals slightly. The exposures for Unit 1 included a 99 day refueling outage and four mini-outages during the year. For the new year, the station has set the following ALARA budget for 1992: 60 person-rem for Unit 1 and 300 person-rem for Unit 2 for an annual station budget of 360 person-rem. Departmental ALARA budget values were in the final stages of approval.

The inspector reviewed the meeting minutes for the first three 1991 quarterly Nuclear Group ALARA Review Committee (NGARC) meetings. This committee is chaired by the Director of Radiological Engineering and consists of representatives of the various station departments. Collective exposure values versus estimates were common themes of discussion. ALARA initiatives mentioned included the new ALARA training course for first line supervisors and endorsement of a new dollar value for exposure to be used in cost/benefit evaluations; $12,000 per person-rem up from $5,000 per person-rem previously.

The inspector reviewed the lesson plan for the new four hour ALARA course entitled, "Practical ALARA Techniques For Supervisors". This course serves to familiarize the non-HP supervisors with the purpose and implementation of the station ALARA program as well as acquaint these supervisors with the regularly published exposure report and dosimetry Alert Lists and teaches them how to prioritize his or her workers based on accumulated dose. The audience for this course was intended for all on site supervisors and all work planners and outage schedulers. This course is viewed as a significant ALARA initiative and appears to have potential for effecting greater station involvement in the station ALARA program. The course effectiveness will be reviewed in later outage HP inspections.

8.0 Dosimetry Implementation

The inspector reviewed the licensee's program for dosimetry and exposure control. Areas reviewed included: dosimetry laboratory operations, dosimetry exchange and issue, field handling of dosimetry, exposure control, and dose reports.

8.1 Dosimetry Laboratory Operations

The Thermoluminescent Dosimetry (TLD) processing laboratory is located in the Emergency Response Facility. The licensee uses a Panasonic Model UD812-AS2 four element lithium borate TLD for determining personnel record exposures. The licensee is currently National Voluntary Laboratory Accreditation Program (NVLAP) qualified in all ionizing radiation categories except for neutron radiation. The laboratory processes approximately 3500 station TLDs on a quarterly basis with an inventory of some 11,000 TLDs. A point of note is the dosimetry laboratory has not experienced any turnover in personnel since 1984. The laboratory also manages personnel dose histories and determines the available dose levels for station personnel.

The TLD reader is calibrated annually using a Cesium 137 source with heat lamp checks performed quarterly. Element Correction Factor (ECF) determinations are performed annually for each TLD by averaging three ECF determinations rather than one, which is traditional. Prior to reading the personnel TLDs, the badges are surveyed for contamination, and accountability of all badges is verified. The badges are read and a computational algorithm is used to compute the resultant dose. Doses are computed for shallow dose (0.007 cm depth), eye dose (0.3 cm depth), and deep dose (1 cm depth). The licensee does not take credit for eye protection and therefore normally the whole body dose is assigned from the eye dose category. The computational algorithm is currently undergoing dedicated review to enhance the accuracy of results which is a noted strength. Prior to reissuing a personnel TLD, the badges are annealed and checked to verify that complete anneals are attained with each TLD reset to its ground state with no residual exposure energy retained in the TLD. The lab technician crosschecks final personnel TLD results with the results obtained from the direct reading dosimeter (DRD) data for the same time period to flag any results which diverge more than 25%. Differences greater than 25% are investigated.

The inspector reviewed the laboratory operations to determine possible causes for mishandling or misprocessing of personnel dosimetry. In general, the data review and record work is manually performed. Appropriate crosschecks have been incorporated to ensure accurate TLD issuance and processing results. According to the licensee, since establishing the dosimetry lab in 1984, there has been only one erroneously issued TLD. Future plans call for fully computerizing the data handling which would eliminate the need for manual transcription and crosschecks and increase the lab efficiency. No discrepancies were noted in this area. The zero staff turnover and the continued effort to improve the x-ray and ß-ray dose computation algorithms are considered strengths.

8.2 Dosimetry Exchange & Issue

Dosimetry is normally issued to personnel from the Dosimetry Issue Facility located inside the Protected Area. Initial issue requires that appropriate training, exposure history, baseline bioassay, and security background investigation have been completed. TLDs are issued with a DRD of appropriate range commensurate with the remaining allowable dose. Extremity TLDs and multiple whole body dosimetry are handled in like manner. An additional prerequisite for multiple dosimetry issue is the processing of the normal whole body TLD to provide accurate dose records. All issued dosimetry is required to be returned to the issue facility at the end of the shift when final DRD readings are recorded on dosimetry log sheets. Only HP technicians assigned to this facility are qualified to issue and read dosimeters. All of the DRDs that have been issued for the quarter are read every Sunday on updated dosimetry log sheets incorporating the latest record TLD information. These dosimetry log sheets serve as the basis for dose control at this station.

8.3 Dosimetry Field Handling

After initial dosimetry issue, the worker is responsible for properly locating his dosimetry on the front upper body area. Multiple badge packages are required to be worn on the front upper body area until dressing in anti-contamination clothing for the job requiring the multiple dosimetry. HP technicians are responsible for affixing the various multiple dosimeters to the appropriate body parts after reading the DRDs and recording the initial readings. After job execution, the HP technician is again responsible for removing the dosimeters and recording the final readings on the appropriate Radiation Work Permit (RWP) sign-on sheets. The multiple dosimeters are then required to be worn on the person's chest until returned to the Dosimetry Issue Facility at the end of his or her work shift. Any relocation of the normal singular whole body TLD and direct reading dosimeter to another part of the whole body can only be performed by a HP technician as dictated by the workers' radiation environment.

8.4 Exposure Control

TLD results serve as the basis for recording of personnel exposures. Between the routine quarterly reading of these dosimeters, the direct reading dosimeters serve to control individual exposures within station administrative and regulatory limits. The DRD is not normally reset to zero during an exposure monitoring quarter. A particular range of DRD is selected to reflect the individual's remaining exposure for the quarter or year. Three-quarter scale of a DRD is designed to represent one half of the individual's remaining exposure. Upon reaching the three-quarter mark of a

DRD, the worker's TLD must be read and records updated before reissuing his or her dosimetry. Generally speaking, personnel exposures are controlled by the three-quarter scale limit on the individual's DRD.

As mentioned in section 8.2, every active DRD at the station is read each Sunday. DRD results are added to the TLD results for the monitoring period and the cumulative exposures (Dose Tracking Logs) are used as exposure control references at the Radiological Operations Center (ROC). For various conditions of dose control high sensitivity (e.g. pregnant female, exposure history incomplete, high dose for the monitoring period), a Personnel Dosimetry Alert Status Report is issued to the ROC to provide daily exposure updates on these lower limit individuals. The inspector was satisfied that appropriate exposure control measures were inplace.

8.5 Dose Reports

As was mentioned in the previous section, the weekly Dose Tracking Logs and the Personnel Dosimetry Alert Status Reports together provide the exposure data for dose control purposes. The dosimetry lab periodically compares the record TLD results with the DRD quarterly results obtained from the Dosimetry Issue Facility and indicated to the inspector that the DRD results average conservatively higher than the TLD results. Therefore, reliance on the DRD for exposure control would ensure exposure limits were not exceeded. The station has another method of tracking DRD dose which utilizes RWP data. The RWP/RACP (Radiation Access Control Permit) sign-on sheets capture the personnel exposures received while working on an RWP or RACP.

The RWP/RACP sign-on sheets provide the data input for the ALARA dose reports. RWP specific entries are categorized to specific jobs and the data is also sorted to provide total exposures by the individual and by the department. This information is compiled for the station's use on a periodic basis (weekly during non-outage periods and daily during outages). These reports are distributed to the various station departments to allow radiation workers and their supervisors to review their personal doses, to provide the basis for dose leveling among workers in a common work group, and allow job exposure estimates to be compared with actual results as a job performance indicator. According to the licensee, exposure results based on the RWP/RACP sign-on sheets have been traditionally lower than the final TLD results.

The inspector was concerned that although the specific job doses were being reported appropriately, the individual doses derived from the RWP/RACP sign-on sheets were being reported to the worker and generally reflected doses on average that were lower than actual. This information was designed to be used by the worker's supervisor to ensure there were enough dose resources within his or her

group to perform the required radiation area work and to manage these resources within the group effectively. The inspector questioned the adequacy of this part of the report if it in fact provides lower exposure values than the record TLD. In order to determine how much lower the doses were, the licensee chose 13 station maintenance workers with 1991 accumulated exposures of over 1000 mRem to compare the RWP/RACP sign-on sheet derived DRD exposures with the TLD records and to compare the Dosimetry Issue Facility (DIF) derived DRD exposure results with the same TLD records. This limited population sample showed that the DIF results on average were 8% higher than the TLD record standard. The RWP derived results were 9% lower than the final TLD results. In general, results that are 9% lower than actual are not likely to cause problems in managing resources.

Nevertheless, the inspector questioned why the worker is not provided with better exposure information when it is available although it is used for dose control purposes. The licensee stated that on an annual basis, the RWP/RACP dose has always been within 20% of the record TLD results. Station procedures require the DRD results to be within $\pm$ 25% of the TLD results or an exposure investigation must be documented. To address the long term resolution of this issue, the station expects to have a real-time exposure control system installed by early 1993 which will use the same electronic dosimeter reading data for all of the current DRD data requirements which would remove the current discrepancy.

9.0 Source Term Reduction

In June of 1989 the licensee completed an engineering study and instituted program policy for transient cobalt control[2]. The purpose of the study was to identify cobalt containing components and to prioritize them as to level of source term contribution. The study concluded that component replacement solely for source term reduction was not cost effective. The transient cobalt control program instituted by the study requires Engineering Materials and Standards Section Director approval for any design change or plant modification that would result in an increase in cobalt in the reactor coolant system (RCS). The program also requires engineering review of chemistry test reports that specify cobalt content for any materials being considered for plant use which would be in contact with the RCS. No cost versus benefit equations or decisional parameters were suggested by the program.

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[2] "Engineering Activities in Support of the Transient Cobalt Control Program", ES-M-018, Rev. 1

Since the inception of the transient cobalt control program, only one selection of low-cobalt components for plant use has occurred. The station has selected a brand of Westinghouse fuel which replaced the inconel alloy fuel grid straps with lower cobalt containing zircaloy grid straps. The station has not taken advantage of the EPRI sponsored NOREM low-cobalt alloy designed to replace hard surfaced components which traditionally were faced with stellite - a major source of reactor system cobalt intrusion. The licensee stated that the reactor's steam generator tubes are the most significant source of cobalt intrusion at Beaver Valley Power Station and low cobalt containing tubes will be a major criterion when the steam generators are replaced. Also of mention, the licensee is a participant in the development of full reactor coolant system chemical decon study conducted by a joint Westinghouse/Utility group in cooperation with EPRI.

As mentioned in a previous inspection report[3] during the previous SALP period the licensee has effected several very significant and commendable source term reduction actions including steam generator channel head chemical decontamination, RTD by-pass piping elimination, and the discovery of the benefits of early boration of the RCS under hot shutdown conditions. During the current SALP period, the inspector acknowledged the purchase lower cobalt containing fuel assemblies, but also noted the absence of an on site source term measurement program, or any documented engineering evaluation of source term reduction considerations.

10.0 Exit Meeting

The inspector met with licensee representatives at the end of the inspection, on January 10, 1991. The inspector reviewed the purpose and scope of the inspection and discussed the findings.

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[3] Inspection No. 50-334/91-24; 50-412/91-23