

U.S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report No. 50-317/82-06  
50-318/82-06  
Docket No. 50-317  
50-318  
DPR-53  
License No. DPR-60 Priority -- Category C  
Licensee: Baltimore Gas & Electric Company  
P.O. Box 1475  
Baltimore, Maryland 21203

Facility Name: Calvert Cliffs Nuclear Power Plant, Units 1 & 2

Inspection at: Lusby, Maryland

Inspection conducted: March 15-19, 1982

Inspector: K.E. Plumlee 9/17/82  
K.E. Plumlee, Radiation Specialist date signed

Approved by: E. G. Greenman for 9/17/82  
E. G. Greenman, Chief, Facility Radiological Protection Section  
Technical Inspection Branch date signed

Inspection Summary:

Combined Inspection on March 15-19, 1982 (Combined Report Nos. 50-317/82-06 and 50-318/82-06)

Areas Inspected: Routine, unannounced safety inspection by a region based inspector of the radiation protection program, including followup on previously identified items, radiation safety practices, and advance preparations for a refueling and maintenance outage. This inspection involved 38 hours onsite by one NRC region based inspector.

Results: Three violations were identified; failure to establish adequate procedures (Paragraph 5.1); failure to follow radiation protection procedures (Paragraph 5.2); and, failure to make necessary and reasonable radiological surveys (Paragraph 5.3).

## DETAILS

### 1. Persons Contacted

T. Butkowski, Quality Assurance Engineer  
\*J. Carlson, Supervisor, Radiation Control  
\*J. Carroll, General Supervisor, Operations  
P. Crinigan, Senior Engineer, Chemistry  
\*D. Latham, Principal Engineer  
J. Lenhart, Radiological Support Supervisor  
N. Millis, General Supervisor, Radiation Safety  
G. Probst, General Supervisor, Chemistry  
J. Wood, Nuclear Fuel Management Engineer

\*Denotes presence during the exit interview, March 19, 1982.

### 2. Review of Previously Identified Items

(Closed) Inspector Follow-up Item (318/78-21-05): Review of procedural controls of radioactive materials. During tours of the facility, the inspector verified the labeling of containers and the control of accesses to radiation areas, high radiation areas, and airborne radioactive materials areas (paragraphs 6.2 and 9.2). No inadequate procedures, or procedure violations were identified.

(Closed) Violation (317/78-36-01): High Radiation Area access controls - three examples (dose rate device, locking, posting and barricading). The inspector verified by discussions with personnel and by direct observation during tours of the facility that the licensee's corrective actions were as described in licensee's letter to NRC Region I office, December 29, 1978. Also reference NRC Region I letter to the licensee dated January 23, 1979.

(Closed) Inspector Follow-up Item (317/81-21-03; 318/81-20-04): Review of personnel exposure received September 30, 1981 (Reference paragraph 5).

### 3. Actions Following the Health Physics Appraisal

The inspector examined the commitments provided in the licensee's correspondence relative to the Health Physics Appraisal. The status of the following items were reviewed.

January 16, 1981, Letter

- (1) & (2) Realignment of organizational responsibilities of the Plant Health Physicist and the Radiation Safety Foreman;
- (3) Development of a calibration program for the whole body counter;

- (4) Implementation of an ALARA program by December 31, 1981;
- (5) Provision of improved post accident sampling techniques, equipment, procedures and shielding;
- (6) Development of a formal training/retraining program for radiation protection; and,
- (7) Improvements to the Emergency Plan.

February 13, 1981, Letter

- (1) Calibrations of neutron survey instruments semi-annually using an NBS-traceable source; and,
- (2) Establishment of an approved Quality Assurance Program for transport of radioactive material.

Inspection of organization charts, procedures and records for the whole body counter calibrations, ALARA program, training/retraining information and schedules, neutron survey instrument calibration records, and correspondence on the QA Program approval did not identify any problems, and the commitments were determined to be fulfilled acceptably.

Review of the post accident sampling and monitoring equipment found installation work was continuing. The Emergency Plan was not inspected. These areas will be followed up in a subsequent inspection. (82-06-05)

#### 4. Licensee Audits

##### 4.1 Institute of Nuclear Power Operations (INPO) audit

The first INPO audit of the facility (April-May, 1981, Report dated August, 1981) resulted in the following recommendations for chemistry and radiation protection.

- . Review and revise the water chemistry control
- . Improve solid waste management
- . Review and revise certain plant operating procedures
- . Improve certain training/retraining practices
- . Identify and encourage the desired organizational interactions

The inspector verified the licensee had implemented each of the above recommendations.

No violations were identified.

#### 4.2 Licensee's Surveillance Checks and Audits

The inspector verified that the Quality Assurance Procedures (QAPs) included routine job surveillance checks and audits of records. The inspector also reviewed records of QC audits of the receipt and shipment of radioactive material shipping containers used in accordance with Certificates of Compliance.

No violations were identified.

#### 4.3 Supervisory Audits and Incident Investigations

The inspector verified that licensee management personnel conduct frequent tours of the facility and were correcting problems expeditiously. The inspector also reviewed written instructions and repair orders. The following examples of licensee follow-up were reviewed.

- . Engineering controls (decontamination, shielding, ventilation, and ALARA reviews)
- . Access controls (posting and locking)
- . Surveys and air sampling

Additionally, the inspector reviewed records of six incident evaluations maintained by the ALARA coordinator (also see paragraph 5).

No audit problems were identified.

#### 5. Incore Instrument (ICI) Exposure Events

On September 30, 1981, two Fuel Management Engineers signed into the controlled area under RWP 81-6 (Entry into areas less than 100 mrem). As required by the RWP, the individuals informed the Radiation Control (Rad-Con) technician they were proceeding to the Spent Fuel Pool (SFP) only to view the Unit 2 spent fuel inspection machine. Upon reaching the area, they discovered that it was too dark to adequately see the machine; therefore, they moved an underwater light from the Unit 1 pool to the Unit 2 pool.

The two engineers did not inform the Rad-Con technician of the change in the scope of work, though the RWP stated, "Contact Rad-Con if abnormal or unexpected conditions develop". The RWP did not provide approval or radiological controls sufficient for the work.

Note: In preparation for spent fuel rack placement, all the loose ICI wires in Unit 1 pool were moved to the Unit 2 pool. The wires were about 40 feet long and were supported on the side of the pool by ropes. The wires had been surveyed with underwater exposure rate meters, and radiation levels ranging between 10,000 and 20,000 rem per hour were measured (near contact).

While moving the underwater light, the active end of an ICI wire became tangled on the underwater light handle. The wire looped around the handle "T" and one end wrapped around the light. The engineers adjusted the lighting on the inspection machine by raising the light. The handle was brought up to the surface of the pool when the ICI coil was observed and the engineers immediately dropped the light back into the pool. It is estimated that the coil may have been 2 to 3 feet out of the water.

Note: The total time out of the pool is estimated at between one half and one second. The reported doses to the individuals were 180 and 140 mrem, respectively.

All three pool RMS area monitors, and some adjacent friskers in the access hallway and in the hot lab alarmed. In response to the alarms, the Radiation Control Shift Supervisor (RCSS) and the area Rad-Con technician investigated and noted that the engineers were working around the pool. According to the licensee's evaluation, the engineers involved indicated that they did not hear the RMS alarms until after they had returned the light to the pool.

Note: Subsequent inspection of the pool found the audible alarms on all three pool RMS units taped over. Due to the low set points of area RMS monitors, spurious alarms had occurred frequently, and personnel working in the areas had taped over the audio amplifier to limit the noise from spurious alarms.

A similar incident occurred on February 4, 1981 when two maintenance workers raised a ICI wire spool out of the pool. Working in accordance with procedure RV-19, "Incore Instrument Thimble Removal," and a job specific work permit (SWP), the workers believed they were moving an empty spool. In fact, due to apparent poor communication with workers from a previous shift, the spool contained a coil of activated ICI wire. Consequently, the area RMS system alarmed and the workers dropped the spool back into the pool. Doses to the personnel were estimated to be 1500 and 660 mrem, respectively. Though a Rad-Con technician was present, continuous coverage was not provided since the spool was expected to be empty and was not expected to constitute a significant exposure problem.

In both cases, an ICI coil was located in a place where it was not expected; and Rad-Con coverage was not provided based on the assumed lack of significant hazard. Each case had significant potential for excessive exposure to the personnel performing the work and other personnel in the near vicinity. (Groups of craftsmen were working around the pool in both cases).

Relative to these events the inspector identified the following as items of noncompliance:

5.1 Technical Specification 6.8, "Procedures," states,

"Written procedures shall be established implemented and maintained covering the activities referenced below:

- a. The applicable procedures recommended in Appendix "A" of Regulatory Guide 1.33, November, 1972..."

Regulatory Guide 1.33, November, 1972 "Quality Assurance Program Requirements (Operation)," indicates in Section I that procedures should be prepared specifically for the repair of Incore Flux Monitoring System; and, to this end, general procedures should be established to include the factors to be taken into account in preparing such detailed work procedures, including the necessity for minimizing radiation exposure to workmen relative to maintenance, repair, replacement and modification detailed work procedures.

Contrary to this requirement the detailed work procedure RV-19, "Incore Thimble Removal," was not adequate in that factors for minimizing radiation exposures to workmen were not taken into account in preparing the work procedure. RV-19 did not provide instruction or direction relative to assuring that adequate radiation protection would be offered to personnel working with ICI components in the spent fuel pool. Consequently on February 4, 1981, two maintenance workers received unplanned exposures of 1500 and 660 mrem respectively while performing maintenance on ICI components (82-06-01)

5.2 Technical Specification 6.11, "Radiation Protection Program Program," states,

"Procedures for the personnel radiation protection program shall be prepared consistent with the requirements of 10 CFR Part 20 and shall be approved, maintained and adhered to for all operations involving personnel radiation exposure."

Procedure RCP-3-602, "Radiation Work Permit," Section 4.4.1 states, a RWP may not be used for work in an area where conditions are likely to change abruptly, even though the job is of a repetitive nature unless prior approval is obtained.

Contrary to this requirement, on September 30, 1981, two Fuel Management Engineers performed work beyond the scope of RWP 81-6, without prior approval by performing work in the spent fuel pool which caused abrupt changes in the radiological conditions. As a consequence the workers received unplanned radiation exposures of 180 and 140 mrem. (82-06-02)

- 5.3 10 CFR 20.201, "Surveys," requires each licensee to make or cause to be made such surveys (an evaluation of the radiation hazards incident to the presence of radioactive material) as may be necessary to comply with the regulations of 10 CFR 20 as are reasonable, under the circumstances, to evaluate the extent of radiation hazard that may be present.

Contrary to this requirement, on February 4, 1981, surveys were not made in support of work being performed by two maintenance workers raising a ICI wire spool from the fuel pool. Though a Rad-Con technician was present in the area, it was assumed that the wire spool was empty, and consequently no radiological monitoring was performed while raising the spool to the surface. The subject wire spool unexpectedly did contain ICI wire and caused inadvertent exposure to the two personnel of 1500 and 660 mrem, respectively. (82-06-03)

The inspector verified that the tape was removed from the audible alarms. The operation of the Radiation Monitoring System will be examined in a subsequent inspection. (82-06-04)

## 6. Procedure Review and Implementation

### 6.1 Preparations for the Outage

The inspector reviewed the status of the procedures prepared for the non-routine outage jobs, to verify compliance with the Technical Specifications requirements for written procedures, and with As Low As Reasonably Achievable (ALARA) principles. The major jobs were identified and procedures drafted for review and approval. The manpower, anticipated occupational exposures, protective clothing, shielding, and decontamination requirements were identified for the major jobs.

No violations were identified.

### 6.2 Routine procedures

The inspector reviewed the status of procedures in the following 16 areas:

- . Radiation Safety Manual
- . Whole body counter calibrations
- . Radiation area access controls
- . Personnel dosimetry records
- . ALARA program
- . Incident and event evaluations
- . Training of radiation protection personnel
- . Neutron survey instrument calibration

- . Solid waste management
- . Quality Assurance Procedures related to radiation protection, and to radwaste transportation
- . Surveys
- . Air Sampling
- . Annunciator Control and Alarm Manual
- . Gaseous release records
- . Liquid radwaste release permits
- . Packaging, labeling and shipment of radioactive materials

Observation during tours of the facility and during reviews of records and checksheets, maintained pursuant to licensee procedures and instructions, did not identify any violations.

#### 7. Radiation Protection Qualification and Training

The inspector verified compliance with the requirements of Technical Specification 6.3, "Facility Staff Qualifications", and 6.4, "Training"; and Section 5.5 of ANSI N18.1-1971 with respect to the licensee's program for qualifying eight Chemistry and Health Physics Department trainees. Records of 10 contract technicians were also reviewed. The inspector also reviewed the training records of the four individuals (two fuel management engineers and two maintenance workers) discussed in paragraph 5.

No violations were identified.

#### 8. Exposure Control

##### 8.1 External Exposure

During tours of the facility the inspector observed the dosimetry practices on the job, including work requiring extremity dosimetry and special placement of dosimetry, to determine compliance with 10 CFR 20.202.

The inspector reviewed work permits and personnel dosimetry records, and interviewed personnel to determine compliance with 10 CFR 20.101, 20.102 and 20.202.

No violations were identified.

##### 8.2 Internal Exposure

During tours of the facility the inspector observed the practices regarding contamination areas and airborne radioactive materials areas, respiratory protection and air sampling to determine compliance with 10 CFR 20.103. The inspector reviewed the licensee's records of process and engineering controls, personnel exposures to airborne radioactive materials, and maintenance of respiratory protection equipment.



The review of the Breathing Air System indicated that the source (Service Air System Compressors) was oil-free and any use for breathing purposes was through a purifying unit equipped with alarms. The Breathing Air System piping and manifolds inside containment were separated from any Service Air System piping inside containment. A backup supply of bottled breathing air was on automatic standby in the event of a Service Air System compressor failure.

No violations were identified.

## 9. In-Plant Radiation Protection

### 9.1 Surveys

The inspector conducted confirmatory surveys during plant tours to determine compliance with the requirements of 10 CFR 20.201. No problems were identified.

### 9.2 Area Control

The inspector observed the control of Radiation Areas, High Radiation Areas, locked High Radiation Areas, Contaminated Areas, and Airborne Radioactive Materials Areas throughout the facility to determine compliance with 10 CFR 20.203, Technical Specification 6.12, "High Radiation Area," and licensee procedures.

No violations were identified.

### 9.3 Radioactive and Contaminated Material Controls

During tours of the facility and the surrounding owner-controlled property, the inspector observed the labeling of containers of radioactive materials, posting of Radioactive Materials Areas, labeling of shipping containers, transport placards, and control of restricted area access, in order to determine compliance with 10 CFR 20.105 and 10 CFR 20.203. The inspector also reviewed the survey, receipt, and release of radioactive material packages, tools, and equipment entering and leaving the site to determine compliance with 10 CFR 20.203, 10 CFR 20.205, and 10 CFR 71.

No violations were identified.

### 9.4 Radiation Work Permit Program

The inspector reviewed the records of recent and current work permits to determine compliance with Technical Specifications 6.11 and 6.12. With the exception of the items noted in Paragraph 5, no other problems were identified.

## 10. Advance Planning and Preparation for Major Tasks

### 10.1 Increased Work Force for Radiation Protection Purposes

A licensee representative stated that about ten contract personnel were on site to assist with specific jobs that were not outage-related. Additionally, eight contract personnel were onsite to assist with the outage preparations, and 32 additional personnel were scheduled to report in time to start the outage.

### 10.2 Special Training and Mockups

The licensee representative stated workers were hired with special training and experience on the high dose rate jobs such as steam generator inspection and repair, and valve, pump, and nozzle repairs.

The licensee planned each high dose rate job using a mockup or spare unit onsite.

### 10.3 Identification and Planning of High Exposure Jobs

Interviews with personnel and a review of ALARA documents indicated the threshold for ALARA review of a job was a three man-rem total dose estimate, or a one rem/hr dose rate, for the job. The licensee had identified the following jobs for ALARA review as major tasks:

- . Steam generator in-service-inspection and repair
- . Steam generator modifications (rim cut top tube spacer)
- . Changeout of incore instruments (ICIs)
- . Changeout of reactor cooling pump seals
- . Refueling Water Storage Tank in-service-inspection and repair
- . Repairs to valves in letdown system, charging system and safety injection system lines (CV-5,-15, and -16 and CV-5,-17, -18 and -19).
- . Repairs to pressurizer spray valves (100-E and F), and pressurizer level transmitters
- . Installation of parts of the post accident sampling system

The licensee plans to maintain current histories of ALARA jobs as work progresses.

No violations were identified.

## 11. Exit Interview

The inspector met with the individuals denoted in paragraph 1, at the conclusion of the inspection. The inspector reviewed the inspection findings.