U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 88-04

Docket No. 50-29

License No. DPR-3 Priority -- Category C

Licensee: Yankee Atomic Electric Company
1671 Worcester Road
Framingham, Massachusetts 01701

Facility Name: Yankee Nuclear Power Station

Inspection At: Rowe, Massachusetts

Inspection Conducted: February 8-11, 1988

Inspectors: A. Wendorf for — 3/31/88
M. Markley, Radiation Specialist — date

A. Wendorf for — 3/31/88
J. A. Gresick, Radiation Specialist — date

Approved by: M. Shanbaky — 3/31/88
M. Shanbaky, Chief, Facilities Radiation Protection Section — date

Inspection Summary: Inspection on February 8-11, 1988 (50-29/88-04)

Areas Inspected: Routine, unannounced inspection of the licensee's implementation of their Radiation Protection Program during routine operations. Areas reviewed included: the status of previously identified items, organization and management controls, training and qualification of personnel, facilities and equipment, internal exposure controls, external exposure controls, ALARA, control of radioactive material, surveys, and monitoring.

Results: Within the areas inspected, one violation was identified. However, the inspector determined this violation meets the criteria established in 10 CFR 2, Appendix C, Section V.A for licensee identified violations. No citation will be made at this time. An unresolved item, concerning radioactive material labeling, is discussed in Section 8.3. Weaknesses were identified in staffing, facilities and equipment, bioassay, hot particle exposure controls, and ALARA.

DETAILS

1.0 Persons Contacted

During the course of this inspection, the following personnel were contacted or interviewed:

1.1 Licensee Personnel

*G. M. Babineau, Radiation Protection Manager
*L. Bozek, Quality Assurance Supervisor
R. Clark, Training Manager
*B. L. Drawbridge, Assistant Plant Superintendent
*J. Geyster, Radiation Protection Engineer
*T. K. Henderson, Technical Director
*P. Hollenbeck, Radiation Protection Engineer
*J. Kay, Technical Services Manager
*G. F. McDonald, Quality Services Manager
N. N. St. Laurent, Plant Superintendent
*T. Shippee, Radiation Protection Engineer
*S. Wisla, Radiation Protection Engineer

1.2 NRC Personnel

H. Eichenholz, Senior Resident Inspector
*C. Carpenter, Resident Inspector

Other licensee personnel were contacted or interviewed during this inspection.

*Attended exit interview on February 11, 1988

2.0 Purpose

The purpose of this routine inspection was to review the licensee's radiation protection program with respect to the following elements:

- Status of previously identified items;
- Organization and management controls;
- Training and qualification of personnel;
- Facilities and equipment;
- Internal exposure control and assessment;
- External exposure control and dosimetry;
- Control of radioactive material, surveys and monitoring; and
- ALARA.

3.0 Status of Previously Identified Items

3.1 (Closed) 84-15-03 (Inspector Follow-up). Revise calibration procedures to incorporate ANSI-N323 and Regulatory Guide 8.25.

The licensee upgraded the calibration procedures to include three calibration points per scale, acceptance criteria for instrument accuracy, and calibration frequencies. There were still some minor technical problems noted with source to detector distances for certain instrument ranges. This is discussed in Section 6.0. This item is closed.

3.2 (Closed) 85-16-01 (Inspector Follow-up). Establish controls to ensure all requirements are met during requalification of respirator users.

The licensee established a computer tracking system on their computer program for tracking respirator requalification status. Printed reports are updated and issued weekly during routine operations and once per shift during outages. This item is closed.

3.3 (Closed) 87-11-02 (Unresolved). Licensee identified failure to provide personnel monitoring reports in accordance with 10 CFR 20.408 and 20.409 for 37 terminated personnel.

The inspector discussed the scope and nature of the violation with the licensee. The inspector determined the following:

(1) Through a review of personnel accountability, which is a part of the station access controls, the licensee had identified this violation;

(2) The violation identified meets the criteria of a Severity Level V violation (Supplement IV);

(3) The violation was not required to be reported based on the provisions of 10 CFR 20.408 and 409;

(4) The licensee provided the inspector with proposed corrective actions to prevent recurrence of this incident; and

(5) The violation is not a violation that has been previously identified with this licensee in the area of Health Physics.

10 CFR Part 2, Appendix C, Section V.A. "Notice of Violation", states "the NRC will not generally issue a violation" when the above criteria are met.

The inspector reviewed the licensee's Nonconformance Report No. 87-38. The licensee had identified the root cause of this failure to be a lack of appropriate administrative controls to flag terminated individuals with discrepant dosimetry results. The licensee corrected this deficiency and established an automated system to provide a list of all individuals approaching termination letter due dates. This will enable the licensee to identify personnel for which an immediate dosimetry evaluation is needed. The licensee will also

establish additional administrative controls between Security and Radiation Protection to ensure that security badges and dosimetry terminate simultaneously.

The inspector determined that the licensee's corrective actions appeared sufficient to prevent a re-occurrence of this action. This item is closed.

3.4 (Closed) 85-16-03 (Inspector Follow-up). Review progress of RP procedure upgrade project.

All radiation protection procedures have been revised in the last two years. Procedures were found to be concise and provided clear guidance for the appropriate users. The licensee has initiated steps to address minor procedural problems identified during the current inspection (Section 4.3). This item is closed.

3.5 (Closed) 86-12-01 (Inspector Follow-up). Implement corrective actions for missed survey incident.

Licensee procedure revision (OP-8101) now includes itemized survey checkoff lists. These lists (survey charts) provide easy verification that required surveys were performed at specified frequencies. Inspector review of daily, monthly, and quarterly surveys indicated no examples of missing surveys. Licensee management met with technician personnel to discuss the importance of meeting surveillance requirements. Technician training was performed as a procedure revision sign-off. This item is closed.

4.0 Organization and Management Controls

The licensee's organization and management controls were reviewed with respect to criteria contained in:

- Technical Specification 6.2, "Organization", and 6.8, "Procedure".

The licensee's performance related to the above criteria was determined by:

- review of AP-8001, Rev. 5., "Radiation Protection Department Organization,"
- review of position descriptions for the Radiation Protection Manager and the Radiation Protection Engineers,
- review of selected Radiation Protection procedures,
- review of Yankee Atomic Audit Nos. Y-86-03 and Y-87-03, and
- discussions with licensee representatives.

4.1 Staffing

Weaknesses were noted in the frequency of Health Physics (HP) technician rotations in the areas of internal exposure controls (i.e., respiratory protection, whole body counting) and instrument calibration. This

may lead to a decrease in the level of technical proficiency of the HP technicians assigned to these technically complex areas. The licensee stated that this weakness had been identified. To correct this weakness, one individual was being used for two hours a day to calibrate instruments. However, this individual was occasionally unable to perform the calibrations, if other HP responsibilities, such as control point duty, or surveys took precedence. The inspector brought this to licensee management attention. The licensee stated another method of staffing these specialty areas would be considered.

4.2 Audits

Audits of the Radiation Protection program are performed annually by the corporate Quality Assurance group and independent technical specialists. The audits reviewed by the inspector addressed selected aspects of the licensee's Radiation Protection program, and appeared thorough and comprehensive. Licensee's responses to the audit findings were timely.

The licensee had a few systems in place to identify, analyze, and correct problems in the implementation of the Radiation Protection program. These systems included Nonconformance Reports, Radiological Occurrence Reports (ROR), and Plant Information Reports. A licensee audit identified that the ROR system was ineffective, which the licensee was trying to correct at the time of the inspection. Inspector review of the Nonconformance Reports and the Plant Information Reports indicated that these systems appeared capable of identifying noncompliance or programmatic weaknesses and achieving the appropriate corrective actions.

4.3 Procedures

The inspector reviewed selected Radiation Protection procedures. The Radiation Protection program procedures had undergone a major revision (NRC inspector follow-up item No. 85-16-03). The procedure upgrades resulted in concise procedures with clear directions and requirements. However, selected procedures still needed some technical review and revision. Examples of specific procedures needing additional work, such as certain instrument calibration procedures and hot particle control procedures, were discussed with the licensee and are discussed further in the specific areas of the licensee's Radiation Protection program in this report. The licensee stated that the appropriate revisions would be made to the procedures.

No violations were identified during this review.

5.0 Training and Qualification of Personnel

The licensee's program for training and qualifying radiation workers and radiation protection technicians was reviewed with respect to criteria contained in:

- 10 CFR 19, "Notices and Instructions to Workers",
- Technical Specifications 6.3, "Facility Staff Qualifications", and 6.4, "Training".

The licensee's performance related to the above criteria was determined by:

- review of the training and retraining programs for GET, HP technicians, and HP supervisors, and
- discussions with various licensee representatives.

The licensee was conducting training and retraining in accordance with regulatory requirements and license conditions.

The licensee hired a new Manager of Training who has augmented the technical training staff and has begun upgrading the GET and Health Physics technician training programs. Additional technical training for Health Physics supervisory personnel is also planned. The upgraded training programs will be reviewed in future inspections.

No violations were identified in this area.

6.0 Facilities and Equipment

The licensee's Radiation Protection facilities and equipment, including the counting laboratory, field survey instrumentation and instrument calibration facility, were reviewed by the following:

- tours of the calibration trailer and counting laboratory,
- review of the following procedures:
    - DP-8583, revision 3, 04/86, "Calibration of the IRT PRM-110 and PRM-120 Portal Radiation Monitors";
    - DP-8558, revision 6, 11/86, "Operation, Source Checks and Calibration of G.M. Friskers";
    - DP-8005, revision 8 major, 8/87 "Dose Rate Calculations for Calibration Sources";
    - AP-8006 revision 5 major, 9/86, "Control of Radiation Protection Measuring and Testing Equipment";
    - OP-8524, revision 1, 9/87, "Operation of the Victoreen Model 878-10 Calibrator for Calibration of the Two VC Accident Area Rad Monitors";
    - DP-8511, revision 4, 10/87, "Alpha Spectrometry System Operation and Calibration";
    - DP-8552, revision 9, 1/87, "Calibration of the Eberline Model E-520";
    - DP-8553, revision 4 major, 11/86, "Air Sample Pump Calibration";
    - DP-8555, revision 7, 1/87, "Calibration of the Eberline Portable Ion Chamber, Model PIC-6"; and
- discussion with licensee representatives.

There were sufficient numbers of calibrated instruments for field measurements. A computer program, associated with the licensee's computer system for Radiation Protection record-keeping, maintained the status and location of all field instrumentation. Counting room instrumentation was calibrated and well maintained. However, program weaknesses were noted, and are discussed below:

- For the high range calibration of certain survey instruments, the source-to-detector distance was unacceptably close (ANSI N-323 - 1978, Section 6.1, states that the source-to-detector distance should be a minimum of 7 detector diameters).

- No daily QC charts were used for background and efficiency/resolution checks for laboratory counting instrumentation.

- There was only one individual (the Radiation Protection Engineer) on the staff who was fully familiar with all of the counting instrumentation. This individual performs all data analysis and technical evaluation of equipment performance problems. This may make the licensee's analytical capabilities vulnerable to the loss of key personnel. This observation was communicated to licensee management for their review.

The licensee stated that the source-to-detector distance during calibration would be increased to reflect the ANSI Standard recommendation. The licensee also stated that instrument QC data was reviewed daily, making the plotting of QC charts unnecessary (also see Section 7.4).

7.0 Internal Exposure Controls

The licensee's program for air sampling, performing bioassays, and providing engineering controls and respiratory protection was reviewed against criteria contained in:

- 10 CFR 20.103;
- Technical Specification 6.11, "Radiation Protection Program";
- Regulatory Guide 8.15, "Acceptable Program for Respiratory Protection";
- Regulatory Guide 8.26, "Applications of Bioassay for Fission and Activation Products"; and
- ANSI N13.1-1969, "Sampling Airborne Radioactive Materials in Nuclear Facilities."

The licensee's performance relative to the above criteria was determined by:

- observations made during tours of the Radiologically Controlled Area, the Health Physics control point, and the whole body counting and respirator fitting room;

- review of the following procedures:

  - OP-8102, revision 1, 2/88, "Plant Airborne Radioactivity Surveys";
  - DP-8015, revision 7, 8/86, "MPC Hour Accountability";
  - DP-8105, revision 6 major, 8/86, "Breathing Zone Air Samples";
  - OP-8405, revision 8, 6/87, "Bioassay Program";
  - DP-8030, revision 3 major, 4/87, "Evaluation of In-Vivo Bioassay Results";
  - AP-8012, revision 6 major, 9/86, "Respiratory Protection Training"; and

- discussions with the Radiation Protection Engineer.

A weakness was identified, in that there was only one individual (Radiation Protection Engineer) responsible for development and implementation of the internal exposure controls program. There was no technical support for internal exposure controls. Routine operations of these activities (i.e. whole body counts and respiratory fitting) were rotated through the technician pool without sufficient time to gain competence in this area to maintain the internal exposure controls program in the absence of the Radiation Protection Engineer (RPE).

7.1 Air Sampling Program

The licensee uses breathing zone air samples extensively to monitor breathing air radioactivity concentrations. A review of the procedures for breathing zone air samples and MPC-hour accountability indicated that the licensee had a technically sound and thorough approach to quantifying concentrations of radioactive materials in air in the worker's breathing zone.

The licensee had several alarming air monitors strategically placed in the RCA to monitor and trend airborne activity. Additional low and medium volume air samplers were used to determine airborne radioactivity concentrations prior to entering potential airborne radioactivity areas.

7.2 Engineering Controls

To limit airborne radioactivity areas, the licensee uses tents and enclosures with portable HEPA and charcoal filtration. For work inside the Vapor Container (VC), the licensee had two 1000 cubic foot per minute ventilation units and one 2000 cubic foot per minute ventilation unit. There was also one 500 cubic foot per minute ventilation unit for work outside the VC requiring engineering controls to limit airborne radioactivity concentrations.

7.3 Respiratory Protection

The licensee had procedures in place which defined the key elements of a good respiratory protection program. However, through discussions with the Radiation Protection Engineer (RPE) and the training department, the inspector found that there were occasional lapses in retraining radiation workers on the emphasis of using engineering controls in lieu of respirators, and on relief from using a respirator in the event of physical or psychological discomfort. Inspector discussions with the Training department found that this training weakness had been identified and would be upgraded in the annual retraining program for radiation workers.

There were sufficient supplies of clean, usable respirators. However, the supplies of replacement parts were depleted. Also, the inspector found respirators improperly stored. The RPE had recently completed a Respiratory Protection Course for a training refresher and was aware of appropriate practices with respect to respirator storage and repair. The RPE stated that he had planned to upgrade respirator maintenance and storage, but had not had the opportunity to do so at the time of the inspection. He stated that the upgrades in this area will be completed on a timely basis.

In addition to full-face particulate respirators, the licensee also uses supplied air breathing hoods and masks. The licensee previously used compressed air tanks for supplied breathing air. Recently, the licensee installed a plant breathing air compressor system. Air quality is tested twice a year by a contractor. The inspector reviewed the sample results of breathing air quality and found that the licensee's installed breathing air system exceeded Grade D breathing air standards, as specified in ANSI Z86.1-1973, "Commodity Specification for Air".

7.4 Bioassay Program

The licensee's bioassay program consists primarily of a single intrinsic germanium detector whole body counter which is collimated to view the lungs, GI and thyroid. The equipment is calibrated every 18 months by the RPE using a humanoid lung phantom provided by YAEC Environmental Laboratories. Inspector review of the calibration data and minimum sensitivities for detection of radioactive material in the body were found to be acceptable. However, the instrumentation did not have adequate control devices to ensure consistent counting geometries. Personnel were positioned on a stool in front of the detector by "eye-balling" the detector center to a location on the counted individual's back.

The inspector reviewed the daily quality control data (background and source checks) for the whole body counter. The RPE reviews the data on a daily basis. However, no quality control charts were used

to trend and track the data. The inspector stated that current good practices dictate the use of daily QC charts for effective equipment performance checks. The licensee stated that daily QC charts were unnecessary, because the data was reviewed daily and the equipment performed consistently.

Within the scope of this review, no violations were identified.

8.0 External Exposure Controls

The licensee's program for external exposure controls was reviewed against criteria contained in the following:

- 10 CFR 20, "Standards for Protection Against Radiation";
- Site Technical Specifications;
- Selected procedures;
- Information Notice (IN) 86-23, "Excessive Skin Exposure Due to Contamination with Hot Particles", dated April 9, 1986; and
- Information Notice (IN) 87-39, "Control of Hot Particle Contamination at Nuclear Power Plants", dated August 21, 1987.

Evaluation of licensee performance in this area was based on the following:

- Discussions with licensee personnel;
- Tours of the facility;
- Review of dosimetry records;
- Review of personnel contamination reports;
- Review of RWPs and associated surveys.

8.1 Hot Particle Exposure Controls

The licensee has no procedure for "hot particle" identification and exposure controls. Personnel decontamination and dose assessment for hot particle or "speck" exposure controls is in procedure OP-8430, "Personnel Contamination Monitoring and Decontamination." Weaknesses were identified in this procedure in that documentation forms lacked contamination classification (area vs. hot particle). Also, the manual calculation methodology provided inadequate guidance as evidenced by the numerous calculation errors identified in contamination incident reports.

The licensee stated that the weaknesses would be addressed and appropriate procedures will be developed or upgraded. Personnel contamination monitors are of the whole body frisker-type which are capable of detecting and locating hot particles. The licensee monitored protective clothing and laundry processing for hot particles. The inspector frisked a representative sample of in-use protective clothing. No hot particles were identified. Review of personnel contamination incident reports indicated no significant skin exposures since the 1987 outage.

Below is a listing of controls the licensee intends to implement prior to the November 1988 outage.

- Provide additional personnel monitoring instrumentation to identify radioactive material which may exist at "blind spots" not detected by the whole body friskers;
- Approve a comprehensive procedure specifically addressing hot particles;
- Establish a zone classification system for plant areas likely to produce hot particles;
- Acquire or develop a radiological laundry monitor; and
- Provide stay time limits for high risk hot particle evolutions.

The inspector viewed the above planned measures as a good initiative.

8.2 Personnel Dosimetry

Review of external exposure records indicated that there were no occupational exposures in excess of regulatory limits. All radiation workers observed were found to be correctly wearing personnel monitoring devices specified by the appropriate Radiation Work Permits (RWPs). Examination of pocket ion chamber storage racks indicated all devices were calibrated and clearly labeled.

8.3 Posting and Labeling

Facility posting was good. Inspector verification of radiation and contamination levels produced no anomalous results. The licensee is making progress in reducing the number of posted high radiation exclusion areas as discussed in section 10.0.

The inspector identified one programmatic weakness in radioactive material labeling. The licensee uses containers (clear polyethylene bags with magenta lettering) which do not meet radioactive material labeling requirements. The regulations require the color coding for the radiation caution symbol to be "magenta or purple on yellow background." Without additional labeling, these containers would not satisfy labeling requirements for quantities of radioactive material above 10 CFR 20, Appendix C quantities. The inspector noted numerous examples of inconsistent labeling. Some polyethylene bags were used in barrels which had radioactive material labels on them. Some barrels had no labeling. The inspector identified the same bags being used for clean material storage. The inspector also noted a general absence of radiation and contamination level markings on containers which had the appropriate radioactive material labels. This indicates a need for improved attention to detail. Licensee corrective actions included ordering new bags with labels that meet regulatory requirements and increased labeling to properly identify all bags. Because no containers containing quantities in excess of 10 CFR 20, Appendix C were identified, no violation was cited. This item is unresolved

pending completion of the licensee's improvements in this area (88-04-01).

8.4 Radiation Monitoring Instrumentation

The inspector found containment high range area monitors to be operable and calibrated with sources traceable to the National Bureau of Standards (NBS). Radiation protection surveillances of all Technical Specification area monitors were complete. Control Room logbooks indicated maintenance was performed on the Vapor Container East high range area monitoring system in November 1987. Records were well maintained.

All portable radiation protection survey instruments examined were found to have valid calibration stickers. Instrument issue records were observed to be complete throughout the inspection. The inspector observed a radiation protection technician source check a representative sample of instruments. All instruments source checked met the appropriate acceptance criteria.

9.0 ALARA

The licensee's ALARA program was evaluated against criteria contained in the following:

- Regulatory Guide 8.8, "Information Relevant to Ensuring the Occupational Radiation Exposures at Nuclear Power Stations Will be as Low as is Reasonably Achievable (ALARA);"

- Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as is Reasonably Achievable;"

Licensee performance relative to these criteria was evaluated by:

- Discussions with cognizant personnel;
- Tours of radiologically controlled areas;
- Review of station ALARA goals;
- Review of departmental exposure tracking;
- Review of station procedures;
- Review of ALARA briefing packages.

The licensee ended 1987 well within the annual ALARA goal of 237 person-rem (186 outage and 51 non-outage person-rem). Actual exposure for 1987 was 204 person-rem (170 outage and 34 non-outage). For 1988, also an outage year, the ALARA goal is 193 person-rem (156 outage and 37 non-outage). These goals are reasonable for this facility.

Currently, two individuals are assigned to perform formal ALARA functions (i.e planning and completion of ALARA job reviews). These individuals also perform inplant ALARA implementation such as briefing workers and

installing radiological shielding. ALARA briefing packages completed since the 1987 outage were thorough. The inspector found a high level of overall completeness in ALARA job reviews where the Yankee Atomic Group was involved in Engineering Design Change Requests (EDCRs). By comparison, ALARA packages completed by the site staff lacked similar depth and degree of completion. Licensee management acknowledged this concern and stated that three additional contractor ALARA support personnel were planned for the upcoming outage.

The licensee's ALARA staff performs exposure tracking and trending daily. This information is readily available and distributed. Currently, this trending includes site and departmental exposure for routine operations and outages.

The licensee has made good progress in reducing the number of locked high radiation exclusion areas through effective shielding. This program was initiated to reduce routine occupational exposures such as those incurred during operator surveillances. The inspector viewed this as a good practice.

The licensee has exercised good initiative in implementing the use of audio-visual equipment for radiation protection surveillance of work evolutions. The inspector noted that opportunities for broader use of this equipment were available to the licensee.

The licensee has purchased a new steam generator mock-up. At the time of inspection, it had not yet been received. Licensee efforts to improve steam generator training for upcoming outages is viewed as a good effort.

The inspector found the licensee's ALARA briefing program to be weak in that individuals can be authorized to perform work prior to receiving an ALARA briefing. The licensee initiated a procedure revision to OP-8020, "Implementation and Documentation of ALARA Job Reviews" to ensure briefings are completed.

10.0 Control of Radioactive Materials, Surveys, and Monitoring

Radiological survey results reflected that the licensee was evaluating the appropriate hazard. Specifically, RWP number 88-00115, "Cut Up Old Spent Fuel Rack" provided survey results for smearable alpha contamination and air activity. Because the reactor was operating, most RWPs and surveys posted were for general access entries. No expired RWPs or out of date surveys were identified.

A weakness was identified in the licensee's ability to minimize the introduction of clean materials into contaminated trash. Specifically, individuals preparing to perform work under RWP 88-00115 disposed of clean respirator storage bags and earplug containers in a barrel labeled "Caution, Radioactive Material."

Since September 22, 1987, the licensee has reduced contaminated areas outside the Vapor Container from 6,000 ft^2 to 5,200 ft^2. Also, two contractor decontamination personnel have been added to the RP staff to provide these services. The inspector viewed this as a good initiative.

11.0 Exit Meeting

Inspectors met with licensee management listed in Section 1.0 on February 11, 1988, at the conclusion of the inspection. The findings of the inspection were discussed at that time.